ove Office of Evaluation and Oversight

Climate Change and IDB: Building Resilience and Reducing Emissions

Regional Study: LAC Small Island Development States

IDB
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PREFACE

Climate change (CC) poses important risks to development in Latin America and the Caribbean (LAC). Climate adaptation can limit the negative impacts and is important in achieving sustainable development and equity, including poverty reduction and economic growth. Integrating CC mitigation into development work is also an opportunity to foster and support the design and implementation of sustainable projects, programs and policies. Low-carbon alternatives contribute to more sustainable development. LAC countries are increasingly incorporating CC in their national policy agendas and aim to reduce GHG emissions and build climate resilience and the IDB has supported these efforts in the Region.

In 2013-2014, the Office of Evaluation and Oversight (OVE) carried out an evaluation of IDB's support for CC mitigation and adaptation (RE-459). This is OVE's first evaluation of IDB's interventions and institutional set-up related to CC. The evaluation seeks to document and to draw lessons from the recent IDB experience related to CC (2004-2014). It focuses on IDB-financed operations in important climate-related sectors—agriculture and natural resources, energy, disaster risk management, and transport—that directly support climate resilience-building (adaptation) or GHG emissions reduction (mitigation) or that have these outcomes as co-benefits. A number of background papers were produced for the evaluation and this is paper is one commissioned by OVE to support the overall CC evaluation.

The future happens. No matter how much we scream.

Derek Walcott, *The Odyssey* (1993)*

***** Derek Walcott is a Saint Lucian poet and playwright who received the 1992 Nobel Prize in Literature.

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This evaluation was prepared by Ricardo Marto, Lourdes Alvarez, David Suarez and Veronica Gonzalez Diez as an input for the evaluation *Climate Change and the IDB: Building Resilience and Reducing Emissions*.

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ACRONYMS AND ABBREVIATIONS

AOSIS	Alliance of Small Island States
BPoA	Barbados Programme of Action for the Sustainable Development of SIDS
CARICOM	Caribbean Community and Common Market
CCCCC	Caribbean Community Climate Change Centre
CCVI	Climate Change Vulnerability Index
CCS	Climate Change and Sustainability
CDB	Caribbean Development Bank
CDEMA	Caribbean Disaster Emergency Management Agency
CIAT	Comité Interministeriel d'Aménagement du Territoire
CIF	Climate Investment Fund
CPACC	Caribbean Planning for Adaptation to Climate Change
CS	Country Strategy
CSIDS	Caribbean Small Island Developing States
CZM	Coastal zone management
CZMU	Coastal Zone Management Unit
DEM	Department of Emergency Management
DfID	UK Department for International Development
DRM	Disaster risk management
DRR	Disaster risk reduction
ECLAC	Economic Commission for Latin America and the Caribbean
GAIN	Global Adaptation Institute Index
GDP	Gross domestic product
GEF	Global Environmental Facility
GHG	Greenhouse gas
ICZM	Integrated coastal zone management
IDB	Inter-American Development Bank
IPCC	Intergovernmental Panel on Climate Change
LAC	Latin America and the Caribbean
LCDS	Low Carbon Development Strategy
LDCs	Least developed countries
LULUCF	Land use, land-use change, and forestry
NAPA	National Adaptation Program of Action
OECS	Organization of Eastern Caribbean States
OVE	Office of Evaluation and Oversight
PBG	Policy-based grant
PBL	Policy-based loan
PBP	Programmatic policy-based loan
PPCR	Pilot Program for Climate Resilience
SIDS	Small island developing states

SLR	Sea-level rise
SPCR	Strategic Program for Climate Resilience
TCDPO	Town and Country Development Planning Office
UN	United Nations
UNEP	United Nation Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
WB	World Bank
WMO	World Meteorological Organization

EXECUTIVE SUMMARY

This report is a background paper for the overall climate change evaluation being conducted in 2014 by the Office of Evaluation and Oversight (OVE) of the Inter-American Development Bank (IDB, or the Bank). The report aims to assess the IDB's role in responding to climate change in the Caribbean over the period 2004-2013 and to provide suggestions to strengthen the effectiveness of Bank operations in small island developing states (SIDS). It analyzes key vulnerabilities, threats, and opportunities that the nine Caribbean countries—The Bahamas, Barbados, Belize, Dominican Republic, Guyana, Haiti, Jamaica, Suriname, and Trinidad and Tobago—are facing, discusses the IDB strategy and *de facto* program to address them, and presents case studies of the Bank's role in Barbados, Dominican Republic, and Haiti.

A changing climate in the Caribbean: a warmer region. According to the Intergovernmental Panel on Climate Change, average temperatures in the region have increased by roughly 0.1° to 0.2°C per decade over the last 33 years. This increase is projected to continue and to be even more pronounced in certain Caribbean countries. Rainfall patterns have also shifted in different countries. Although the trend for precipitation intensity is not clear for most of the Caribbean, the number of consecutive dry days is expected to increase. The region was hit by 62 tropical storms and hurricanes between 2004 and 2012; it is projected that extreme weather events will be more intense, although no conclusions can yet be drawn on their frequency. Sea-level rise has been about 2-4 cm per decade, and the trend is expected to continue in the coming years.

Small island developing states and their vulnerabilities: big impacts in small territories. Small island developing states (SIDS) are a distinct group of developing countries that are characterized by vulnerable ecosystems given their particular geographic position and size, limited land space and high population and infrastructure density in coastal areas (averaging 52 people per km^2), and their proneness to natural disasters and to the disproportionately huge losses these could cause. Because climate change is likely to increase the severity of natural disasters in the Caribbean, it has the potential to affect the region's key economic sectors—agriculture and the tourism industry—as well as private property in general, shoreline stability, and the health of coastal and marine ecosystems. Sea-level rise might exacerbate these effects and add severe risks of groundwater saline intrusion and amplified beach erosion, which could have serious implications for water resources and land use in highly populated coastal areas. And although these countries have similar economic characteristics—all are small open economies (some commodity-based, others reliant on tourism) that are highly exposed to external shocks—their differing institutional capacities affect their vulnerability to climate change.

Limited resources to address challenges: the cost of inaction might be too high. Various bilateral and multilateral institutions have supported Caribbean countries in mitigating the impacts of climate change, but the resources deployed have been limited. In addition, Caribbean SIDS' access to global climate funding has been hindered by the small size of their proposals and financing needs relative to bigger countries. For instance, Jamaica is the only country of the nine SIDS receiving a grant from the Adaptation Fund, while the Pilot Program for Climate Resilience in the Caribbean is financing operations only in Haiti and Jamaica. Resources are needed to better prepare the region for the foreseen impacts of climate change. The Bahamas, Suriname, Guyana, Trinidad and Tobago, and Belize are expected to suffer the greatest economic

losses and damages in absolute economic terms (Simpson et al., 2010). At the same time, the cost of inaction in the Caribbean is projected to total US$22 billion annually by 2050—that is, 10% of the current size of the Caribbean economy (Bueno et al., 2008). Despite significant differences in the Caribbean SIDS' levels of development, economic performance, endowments, and geography, climate change poses serious threats to all of them.

Investing in development and climate change: bringing co-benefits for economies struggling to reduce oil import bills. Together, Caribbean SIDS are among the lowest global emitters of greenhouse gases (GHGs)—less than 1%—although Belize and Trinidad and Tobago are among the largest emitters of GHG per capita. Energy expenditure represents a large part of their national budgets and is a major drain on their foreign reserves, with oil imports accounting for 6-22% of GDP in 2012. Climate change resources could help the region reduce its dependence on fossil fuels and exposure to their price variability, with gains for climate change mitigation. Significant energy efficiency measures and the adoption of renewable energies would help reduce government and private sector energy bills. The tourism industry and other major foreign-exchange-earning sectors would likely gain competitiveness as a result of savings in energy bills. Climate funding might support the Caribbean in moving toward a climate-resilient low-carbon economy.

IDB strategy for climate change: uneven priorities across the region. The Bank currently has no regional strategy or action plan to guide adaptation and mitigation measures in the Caribbean SIDS. Although the Bank has taken important steps to tackle climate change challenges in the Caribbean region following the development of its Climate Change Strategy, its attention to the issue at the country level—through Country Strategies (CSs) and country portfolios—has been unevenly distributed among the nine Caribbean countries. Most CS risk assessments do recognize the risks climate-change-related impacts—primarily through natural disasters—may pose to the success of the Bank's program, but many fail to consider it one of the priorities. Mainstreaming of climate change into CSs seemingly relies on Bank specialists' technical support and the country's commitment on the issue. Those CSs that have considered climate change a priority have focused essentially on disaster risk management (DRM), coastal zone management (CZM), and the promotion of renewable energies.

IDB climate change program: resources evenly distributed between adaptation and mitigation. The Bank's 2004-2013 climate change portfolio of loans and grants represented 25% by number and 11% by value of the Caribbean portfolio—corresponding to about 0.1% of the nine Caribbean countries' GDP. The number of climate change-related operations has increased since 2010. Although in other regions the Bank has focused mostly on mitigation, in the Caribbean, operations are almost evenly distributed between adaptation and mitigation: the Bank devoted US$488 million to adaptation and US$548 million to mitigation activities in the nine countries. Of the adaptation and mitigation resources, 31% and 47%, respectively, supported drafting policies and legislation and institutional strengthening and research activities, while the rest (69% and 53%) supported investments. In terms of sectors, sustainable energy was the main area of Bank support (40% of the climate change portfolio), followed by agriculture and forestry (26%), and DRM and CZM (17%). The lion's share of the portfolio (66%) has focused on three countries: Trinidad and Tobago, Haiti, and Dominican Republic.

IDB instruments to address climate change: a mix of investment loans, policy-based loans, technical assistance, and investment grants. The Bank has mostly used sovereign-guaranteed lending—52% of the climate change portfolio was channeled through investment loans, 26% as non-emergency policy-based loans (PBLs) largely concentrated in mitigation policy, and 4% as emergency PBLs to support adaptation investments in response to extreme weather events. Private sector participation has been relatively low (9%), focused on mitigation activities and mainly concentrated on the promotion of renewable energies in the Dominican Republic. Investment grants (5%) and non-reimbursable technical cooperations (4%) have been used to support both adaptation and mitigation efforts. Operations classified as regional that involved the nine Caribbean SIDS focused on energy, biodiversity, and DRM and were to a large extent channeled through technical studies and other knowledge products. Regional support for the transport sector is almost nonexistent. The Bank also supported OECS (Organization of Eastern Caribbean States) countries through the Caribbean Development Bank (a loan and grants).

Barbados: climate change, coastal vulnerability, and economic development. The Bank and the Government of Barbados have worked together on CZM for more than 30 years. The Bank has been strategically and financially relevant, investing more than US$58 million through investment loans and technical cooperation. Continued Bank support helped strengthen the CZM Unit's institutional capacities to analyze and plan for the impacts of sea-level rise, coastal erosion, and saline intrusion into groundwater resources, using technical studies and frequent exchanges with international experts in climate change, oceanography, and engineering. Important engineering works, including breakwaters, groynes, and seawalls, were developed to protect the shoreline along the south and west coasts of the island (4.5 km of continuous safe beach access, with an additional 1.5 km in progress, and a beach volume increase of 16,000m^3). Although the long-term effectiveness of such investments has been disputed, given their high maintenance costs relative to natural interventions (wetland renewal, beach nourishment and vegetation), their medium-term environmental and economic benefits are significant. The improved and enhanced access to beaches boosted local economic activities, and new businesses have emerged along the coast.

Dominican Republic: extreme weather events, financial planning, and disaster risk reduction. Dominican Republic is highly exposed to major risks from extreme natural phenomena. According to the Germanwatch's Global Climate Change Index, the country ranks among the 10 countries most affected by extreme weather events. Furthermore, hydrometeorological catastrophes have posed serious challenges to a government that already faces significant financial shortfalls. In this context, the Bank's approach to enhance the Government's efforts is remarkable in design: it moved from an ex-post policy of reconstruction to a more structural perspective focused on financial planning and preparedness. The IDB has supported the country with loans and concessional resources to design a system of indicators for disaster risk management, strengthen the country's reserve fund for emergencies (allowing the country to access a contingency credit line for up to US$100 million that depends also on compliance with indicators), and adopt actuarial instruments (a parametric insurance-reinsurance facility) that could further enhance the country's protection against natural disaster losses and its response capacity. However, implementation has been hindered by a lack of appropriation at the highest political level that could jeopardize the achievement of relevant results.

Haiti: climate change adaptation practices in a fragile state. Haiti, the only fragile state in Latin America and the Caribbean, is considered to be among the countries in the world that are most vulnerable to the effects of climate change. The Global Adaptation Index gives Haiti the highest vulnerability score in the region. High geographical exposure, deforestation and land degradation, high poverty rates, lack of access to technology, weak institutional capacity, and unstable governments have limited Haiti's ability to adapt to the adverse effects of climate change. The Bank has been supporting adaptation-related measures in Haiti's agriculture sector for decades. In more recent operations, the objectives have shifted from infrastructure construction and productivity enhancement to more integrated programs combining disaster risk and watershed management activities in agriculture and forestry projects. Persistent implementation challenges were aggravated by the 2010 earthquake, and the disbursement level of the Bank portfolio is currently low across all sectors. However, the Bank has recently made efforts to improve execution and the achievement of development goals: it has combined its support with policy-based grants in the agriculture sector to strengthen institutional capacities while promoting sustainable land use. However, only limited results can be reported yet, as institutional capacities remain low and the Bank operations are relatively complex.

IDB has added value in the Caribbean: it is a major climate change adaptation and mitigation partner in the region. The Bank's program has been strategic and innovative in a few countries—Barbados, Dominican Republic, Guyana, and Trinidad and Tobago—combining different instruments to advance key policies and promote resilience to climate change impacts while moving toward a low-carbon economy. The IDB's value added in the Caribbean has involved supporting meaningful policy reforms to promote renewable energy and energy efficiency measures through policy-based lending, as well as promoting an integrated approach to CZM combining physical infrastructure investments with knowledge generation. The Bank has had an important role in supporting Caribbean SIDS in recovering from extreme weather events and it has more recently pursued a more effective preventive and proactive approach to DRM. Program implementation and effectiveness across sectors has been hindered by the difficulties the Bank has generally faced in the Caribbean: slow execution, difficult procurement processes, and lack of absorptive capacity. Furthermore, because there are disparities among the Caribbean countries, one size may not fit all when it comes to responding to the challenges of climate change. Haiti, in particular, is a very special case: in a context of conflicting pressing issues, climate change may be superseded by other major hurdles and challenges, and Bank support can only adapt to them.

In light of these findings, OVE suggests the following:

1. **Promote a Bank regional strategy to address climate change challenges in the Caribbean and to guide countries in accessing global climate finance, sustained by the use of regional instruments to strengthen climate and economic modeling capacities.** Caribbean SIDS need baseline data and modeling tools to enhance the understanding of the long-term impacts of climate change and the resilience of their economies to disaster risk and projected climate change. The Bank could therefore adopt an appropriate strategy or action plan to work with small developing states that would encompass their specificities and needs, and would ultimately favor a stronger adaptation approach to climate change while maintaining the support for an enabling environment for greener and more

sustainable energy matrices. Acting as a broker, IDB could also play a major role in supporting countries in accessing global climate finance.

2. **Adopt an adaptation measure to quantify or qualify the (positive or negative) impacts of Bank operations on their ability to support resilience to climate change in the Caribbean.** As the Bank's Safeguards Department has started estimating the impact of IDB operations on GHG emissions, the Bank should also consider defining a measure to assess their contribution to adaptation—which would likely be more difficult to quantify than GHG emissions. This would serve as a measure of the quality and relevance of IDB support targeted at the needs of SIDS, and could also be extended to operations from other regions. This adaptation measure could assume different forms and methods but should allow for screening and ranking operations at the design stage.
3. **Strengthen IDB's classification of climate-related operations to develop a clear understanding of IDB support to the Caribbean—especially in adaptation.** To assess IDB's efforts to achieve the 25% lending target for climate change, renewable energy, and environmental sustainability it has committed to under the GCI-9, the Bank should consider classifying components of operations, rather than entire operations, as related to climate change for sovereign-guaranteed investment loans and grants, and adopting an analogous criterion for policy-based loans and non-sovereign-guaranteed operations. This would allow including operations not previously considered and giving less weight to operations that have a marginal impact on reducing climate change impacts, thereby providing a more accurate assessment of Bank support. The methodology used in this report to estimate IDB support in the region is a first step in that direction.
4. **Better combine CZM with disaster risk reduction and sustainable spatial planning.** As Barbados' experience illustrates, coastal investment projects should favor planned adaptation measures such as incorporating spatial dynamics, sea-level rise and storm surge projections in the construction process, and when feasible pilot the use of natural coastal protection measures. Furthermore, the Bank could support private partnerships to overcome the costs of public investments in places where the private sector is the main beneficiary—that is, involving the tourism industry in coastal conservation measures.
5. **Continue to explore the use of market-based solutions to hedge against the risks of climate-related damages and as a response to extreme weather events.** Drawing on the piloting of insurance schemes in the Dominican Republic, the Bank could—after carefully assessing and mitigating financial risks—explore the possibility of replicating them or of providing support to established insurance mechanisms such as the Caribbean Catastrophe Risk Insurance Facility.

I. INTRODUCTION

1.1 **The UN Conference on Environment and Development (Rio de Janeiro, 1992) first recognized small island developing states (SIDS) as a distinct group of developing countries facing specific local, economic, and environmental vulnerabilities.**[1] The UN currently considers 52 SIDS distributed in three geographical regions: Africa, Indian Ocean, Mediterranean, and South China Sea (nine countries[2]); the Caribbean (23 countries and territories[3]); and the Pacific Region (20 countries and territories[4]). Several international conferences and high-level meetings followed and reinforced the need to have specific development programs for SIDS to help build resilience and reduce vulnerability to climate change. The Millennium Development Goals also give particular attention to SIDS challenges under Goal 8, "Develop a global partnership for development": target 8.C aims to *"address the special needs of landlocked developing countries and small island developing states."*

1.2 **SIDS are especially vulnerable to the effects of climate change.** SIDS are among the countries that suffer the most from the effects of climate change: sea-level rise (SLR), higher temperatures, regular exposure to extreme weather events, and unstable rainfall patterns, including proneness to droughts. SIDS share many of the same development challenges as other developing countries; however, a number of factors—the small size of their territory, their high population and infrastructure density concentrated in coastal areas, scarce land resources and fragile ecosystems, and limited institutional capacity—can exacerbate the impact of climate change on them.

1.3 **The Inter-American Development Bank (IDB, or the Bank) is one of the main financial institutions pushing forward regional and national efforts to address climate change impacts in the Caribbean.** The IDB lends to 9 of the 23 Caribbean SIDS (CSIDS)—The Bahamas, Barbados, Belize, Dominican Republic, Guyana, Haiti, Jamaica, Suriname, and Trinidad and Tobago—and also provides funds to the Caribbean Development Bank for onlending to nonmember countries in the region (see Annex D, FigureD.1). During 2004 to 2013, the Bank approved 149 operations (loans and grants) related to climate change in these nine countries, totaling more than US$1 billion, distributed between adaptation and mitigation, with particular emphasis on sustainable energy, disaster risk reduction (DRR) and coastal zone management (CZM), and agriculture and land use, land-use change, and forestry (LULUCF). The Bank also participated in several regional initiatives to reduce vulnerability and enhance resilience in the Caribbean region.

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1 SIDS are defined as low-lying coastal countries sharing similar challenges to sustainable development.

2 Bahrain, Cape Verde, Comoros, Guinea-Bissau, Maldives, Mauritius, São Tomé and Principe, Seychelles, and Singapore.

3 Anguilla, Antigua and Barbuda, Aruba, The Bahamas, Barbados, Belize, British Virgin Islands, Cuba, Dominica, Dominican Republic, Grenada, Guyana, Haiti, Jamaica, Montserrat, Netherlands Antilles, Puerto Rico, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago, and the U.S. Virgin Islands.

4 American Samoa, Cook Islands, Federated States of Micronesia, Fiji, French Polynesia, Guam, Kiribati, Marshall Islands, Nauru, New Caledonia, Niue, Northern Mariana Islands, Palau, Papua New Guinea, Samoa, Solomon Islands, Timor-Leste, Tonga, Tuvalu, and Vanuatu.

1.4 **This report assesses the Bank's role in responding to the increasing threats of climate change in the Caribbean and provides recommendations to strengthen the effectiveness of Bank operations.** This report is a background paper for the overall climate change evaluation being conducted by the Bank's Office of Evaluation and Oversight (OVE). It analyzes the key vulnerabilities, threats, and opportunities these nine countries are facing and presents case studies of the Bank's role in Barbados, Dominican Republic, and Haiti, selected because they provided synergies with OVE evaluations conducted in 2013 (Country Program Evaluations for the first two, and the midterm evaluation of IDB-9 commitments for Haiti) and a view on climate change adaptation issues particular to this subregion that were not addressed in the remaining sectoral background papers. These cases shed light on the challenges countries of different income levels face and their approaches to addressing climate change impacts.[5] The nine Caribbean countries are also covered by three different IDB region departments (Caribbean, Central America, and Haiti), allowing the assessment of IDB's relevance and effectiveness among countries sharing similar challenges regardless of the Bank's institutional setting.[6] The report is structured in five chapters. Following this introduction, Chapter 2 analyzes the main characteristics of the CSIDS and the impacts of climate change on them. Chapter 3 identifies the priorities, policies, and institutions dealing with climate change in the region. Chapter 4 analyzes the IDB's strategy, CSs, and portfolio of operations to address climate change issues in the nine countries, and summarizes the case study reviews of Barbados, Dominican Republic, and Haiti. Chapter 5 concludes the report with recommendations for the Bank. Annexes A, B, and C discuss the case studies of Barbados, Dominican Republic, and Haiti in greater detail. Annex D provides additional figures and tables supporting the discussion of the different chapters.

II. VULNERABILITY AND CLIMATE CHANGE IN THE CSIDS

A. A changing climate in the Caribbean

2.1 **According to the Intergovernmental Panel on Climate Change (IPCC), temperatures in the region have increased and rainfall patterns have changed over the last decades.** Temperatures in the Caribbean region have increased by roughly 0.1° to 0.2°C per decade over the last 33 years and by about 0.8° to 1.0°C since 1901, except in Guyana, where temperatures have increased by about 0.2° to 0.3°C per decade.[7] Rainfalls have also increased in the last 33 years in The Bahamas, Dominican Republic, Guyana, Haiti, and Jamaica, and decreased in Barbados and Belize.[8] Sea levels have risen by about 4 cm per decade in Barbados, Guyana, Haiti, and Suriname, about 2 cm per decade in Belize, Dominican Republic, Jamaica, and Trinidad and Tobago, and, since the mid-1990s, close to zero in The Bahamas.

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5 According to the World Bank classification of countries by income levels, Barbados is a high-income country (gross national income per capita of US$12,616 or more), Dominican Republic is an upper-middle-income country (US$4,086 to $12,615), and Haiti a low-income country (US$1,035 or less).

6 This evaluation took nonetheless into account differences in departmental endowments, structures, and priorities across the different region departments.

7 OVE (2014), and IPCC (2012 and 2013).

8 On a century scale, these trends are somewhat mixed.

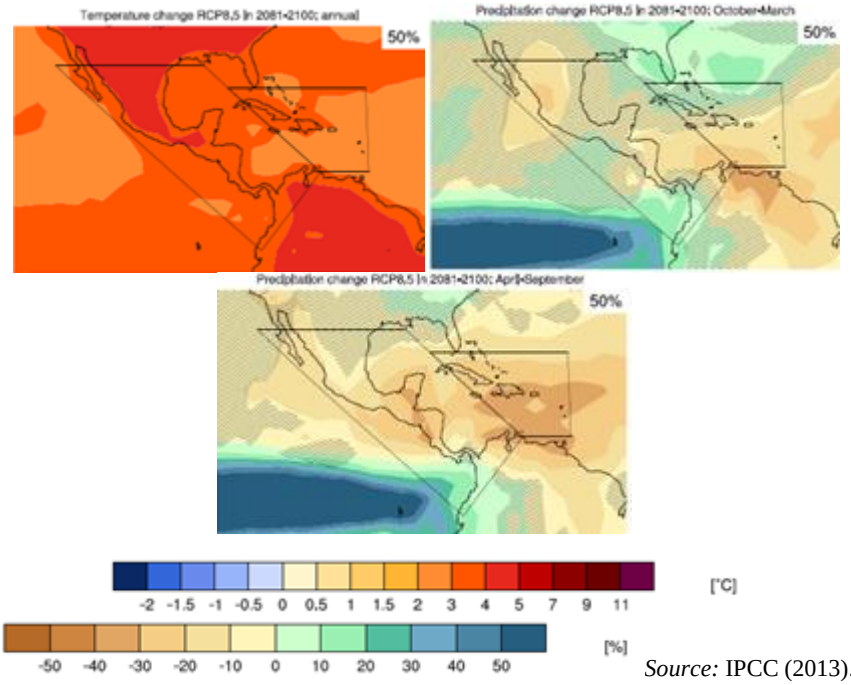
2.2 **Projections indicate a warmer region with increasing SLR and overall less precipitation, and therefore enhanced risks from tropical storm and hurricane incidents.** Guyana and Suriname are particularly likely to see greater risks from both droughts and heavy rains. As Figure 1 shows, the mean temperature is projected to increase comparably to the global mean—except in Guyana and Suriname, where temperatures may increase further inland. The trend for precipitation intensity is not clear for most of the Caribbean, but an increase in the number of consecutive dry days is expected. Although it is not certain that more hurricanes will be the norm, a greater risk from the most intense extreme weather events is expected over the next century, and the intensity of downpours will also increase (Figure 1), possibly resulting in enhanced risks for severe flash floods. SLR will be about the same as the increase expected for other parts of the Region.

Box 1. Projected changes in the Caribbean climate by the end of the century (IPCC, 2013)

The Fifth Assessment Report of the IPCC (2013) projects changes in the Caribbean climate by 2081-2100 compared to 1986-2005:

- Rising temperatures (+2.6° to 4.8°C for an unmitigated scenario—RCP8.5).
- Rising sea levels (+0.45 to 0.82 m for RCP8.5 and not likely to be less than 0.26 m, even if temperatures are kept below 2°C).
- Increased ocean acidity (-0.14 to -0.35 pH units).
- Likely (>50-100% certainty) increase in hurricane intensity in the North Atlantic sector.
- Decrease in dry season (April to September) rainfall and throughout the year in the Greater Antilles, with more variable changes elsewhere.
- Increase in flood events due to increased rain intensity.

Figure 1. Projected future changes in temperature and precipitation (2081-2100)



Source: IPCC (2013).

Note: Maps of temperature and relative precipitation changes in 2081–2100 with respect to 1986–2005 in the RCP8.5 scenario. For each point, the 50th percentile of the distribution of the CMIP5 ensemble is shown; this includes both natural variability and inter-model spread. Hatching denotes areas where the 20-yr mean differences of the percentiles are less than the standard deviation of model-estimated present-day natural variability of 20-yr mean differences. Regions inserted reflect overall scales where assessed changes appear robust. At smaller scales the information must be interpreted with great care.

B. Vulnerable territories in a vulnerable Region

2.3 **Vulnerability to climate change can be defined as a function of three factors: adaptive capacity, sensitivity, and exposure.**[9] IPCC (2007) describes vulnerability as the propensity for, and ability to cope with, the adverse impacts of climate change, given the geophysical, biological, and socioeconomic conditions of a country or region. For CSIDS, the following factors affect vulnerability:[10] their particular geographic position and size; their population dynamics and those of their settlements relative to the *smallness* of the countries; their fragile ecosystems as a result of their insularity for most CSIDS;[11] their proneness to natural disasters and to disproportionately huge losses; the risk of SLR and coastal erosion; overstressed water resources; and institutional weaknesses in their capacity to address the challenges of climate change.

2.4 **Proneness to natural disasters, floods, and coastal erosion is a major characteristic of the Caribbean.** The geographic position, size, and topography of the CSIDS are of paramount importance for the study of their climate change vulnerability. By and large, SIDS are located in tropical and subtropical oceanic regions, with climate, wind patterns, and atmospheric dynamics that are typical of hurricane and cyclone areas. For CSIDS, which are mostly located in the Atlantic hurricane belt,[12] the annual recurrence of these climatic phenomena has considerable implications for their ability to overcome development challenges. The impact of a catastrophic episode might be devastating in terms of costs and losses, and the intensity of this type of event is likely to increase—reinforcing CSIDS' vulnerabilities.

2.5 **High population densities are an issue, given the probable increase in the occurrence of natural disasters of greater magnitude.** More population concentrated in small territories has usually implied more settlements in coastal areas, where most sources of income are concentrated (for agriculture and fisheries or for tourism). Despite considerable variation in CSIDS countries, the link between population and area is crucial: high population densities entail high levels of natural resource exploitation and more pressures to deplete available land. This also means the likelihood of increased damage after a natural disaster.

2.6 **Although these countries share similar economic characteristics—small economies, open to international trade, and highly exposed to natural disasters and economic shocks—their vulnerability to the impacts of climate change varies, depending to a**

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9 Following IPCC (2007), adaptive capacity describes how a system adjusts itself to actual or potential climate distress, and it can be defined in terms of several of its socioeconomic, technological, and institutional variables. Sensitivity is related to the magnitude with which a system responds when facing a change in climate, either positive or negative. Finally, exposure refers to the degree of climate distress associated with a particular geographic region, in a particular moment of time.

10 This list, which is based on Briguglio (2003) and Srinivasan (1986), excludes some elements (such as major economic problems) to keep the document manageable.

11 As islands, most CSIDS are characterized by unique and fragile ecosystems. As Fisher (2004) notes, island ecosystems appear to be less resilient than mainland systems; outside influences affect many endemic species disproportionately.

12 Only Aruba, Curacao, Belize, Margarita Island (part of Venezuela), and Trinidad and Tobago are considered to be outside of the Caribbean (or Atlantic) hurricane belt.

great extent on their institutional capacity and economic structure. In a context of socioeconomic pressures, institutional weaknesses worsen CSIDS' vulnerability to the effects of climate change. The scarcity of skilled manpower, because of both cost constraints and a small base from which to draw efficient and experienced officials, limits the decision-making process necessary to tackle the factors that contribute to these countries' vulnerability (Briguglio et al., 2009). As a result, public institutions have relative disadvantages—when compared to most inland Latin American countries—that could weaken and delay the design of policies intended to decrease the negative effects of climate change or to take advantage of its opportunities.

2.7 **Uneven economic performance across the nine CSIDS translates into different needs, risks, and vulnerabilities.** The Bahamas, Barbados, and Trinidad and Tobago are the wealthiest of the nine CSIDS, with stronger institutional capacities to face the threats of a changing climate. At the other end, Haiti is the poorest and least developed country in the region, recovering from the 2010 earthquake and grappling with far more challenges than its neighbors. Commodity-based economies, such as Belize, Guyana, Suriname, and Trinidad and Tobago—producers of oil and gas, minerals, and agricultural goods—have had an overall better economic performance over the last decade because of high commodity prices. The Bahamas, Barbados, and Dominican Republic are heavily dependent on tourism; for the first two countries, this has meant significantly lower GDP growth over the last decade because of the difficulties faced by the tourism industry in 2001 and 2008/09 (Table 1).

Table 1. Summary indicators for the nine CSIDS

	Bahamas, The	Barbados	Belize	Dominican Republic	Guyana	Haiti	Jamaica	Suriname	Trinidad and Tobago
Area (km^2, 2012)	13,878	431	22,966	48,442	214,970	27,750	10,991	163,821	5,131
Coastline in terms of land area (m/km^2)	809.8	225.1	86.9	33.3	5.4	71.2	81.4	3.8	137.2
Forest area (% of land area, 2011)	51.4	19.4	60.6	40.8	77.2	3.6	31.1	94.6	44.0
Population (million, 2013)	0.37	0.28	0.32	9.74	0.8	10.38	2.71	0.53	1.34
GDP per capita (US$ PPP, 2013)	32,036	25,181	8,716	9,911	8,250	1,315	9,048	13,116	20,438
Share of tourism in GDP (%, direct and indirect, 2013)	46.0	36.2	36.6	15.2	7.6	4.1	25.5	2.2	N/A
Labor force in tourism industry (%, direct and indirect, 2013)	54.5	35.7	32.9	13.9	8.0	3.6	23.4	2.0	N/A
Electricity installed capacity (MW, 2011)	493	239	144	5.868	349	267	872	412	2.099
Share of renewable energy (%, 2011)	Less than 1	Less than 1 (15% with solar water heater)	36.8 (all hydro)	9.5 (8.9% hydro)	Less than 1	22.6 (all hydro)	7.4 (2.5% hydro)	45.9 (all hydro)	Less than 1
Oil imports in terms of GDP (%, 2012)	6.3	8.8	9.0	8.1	21.5	10.3	15.5	6.8	14.8
GHG emissions including LUCF ($MtCO_2e$, 2011)	5.0	3.5	14.2	30.0	7.4	8.0	12.1	9.1	44.1
ND-GAIN Index / Index adjusted for GDP (2012)	65.9 / -6.7	69.6 / 1.0	63.7 / 4.1	58.8 / -4.0	54.9 / 0.6	44.9 / -0.3	62.5 / 1.4	60.7 / -0.4	63.8 / -7.0
IDB's Risk Management Index (2010)	-	44.6	-	29.0	-	-	42.9	-	22.4

Source: IMF WEO (April 2014), ND-GAIN (2014), OLADE Energy Statistics (2012), WB World Development Indicators (2014), WRI Climate Analysis Indicators Tool (2014), WTTC Economic Data (2013), and IDB (2014).

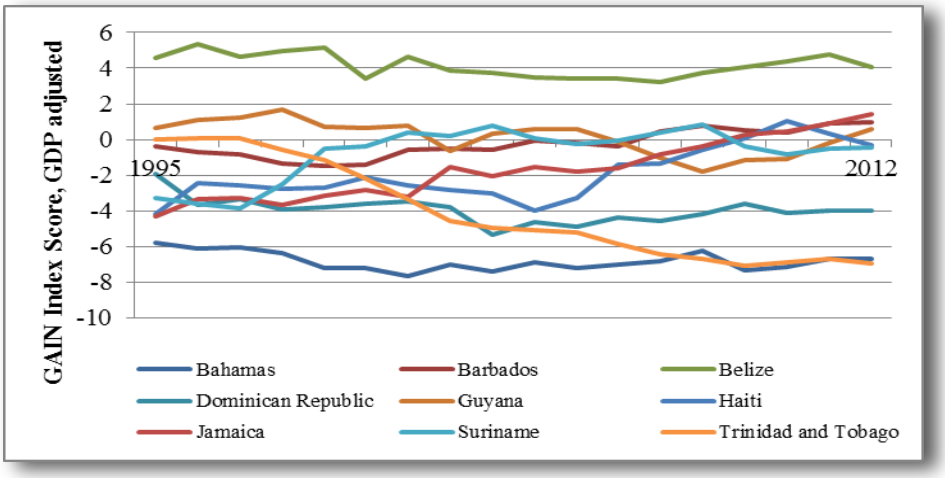
2.8 **According to the Global Adaptation Index (GAIN), the Caribbean's exposure and vulnerability to climate change has increased during the last decades.**[13] Computed by the University of Notre Dame, GAIN lists countries in order of their adaptation to climate change by computing an overall index that results from combining two simpler indexes of vulnerability and readiness: the first is defined as in IPCC (2007), and the second targets "those portions of the economy, governance and society that affect the speed and efficiency of absorption and implementation of Adaptation projects." Haiti is the lowest-ranked (158) of the 177 countries analyzed, and Barbados (41) is the best-equipped to face climate change challenges. Nonetheless, the index shows that in terms of vulnerability most CSIDS were worse off in 2012 than in 2011 (see Annex D, Table D.1).

2.9 **A few CSIDS appear better equipped than others to adapt to climate change impacts.** Four countries—Dominican Republic, Guyana, Haiti, and Jamaica—are better off in terms of adaptation even though their vulnerability status is worsening, while four other countries are getting worse—likely the consequence of better indicators with respect to readiness (Table D.1). Figure 2 summarizes the results obtained if we use the GDP-adjusted index for adaptation for 1995-2012. Even though several countries have been improving in adaptation, The Bahamas, Dominican Republic, and Trinidad and Tobago are less adapted to climate change than their peers with comparable GDP levels. However, as Figure D.2 (Annex D) shows, only two of the nine CSIDS—Guyana and Haiti—have both high vulnerability and low readiness to face climate change consequences; the remaining countries, except Suriname, have been enhancing their preparedness to cope with vulnerability.[14]

[13] Several indexes are computed to address vulnerability, including the HDI, the VI-CRED, the CCVI, and the DARA CVI. Depending on the context, one could be better than the rest. For example, according to Fuessel (2009), the HDI measures social vulnerability to climate change at the national level more accurately than any other index. We chose here the ND-GAIN because it is calculated using the definition of vulnerability presented in the paper, and at the same time includes measurements of "preparedness" that makes it more complete for the sake of our exposition. Further information about vulnerability indexes can be found at http://weadapt.org/knowledge-base/vulnerability/sample-of-existing-vulnerability-indices. Additional details on the methodology to compute the ND-GAIN index used here can be found at http://www3.nd.edu/~nchawla/methodology.pdf.

[14] There is a caveat here: most of CSIDS are located near the median levels used to define the quadrants and classify the countries.

Figure 2. Evolution of GAIN Index, GDP-adjusted, 1995-2012



Source: ND-GAIN Index.

Note: Positive values mean a country has a better GAIN Index score than countries with a similar GDP. Negative values depict a country that compares less favorably with respect to countries with similar GDP levels.

C. Sea-level rise and coastal vulnerability

2.10 **The impacts of climate change on global and regional sea levels are complex but relevant for the Caribbean.** Long-term changes in sea level are the result of various factors, but the two major aspects are indeed linked to global climate change: (i) thermal expansion—that is, warmer waters occupy more space because the density of water depends on temperature; and (ii) increased melting of glaciers and polar ice caps caused by higher air and ocean temperatures. Higher temperatures are causing ice sheets that cover Greenland and Antarctica to melt at an accelerated pace. The IPCC predicts that continued global warming, hastened by increasing GHG emissions, will likely threaten the stability of the world's ice sheets. The extent and speed of melt will determine the magnitude of SLR.

2.11 **The consequences of SLR are not uniform among CSIDS, but Caribbean countries are more at risk than most areas of the world.** The risks from SLR depend largely on the type and quality of coastal infrastructures, the spatial distribution and economic activity of the population, and the specific topography of the islands. CSIDS can be categorized in different groups according to their coastal topographic settings (see Simpson et al., 2009). For instance, The Bahamas, a set of low-lying islands with extensive coral reefs, is highly vulnerable to coastal inundation, inland flooding, and the retreat of mangroves and seagrass beds. Belize, Guyana, and Suriname have large coastal plains close to the sea level, for which saline intrusion into freshwater aquifers is a concern. Barbados, Haiti, Jamaica, and Trinidad and Tobago have varied coastlines that are prone to flooding and coastal erosion from tropical storms and hurricanes.[15]

[15] At the boundaries of the Caribbean Plate, SLR projections for these countries may alter as land levels rise or fall as a result of tectonic movements.

2.12 **SLR is likely causing coastal floods, shoreline erosion, and groundwater salinization** (Nunn, 2009). Erosion is the result of the degradation of nearshore waters and the loss of reefs through algae growth. Coral reefs function as natural barriers to wave action and produce sand that nourishes beaches. A decrease in reefs' ability to reduce effective wave energy has resulted in the erosion of beach sand and the loss of beach vegetation, which are natural erosion defenses. Attempts to control erosion by constructing beach structures have sometimes been reported as aggravating the erosional process. The exceptionally warm waters have also resulted in coral bleaching events in The Bahamas, Barbados, and Belize. Indeed, the poor condition of the marine environment, together with the higher pressure on the coastal areas, makes the coastal areas highly vulnerable, with little defense against hurricanes and tropical storms (CCCCC, 2009).

2.13 **Coastal and marine ecosystems provide a number of services that are essential to the region's (tourism-based) economies.** Because many CSIDS exploit their coastal areas heavily, the sources of income are extremely vulnerable to SLR. Key infrastructures (hotels, houses, and other facilities) and agricultural lands are near or on the coasts—often too close to the water's edge—exacerbating the potential consequences of floods and shoreline erosion.[16] Coastal tourism, a main driver of growth for most CSIDS, will be negatively affected if increasing SLR erodes beach area and puts properties at risk, while higher-breaking waves and reduced freeboard will result in flooding of coastal properties.

2.14 **The degradation of coastal and marine ecosystem services threatens the resilience of the tourism sector and public infrastructure.** Scott et al. (2012) estimate that 29% of major resort properties in the CARICOM countries would be partially or fully inundated by a one-meter SLR. Other studies have attempted to estimate the impacts of climate change on the tourism sector, with costs on the order of US$44 billion at the end of the century for nine countries in the Caribbean Basin (Sookram, 2012). These costs could be even more burdensome, given the sector's importance as a source of income for large strata of the population—some 1.25 million people (13% of the labor force) are employed either directly or indirectly in travel and tourism in eight CSIDS.[17]

2.15 **The water and agriculture sectors are likely to experience other adverse climate change impacts.** SIDS' limited landmasses do not allow for large underground repositories of water or wide bodies of surface water (WMO, 2005). Given the scarcity of water resources in a few CSIDS, climate change has the potential to affect the availability and quality of drinking water as saltwater penetrates into groundwater resources and the frequency and severity of droughts increase. SLR affects the quality of groundwater resources through salinization of aquifers and erosion, while higher temperatures and reduced precipitation affect the quantity of water available by augmenting surface run-off and decreasing soil moisture, which in turn reduce aquifer recharge (Farrell et al., 2008). Surface water resources are the most vulnerable to climate change;[18] increased temperatures are likely to lead to unpredictable stream flows and

[16] The ratio of coastline to total land for CSIDS is high. According to UNEP (2005), this ratio is a proxy for an "islandness" measure: the larger the quotient, the more island-like the country.

[17] See World Travel and Tourism Council. No data are reported for Trinidad and Tobago.

[18] Surface water resources, with their direct connection with the atmosphere, are extremely susceptible to climate change and climate variability.

reduced levels of water in lakes and other surface systems. Agricultural production—a major economic sector in some CSIDS—is also at risk, as temperature rises will affect the productivity of ecosystems. Changing season patterns, with increased periods of drought, losses of mangrove forests to SLR, reduced availability of water resources because of decreased rainfall and saltwater intrusion, and inundation of arable land are pointing to reduced soil fertility and agricultural yields.

2.16 **Overall, the costs of SLR in the Caribbean are too high to be dismissed.** Simpson et al. (2010) estimated the long-term costs of SLR in CARICOM countries and found that the burden could range from US$3.9 billion a year by 2050 for a one-meter rise to US$6.1 billion for a two-meter rise,[19] with related capital costs ranging from US$26 billion to US$61 billion by 2050 (Annex D, Figures D.3-D.7). Integrated coastal zone management (ICZM) is therefore key to effectively managing climate change hazard risk in coastal zones (see Box 2).

D. Climate-related disasters and the increased intensity of extreme events

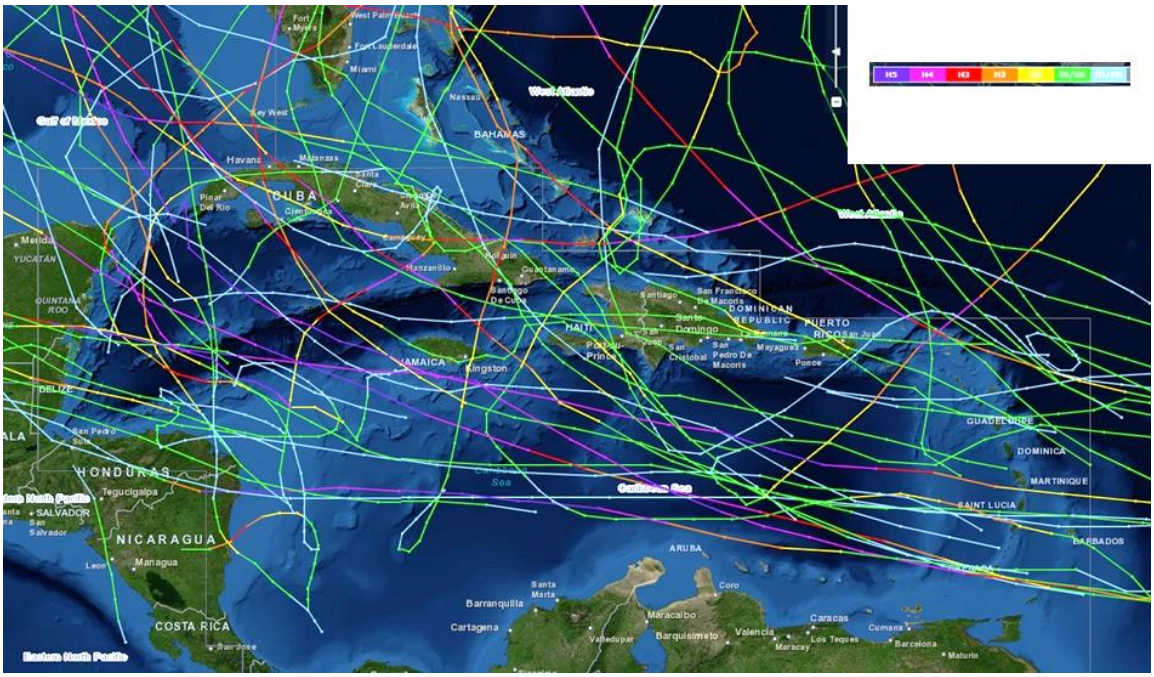
2.17 **The Caribbean is one of the most hazard-prone areas in the world.** The Region has historically been affected by a variety of climate-related hazards: geophysical (earthquakes, landslides, and volcanic eruptions), hydrometeorological (tropical storms, floods, droughts), and climate variations (El Niño and La Niña Southern Oscillations) (Gencer, 2013). Between 2004 and 2012, the Region was hit by as many as 62 climate-related hazards, ranging from tropical storms to hurricanes (Figure 3), and the numbers of storms and floods have increased rapidly over the last decades (Figure 4). Moreover, CSIDS are likely to experience an increase in the severity of climate-related hazards in the coming decades (IPCC 2007, 2013-2014).

Box 2. Integrated coastal zone management

Integrated coastal zone management (ICZM) involves governments, communities, and firms in an integrated effort to maximize the benefits provided by coastal zones while minimizing negative effects on natural resources and the environment. Adapting to the impacts of future SLR will involve considerable adjustments of development strategies and major investment decisions which must be based on the best available information about the relative vulnerability of specific coastal infrastructure and ecosystems, and the resulting economic and non-market impacts. As the Bank defines it, ICZM combines: "(a) sound science on assets, processes and risks in the coastal zone, including those associated with natural disasters and climate change; (b) an effective governance structure involving key stakeholders; and (c) investments that address specific issues for coastal development (such as erosion, conflicts between coastal uses, coastal public access and water quality).

[19] Annual losses are the residual costs of loss of land and interrupted services, including tourist expenditure losses, agriculture losses, and industry losses; capital costs are losses of dryland and wetland and rebuild/relocation costs, including the infrastructure costs of residential property, tourist resorts, roads, seaports, and airports, and power plants.

Figure 3. Category 1-5 hurricanes, tropical storms, and tropical depressions in the Caribbean, 2004-2012

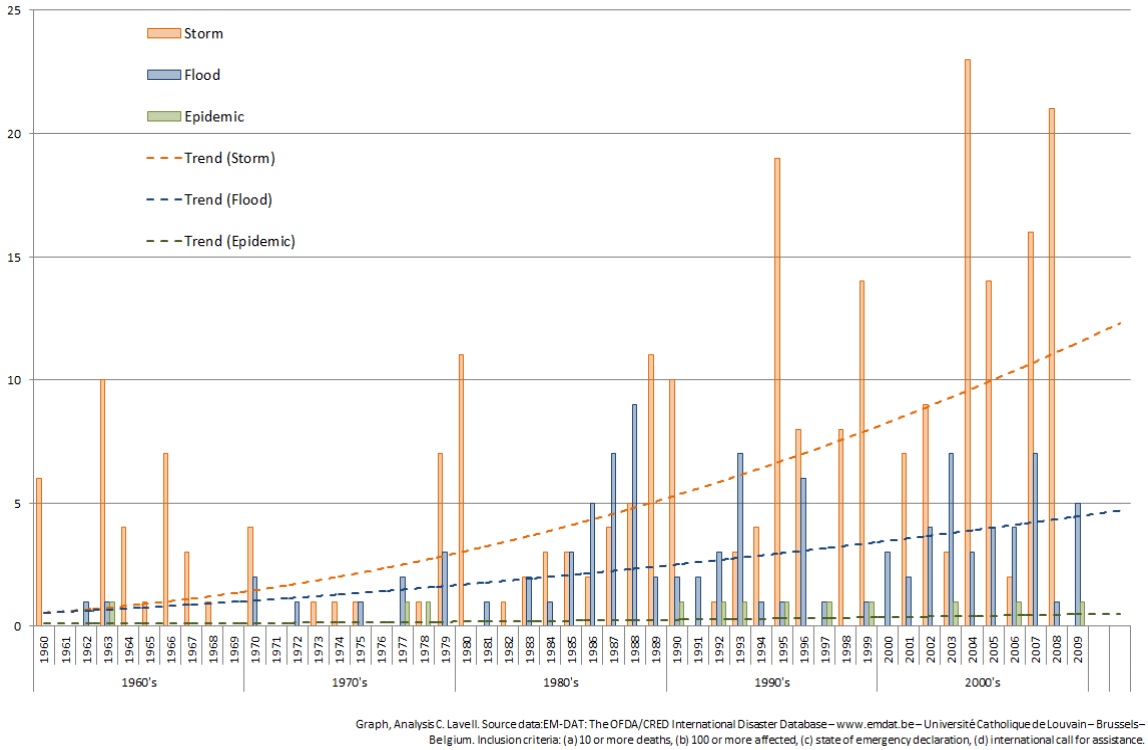


Source: National Oceanic and Atmospheric Administration, Historical Hurricane Tracks.

Note: Lines represent tropical cyclones affecting the Caribbean, with the color scale ranging from category 5 hurricanes in purple (maximum sustained winds greater than 252 km/h) through 1 in yellow (maximum sustained winds ranging between 119 and 153 km/h). Also shown: in green, tropical or subtropical storms (maximum sustained winds ranging between 63 and 118 km/h), and in blue, tropical or subtropical depressions (maximum sustained winds lower than 62 km/h).

2.18 **Vulnerability is not a static condition; it depends on several social, economic, and environmental factors.** The same climate-related hazard may or may not be considered a disaster depending on the country's exposure and adaptive capacity. Likewise, the cumulative impacts of non-extreme climatic events, such as rains, could turn into a disaster depending on their effects on society, the economy, and the environment. Therefore, social vulnerability and exposure are key determinants of disaster risk (Lavell et al., 2012), determining the level of impact (social, economic, and environmental) of a physical event and hazard in a specific area.

Figure 4. Number of hydrometeorological disasters in the Caribbean Region, 1960-2009



Source: EM-DAT.

2.19 **Directly or indirectly, natural hazards affect several key economic sectors in the Caribbean—agriculture, tourism, and transportation.** More severe and frequent hazards in the Region are likely to destroy productive infrastructures, interrupt economic activities, and create irreversible changes in the natural resource base (UNFCCC, 2012). These events also affect such social infrastructure as schools, hospitals, and public transport services. The UN Economic Commission for Latin America and the Caribbean (ECLAC, 2011) has estimated the economic, social, and environmental costs of disasters in the Caribbean between 1990 and 2008 at US$136 billion. The total economic impact was estimated at US$63 billion (46% of total impact), US$57 billion (42%) in social costs, US$12 billion (9%) in infrastructure damages, and US$3.5 billion in damage to the environment (3%). Given a Caribbean population of approximately 36 million, these losses constitute an average of almost US$4,000 per capita (Lavell et al., 2012).

Box 3. Climate change adaptation and disaster risk management

Climate change adaptation and DRM share the main goal of reducing the impacts of natural hazards. DRM focuses primarily on risks from current climate variability and related extremes at the geographical level. Climate change adaptation is mainly concerned with the increasing intensity and frequency of extreme climate events and the risks future changes would pose. Both disciplines require similar information systems, skills, and institutional arrangements to reduce vulnerability and the negative impacts of extreme weather events on society, economy, and the environment.

Source: CDEMA, 2011.

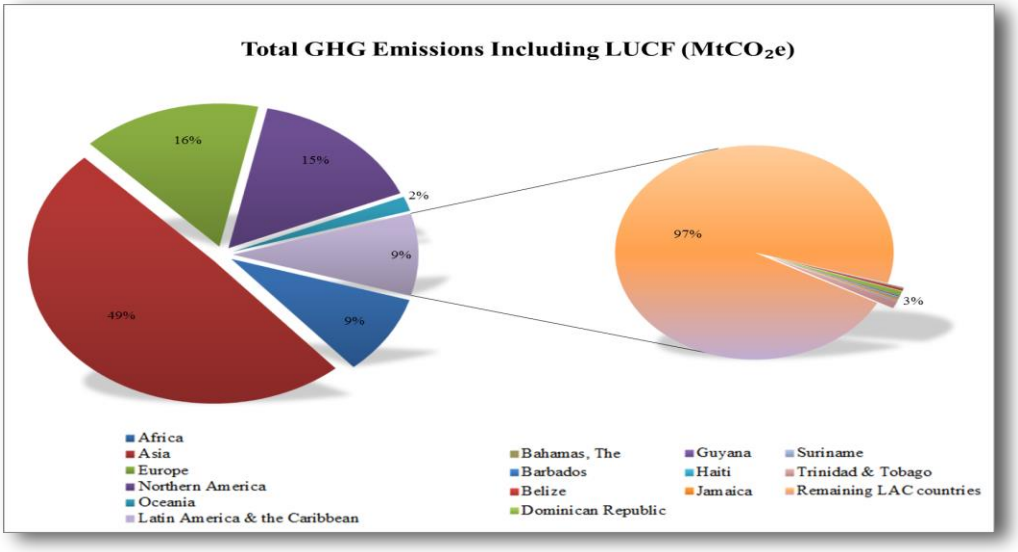
2.20 **The heterogeneity of impacts from climatic hazards demands an integrated approach to disaster risk management (DRM).** Building regional resilience to natural hazards requires coordination among the social, economic, and environmental sectors. Effective DRM needs to take climate change

adaptation measures into account to map future risk areas and hence reduce vulnerability (see Box 3). It is key to strengthen national and local institutions, promote coordination among the different actors affected by natural hazards, advance the production of legislation and guidelines, and favor the development of early warning systems.

E. Greenhouse gas emissions and climate change mitigation

2.21 **Caribbean countries are among the lowest GHG emitters in the world, although their emissions have grown rapidly over the past 20 years.** The 11 gigawatts of electricity installed capacity in the nine CSIDS, of which some 90% is powered by fossil fuels, release about 0.3% of the world's GHG emissions (Figures 5 and 6; see also Annex D, Figure D.8).[20] The large concentration of fossil fuels in CSIDS' energy matrices accounts for 60% of GHG emissions and much of air pollution. In addition, the level of GHG emissions differs significantly across the nine countries. Trinidad and Tobago and Dominican Republic are by far the largest GHG emitters, with levels equal to those of six of the other CSIDS (excluding Jamaica) for Trinidad and Tobago and to the combined levels of El Salvador and Uruguay for Dominican Republic.[21] The GHG emissions of the nine CSIDS together are as high as those of Ecuador or of Chile, Costa Rica, El Salvador, and Panama combined.

Figure 5. CSIDS emissions relative to Latin America and the world



Source: WRI CAIT (2014, data refer to 2011).

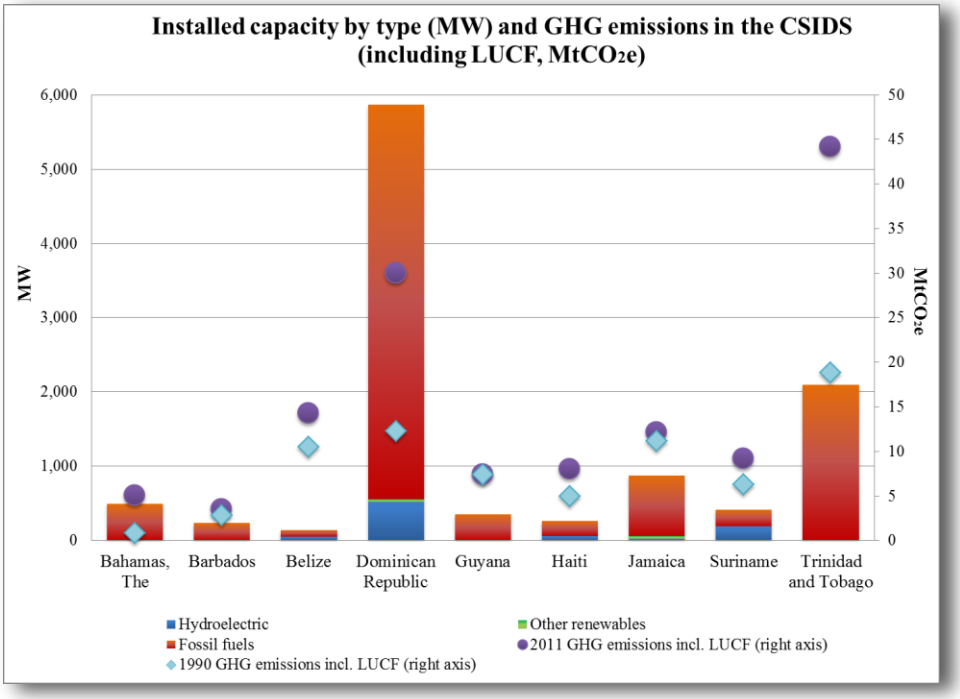
2.22 **CSIDS' heavy reliance on imported fossil fuel poses a challenge to climate change mitigation.** Petroleum products are the main source of energy in the Caribbean, and 90% of commercial energy supplies are imported into the Region (Loy, 2007). Oil imports account for 19% of Guyana's GDP, more than 15% in Jamaica and Trinidad and Tobago,

[20] See OLADE, Energy Statistics Report 2012; EIA, International Energy Statistics, 2010; Gischler and Janson (2011), and World Resources Institute Climate Analysis Indicators Tool (2013).

[21] Using total GHG emissions, including land use change and forestry (LUCF) for 2011. When LUCF is excluded, the GHG emissions of Belize, Guyana, and Suriname s are significantly lower.

and 7-9% in The Bahamas, Barbados, Belize, Dominican Republic, and Haiti.[22] Energy expenditure represents a large part of national budgets and a major drain on foreign reserves as well, partly because of increasing government transfers and subsidies to state-owned electricity companies. The lack of access to affordable and reliable energy is also identified as one of the main constraints to doing business in CSIDS.[23] Caribbean countries' carbon-intensive energy matrices might offer room for reforms that will both reduce the burden of energy costs in the economy and mitigate GHG emissions.

Figure 6. Total electricity installed capacity and GHG emissions in the nine CSIDS



Source: EIA (2010) for The Bahamas and OLEDA (2011) for the remaining countries. WRI CAIT (2014).

2.23 **Some innovative renewable energy projects in the CSIDS could be a source of emissions reduction.** In Barbados, small-scale renewable energy projects have been developed, with biomass cogeneration gaining momentum thanks to the sugar industry and, more recently, solar photovoltaic energy following the introduction of independent power producers into the country's legal framework (solar water heating was already widely used in the country). Jamaica has made small hydro plants a viable source of energy generation, while Trinidad and Tobago has favored biofuel and waste-to-energy technology. Shirley and Kammen (2013) show that the high penetration of solar water

[22] Average of 2007-2012. Oil imports in Suriname represented 5.4% of GDP. Authors' calculation based on IMF WEO, April 2013.

[23] See World Bank Doing Business reports. For instance, electricity for commercial uses costs as much as 62 cents/kWh in Dominican Republic, 40 cents/kWh in Haiti, 32 cents/kWh in Barbados, 27 cents/kWh in Jamaica and 7 cents/kWh in Trinidad and Tobago, while the average for Latin America is 17 cents/kWh. See OLADE, 2011.

heating technology in Barbados has allowed savings on the order of 185 GWh/year—meaning a reduction of 200,000 tCO_2 every year, while the introduction of 38 MW of wind farms in Jamaica is expected to spare the atmosphere 120,000 tCO_2/year.

III. PRIORITIES, POLICIES, AND INSTITUTIONS IN THE CSIDS

A. Regional priorities, policies, and institutions

3.1 **Over the last three decades, there have been significant efforts to raise attention to SIDS' vulnerabilities.** The UN Conference on Environment and Development (or Earth Summit), held in 1992 in Rio de Janeiro, recognized that small islands represented an important part of the diversity of nations and deserved a special status, in recognition of their unique challenges. As a result, the Alliance of Small Island States (AOSIS) was established as a coalition of states to represent SIDS within the UN system and later in international climate negotiations. This group of nations submitted the "AOSIS Protocol" in 1995 as a guide to negotiate climate policy in international fora. The United Nations Framework Convention on Climate Change (UNFCCC)[24] and subsequent Conferences of the Parties have reinforced the importance of climate change adaptation, especially for least developed countries and SIDS, prompting the approval of some programs and strategies.

3.2 **The first global conference on the sustainable development of SIDS, held in 1994 in Barbados, outlined a common framework to address SIDS' special vulnerabilities.** The Barbados Programme of Action (BPoA) was adopted that same year, highlighting priority areas to be addressed: climate change and SLR; natural and environmental disasters; coastal, marine, and freshwater resources; land; and energy resources. The program included actions to mitigate and adapt to the impacts of climate change. Several reviews were then conducted, leading in 2005 to the Mauritius Strategy of Implementation (MSI) to accelerate the implementation of the BPoA. This 10-year review renewed the international community's commitment to build resilience in SIDS and facilitate their integration into the global economy. However, the achievement of results has been hindered by such limited technical expertise and financial, technical, and institutional capacities (Box 4).

[24] In 1994, the UNFCCC was negotiated and signed by 165 states as a legally binding treaty to stabilize GHG concentrations in the atmosphere and assist governments to implement national programs to reduce emissions.

Box 4. Challenges identified from reviews of the Barbados Programme of Action and the Mauritius Strategy of Implementation

A five-year review of the BPoA identified six pressing issues that were yet to be resolved: (i) adapting to climate change and SLR, which could submerge some low-lying island nations; (ii) improving preparedness for and recovery from natural and environmental disasters; (iii) preventing worsening shortages of freshwater as demand grows; (iv) protecting coastal ecosystems and coral reefs from pollution and over-fishing; (v) developing solar and renewable energy to lessen dependence on expensive imported oil; and (vi) managing tourism growth to protect the environment and cultural integrity.

In 2010, SIDS drafted national assessment reports reviewing their progress toward achieving the MSI and BPoA. The reports highlighted key challenges for the years ahead: (i) strengthening data management capacities for monitoring and evaluation; (ii) enhancing strategic partnerships, including South-South and SIDS-SIDS cooperation; (iii) adopting a results-oriented approach and improved measures to address SIDS vulnerabilities; and (iv) exploring the formal recognition of SIDS as a special category in the UN.

3.3 **The UN designated 2014 as the international year of SIDS** to create momentum toward the 2014 SIDS Global Conference, mobilizing international support for sustainable development in those nations and highlighting the efforts already made to overcome the challenges SIDS face. This third international conference is an important outcome of the 2012 UN Conference on Sustainable Development (also known as Rio+20), which also noted the limited progress in achieving the objectives of the BPoA and MSI.

3.4 **Since the early 1990s, Caribbean countries have urged the international community to support regional programs to increase resilience and reduce vulnerability to climate change.** Several workshops and consultations resulted in the Caribbean Planning for Adaptation to Climate Change (CPACC) program for 1997-2001, a partnership of CARICOM, the Organization of American States, the World Bank, and the Global Environmental Facility (GEF). The program involved developing information technologies to monitor climate, SLR, and coastal resources and supporting the formulation of adaptation policies. However, it received some criticism for using overly simplistic and not locally specific climate change scenarios for modeling climate projections—a fact that highlights the need for better national-level capacities and better data collection systems.[25]

3.5 **The establishment of the Caribbean Community Climate Change Center (CCCCC) in 2005 was one of the major outcomes of that CPACC program** (see Box 5). CCCCC is coordinating the regional framework for achieving development that is resilient to climate change (2009) and for its 2011-2021 Implementation Plan. This long-term project, which draws lessons from the BPoA, stresses the need to build climate-resilient low-carbon economies in the Caribbean and demands a transformational change in

[25] CPACC adopted the simplest scenario: climate change is related to SLR with expected increases of 0.20m, 0.50m, and 0.90m–1.0m. Under these simplified scenarios, climate variability remains constant and mean sea level is the cause of climate change impacts. The program also piloted five projects across the region: coral reef monitoring for climate change in The Bahamas, Belize, and Jamaica; coastal vulnerability and risk assessment in Barbados and Guyana; and economic valuation of coastal and marine resources in Trinidad and Tobago.

institutional arrangements and operating systems to achieve this goal. Altogether, this coordinated effort is expected to lead eventually to a regional climate change policy.

Box 5. The Caribbean Community Climate Change Center

Located in Belize, the CCCCC was approved by CARICOM's Council for Trade and Economic Development. It is the key institution gathering information on climate change issues and coordinating the region's response to those challenges. The CCCCC's mission is to address the impact of climate vulnerability and change on all aspects of economic development by providing timely forecasts, analyzing the potentially hazardous impacts of both natural and man-induced climatic changes on the environment, and developing sustainable programs to address these issues.

CCCCC is implementing several projects: the SIDS Sustainable Energy Initiative; the Pilot Program for Climate Resilience in the Caribbean; the 2011-2014 EU-Global Climate Change Alliance; the 2012-2013 Caribbean Risk Management Project; the 2012-2014 Australia Caribbean Coral Reef Collaboration; the 2011-2015 Caribbean Regional Resilience Development Implementation Plan; and the regional IDB project Data Management System.

3.6 **Other important regional institutions are working in this area.** The Caribbean Disaster Emergency Management Agency (CDEMA) was created to provide comprehensive assistance in preparing for, managing, and recovering from the consequences of disasters.[26] An inter-regional network of independent emergency units, it coordinates the Enhanced Comprehensive Disaster Management Strategy (2007-2012) and provides a framework for harmonized DRM interventions in and across the Region.[27] The Caribbean Meteorological Organization promotes regional activities in the fields of meteorology and coordinates scientific and technical activities on weather, climate, and water-related sciences. The Caribbean Institute for Meteorology and Hydrology provides training to meteorological personnel. In addition, the University of West Indies, through the Climate Studies Group, conducts analyses of climate dynamics and regional climate modeling exercises for the Region. The Caribbean Catastrophe Risk Insurance Facility, launched in 2007, provides short-term liquidity in response to natural disasters.

3.7 **On the mitigation side, in 2013 CARICOM approved an energy policy highlighting the importance of renewable energy and energy efficiency for reducing the Region's dependence on and exposure to imported fossil fuels**—and, ultimately, the Caribbean carbon footprint. Moving in that direction, several CSIDS are undertaking changes in their energy regulatory frameworks with, for instance, measures to support independent power producers through tax credits and import duty exemptions. In Barbados and Trinidad and Tobago, renewable energy is sustaining government buildings, hospitals, and schools.[28] A regional renewable energy center established in 2013 in Trinidad is expected to reinforce regional integration and cooperation in promoting low-carbon

[26] Formed in September 1991 as the Caribbean Disaster Emergency Response Agency, it became CDEMA in 2009, integrating not only the emergency response policies, but also the preparation and reconstruction policies.

[27] The Enhanced Comprehensive Disaster Management Strategy builds on the Hyogo Framework for Action, which is the plan describing the work required from all different sectors and actors to reduce disaster losses.

[28] Aruba, constituent country of the Kingdom of the Netherlands, announced in June 2013 its plans to become the first nation with a completely zero-carbon footprint and 100% energy independence by 2020, using only clean sustainable renewable power sources (mostly sun and wind).

economies. However, the advancement of climate change mitigation actions in the Region still has a long way to go.

B. Other development partners that are active in climate change

3.8 **Various bilateral and multilateral institutions have supported Caribbean countries in mitigating, and adapting to, the impacts of climate change.** World Bank support has ranged from emergency recovery and disaster management programs in Dominican Republic, Haiti, and Jamaica to biodiversity restoration and reforestation in Trinidad and Tobago, and energy efficiency initiatives in Dominican Republic, Haiti, and Guyana. A regional operation (US$71 million) was established to support the Caribbean Catastrophe Risk Insurance Facility in limiting the financial impact of natural disasters. The 2004-2007 World Bank-GEF program Mainstreaming and Adaptation to Climate Change helped Caribbean countries mainstream climate change adaptation strategies into their national development agendas.[29] The GEF has provided grants to help countries prepare national inventories, strategies, and action plans, as well as to support pilot projects related to climate change adaptation.[30] The Caribbean Development Bank (Dominican Republic and Suriname are not members) has focused on emergency responses and disaster risk management in the Region and supported the institutional strengthening of CCCCC. UN agencies, and the United Nations Development Programme (UNDP) in particular, have promoted policy and institutional strengthening in climate change adaptation, CZM, and DRR. For instance, the Adaptation Fund is financing a project to enhance the resilience of the Jamaican agricultural sector and coastal areas.[31] The Pilot Program for Climate Resilience in the Caribbean, part of the Strategic Climate Fund, approved a US$75 million program for climate change adaptation grants.

3.9 **Active bilateral partners include the Canadian Department of Foreign Affairs, Trade and Development; the European Union (EU); the UK Department for International Development (DfID); and the US Agency for International Development (USAID).** All these institutions have supported disaster risk management measures in various Caribbean countries. In particular, the Canadian Caribbean Disaster Risk Management Fund has supported small-scale local disaster risk reduction projects in low-income rural communities. The EU has also had a prominent role in promoting renewable energies throughout the Region (Annex D, Table D.2, shows the relative involvement of various partners). USAID supported the launching of a Regional Climate Centre in Barbados—a partnership between the World Meteorological Organization and the Caribbean Institute for Meteorology and Hydrology—to support Eastern Caribbean countries in better understanding and predicting current and future climate-related issues and building capacity for adaptation. In addition, the nonprofit Caribsave has bridged

29 The participating countries were Antigua and Barbuda, the Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Jamaica, Saint Lucia, St. Kitts and Nevis, St. Vincent and the Grenadines, and Trinidad and Tobago.

30 Between 1991 and 2012, it provided 33 grants for up to US$23.7 million.

31 The Adaptation Fund was established to finance concrete adaptation projects and programs in developing countries that are parties to the Kyoto Protocol.

science knowledge, through the University of Oxford, with policy advice and specific climate change projects in the Caribbean.

3.10 **Nevertheless, development partners' support has been insufficient to tackle the serious challenges most Caribbean countries face.** The lack of investment and the limitations on accessing climate change funding have been persistent constraints, while the challenges remain enormous—and the current economic downturn and the associated large fiscal imbalances only aggravate these constraints. According to Gibbs (2012), although the Caribbean is one of the most vulnerable regions in the world, between 2003 and 2012 it received 6.8% of the funds approved in Latin America and the Caribbean for climate change (US$2,355 million. Moreover, those funds have been used mainly for mitigation actions, which, according to Sabelli and Spensley (2012), received three times more funding than adaptation planning.

3.11 **Part of the explanation is institutional capacity limitations.** Deeb (2002) pointed out that the Region is characterized by weak institutional capacity, limited environmental data, inadequate long-term environmental planning and policies, and failure to champion the climate change agenda at the regional and international levels. The implementation of regional agreements still needs to be prioritized. Regional and governmental agencies, civil society, and the private sector still need to engage together in the work of building resilience (Kirton, 2013).

IV. THE IDB'S CLIMATE CHANGE ROLE IN THE CSIDS

A. Evolution of the Bank's climate change strategy in CSIDS

4.1 **The Bank's commitment to climate change was renewed in 2010 when the Ninth General Capital Increase (GCI-9) highlighted the area as one of the five key priorities to pursue in the years ahead.** The Bank had previously embarked on different initiatives addressing climate change issues in the Region before that. The SECCI Trust Fund, for instance, provided resources for technical assistance since 2008. These efforts led the groundwork for the establishment of a strategy responding to climate change, which eventually evolved to become the Integrated Strategy for Climate Change Adaptation and Mitigation, and Sustainable and Renewable Energy (or hereafter Climate Change Strategy) approved in March 2011. Following the GCI-9, the Climate Change Strategy became the guiding instrument for addressing climate change challenges and for scaling up Bank support in Latin America and the Caribbean over the rest of the evaluation period. The strategy acknowledges the continent's high vulnerability to the effects of climate change and provides a framework for supporting actions to mitigate and adapt to those effects. It is anchored in five objectives: (i) strengthening the knowledge base; (ii) strengthening institutions and public and private sector capacity; (iii) developing instruments to mainstream climate change in Bank-funded operations; (iv) expanding lending and technical assistance in key sectors; and (v) scaling up investments, addressing financial gaps, and leveraging private sector investments.

4.2 **The CSS is comprehensive enough to encompass the priorities that big and small countries share, but it does not disentangle the specificities and needs of the CSIDS.** The Action Plan that supports the Climate Change Strategy defines one line of action that

chiefly applies to SIDS—reducing the vulnerability to climate change impacts in coastal and marine ecosystems. The Bank has no regional strategy or action plan to guide particular adaptation and mitigation measures in the CSIDS as a group, so its approach is entirely at the national level—mainly through Country Strategies (CSs). (Annex D, Table D.3, sets out the CS priorities related to climate change.)

4.3 **A few CSs included adaptation and mitigation measures before 2007.** *The Bahamas (2003-2007)* introduced CZM as one of the priorities for improving environmental management and natural resource conservation, and *Barbados (2005-2008)* included the improvement of coastal infrastructure as a strategic objective for the Bank. Following the devastating flood of 2004, *Dominican Republic (2004-2008)* reinforced the need to reduce environmental vulnerability by including measures to prevent natural disasters and to strengthen institutional capacities to mitigate them. One of the three pillars of *Jamaica (2006-2009)* was to reduce vulnerabilities to natural disasters by supporting prevention and risk identification activities. Suriname (2006-2010) stressed the need to improve living standards for indigenous peoples while promoting sustainable natural resource management and environmental protection.[32]

4.4 **The establishment of the Bank's Sustainable Energy and Climate Change Unit[33] seems to have increased awareness of climate change impacts—which ultimately translated into more climate-change-focused strategies.**[34] *The Bahamas (2010-2014)* concentrates on renewable energy, energy efficiency, and energy conservation programs as priorities for greening the country's energy matrix. However, even if this approach addresses climate change mitigation, the strategy fails to link it to an emissions reduction objective. Moreover, the path pursued by the current strategy is strongly at odds with the previous strategy, which favored a climate change adaptation approach through the strengthening of CZM. *Barbados (2009-2013)* strengthened the Bank's focus on climate change adaptation and mitigation, aiming to sustain the results achieved under the previous strategy by pursuing the improvement of the regulatory framework and the understanding of coastal risk factors. It also aimed to expand energy efficiency and renewable initiatives. *Belize (2008-2012)* introduces the need to develop a strategy to manage the fiscal risks that result from natural disasters and climate change, as well as the rehabilitation of road infrastructure damaged by floods; however, it includes only poorly designed progress indicators. *Guyana (2012-2016)* pursues the priority defined in the 2008-2012 CS with respect to sustainable energy by supporting a low-carbon energy matrix. It also adds sustainable management of natural resources as a priority, with the aim of strengthening capacities for climate change adaptation and disaster risk management. *Jamaica (2013-2014)* proposes to mainstream climate change adaptation and disaster risk management as a cross-cutting theme under the strategic axes of fiscal

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32 The term climate change was not yet in use in any of these strategies, nor in those of Belize (2004-2008), Haiti (2007-2011), and Trinidad and Tobago (2004-2007).

33 Later transformed into a Division and renamed the Climate Change and Sustainability (CCS) Division.

34 The CCS Division prepared technical and dialogue notes on climate change to serve as inputs for the CSs of The Bahamas (2013-2017), Jamaica (2013-2014), and Trinidad and Tobago (2011-2015). The Environment, Rural Development, and Disaster Risk Management Division prepared technical notes on disaster risk management and ICZM to inform the CSs of The Bahamas (2013-2017), Barbados (2009-2013), Belize (2008-2012), Jamaica (2013-2014), Suriname (2011-2015), and Trinidad and Tobago (2011-2015).

sustainability and social protection. Although the CS includes actions to reduce fiscal and social vulnerabilities to the impacts of climate change, it does not define outcomes and indicators to monitor them. *Suriname (2011-2015)* recognizes that the country is threatened by SLR and considers natural disaster and climate change management a cross-cutting priority to be mainstreamed in strategic infrastructure investments. However, no concrete objectives or targets are reflected in the CS. *Trinidad and Tobago (2011-2015)* is a good example of climate change mainstreaming: one of its priorities is to reduce CO_2 emissions and to introduce the issue into the government's strategic planning instruments. The strategy also envisages supporting the country in developing a more efficient and sustainable energy matrix.

4.5 **The absence of technical notes to support the Dominican Republic and Haiti CSs translated into less ambitious climate-change-related priorities.** The CSs for Dominican Republic and Haiti addressed the climate change issue rather poorly. *Dominican Republic (2010-2013)* did not mention the importance of the Bank's role in tackling climate change challenges. The strategy proposed to support the increase of contingency funds to cover emergencies and to increase the number of passengers using the metro system, but it made no connection with the reduction of GHG emissions. *Haiti (2011-2015)* stressed the agriculture sector's extreme vulnerability to climate change and natural disasters and proposed interventions—in particular the promotion of sustainable agricultural practice—in the Northern and Artibonite regions.

4.6 **Risk assessments accompanying CSs recognize the huge risk natural disasters may pose to the success of the Bank's program.** The strategies emphasize CSIDS' high vulnerability to the occurrence of extreme weather events, and note the possibility of redirecting resources for rehabilitation and reconstruction activities. It is therefore surprising that the Bank's CSs for these countries do not address climate change more directly.

B. The Bank's climate change portfolio in the CSIDS and case studies review

4.7 **The climate change portfolio—loans and grants—represented 25.4% of the overall Caribbean portfolio between 2004 and 2013 by number of operations.**[35] This corresponded to 15% (by value) of the portfolio if the entire operation is considered a climate change project. Once operations are segmented solely by components addressing climate change issues, the climate change portfolio decreases to 11% of the value of the overall Caribbean portfolio—with almost US$700 million disbursed over the period. The

[35] During 2004-2013, the Bank approved (in all sectors, irrespective of being climate change or not) more than US$8.7 billion in loans (247 operations), including 41 operations totaling US$1.1 billion for Haiti that, have been funded through the IDB Grant Facility since 2007. The loan portfolio includes sovereign-guaranteed investment loans and policy-based loans for US$4.5 billion and US$3.8 billion, respectively, as well as US$5.5 million in project preparation facilities. Private sector operations account for the remaining 4.3% (US$0.4 billion), with private sector investment loans, operations of the Trade Finance Facility Program, and small projects managed by the Multilateral Investment Fund (MIF). The Bank also approved US$545 million (340 operations) in grants for the Caribbean over the period: 55% are non-reimbursable technical cooperations (TCs) and the remainder is classified as investment grants.

remainder of this paper uses the operations' components classified as climate change instead of entire operations (see Box 6).[36]

Box 6. Methodology for classifying operations and components

Beginning with all operations approved between 2004 and 2013, the team classified operations related to climate change using the following methodology:

(i) Use review of loan documents, project visits, and discussions with Bank staff and government officials to classify operations as having (or not having) a climate change impact.

(ii) For climate change operations, define their sectors, as follows:

a. *Agriculture & LULUCF* comprises agricultural and climate change research, rural cadaster and land regularization, forestry, watershed management, and the more comprehensive sustainable development programs.
b. *Disaster risk management and coastal zone management* includes emergency assistance following a natural disaster, early warning systems, and coastal zone infrastructures.
c. *Energy* includes biofuels, hydroelectricity, alternative renewable energy, energy efficiency, and sustainable energy reforms.
d. *Transport* includes sustainable means of transportation, sustainable urban mobility, the improvement of city logistics, and the rehabilitation of roads following natural disasters.
e. *General* includes strengthening overall national environmental capacities, developing strategic planning instruments, and general credit lines to finance environmentally friendly projects.

(iii) Classify their components and the related amounts into one of five categories:

a. Adaptation policy and institutional strengthening;
b. Adaptation and resilience investments;
c. Mitigation policy and institutional strengthening;
d. Mitigation investments; and
e. Likely negative climate change impact (maladaptation and increase of GHG emissions).

Categories a, b, c, and d are grouped as *Likely positive response to climate change impacts.*

The sum of approved amounts from the different components of an operation considered as having a climate change impact may be smaller than the total approved amount of the operation—only components considered relevant for climate change were included in the totals. In addition, an operation may have its components distributed among different categories.

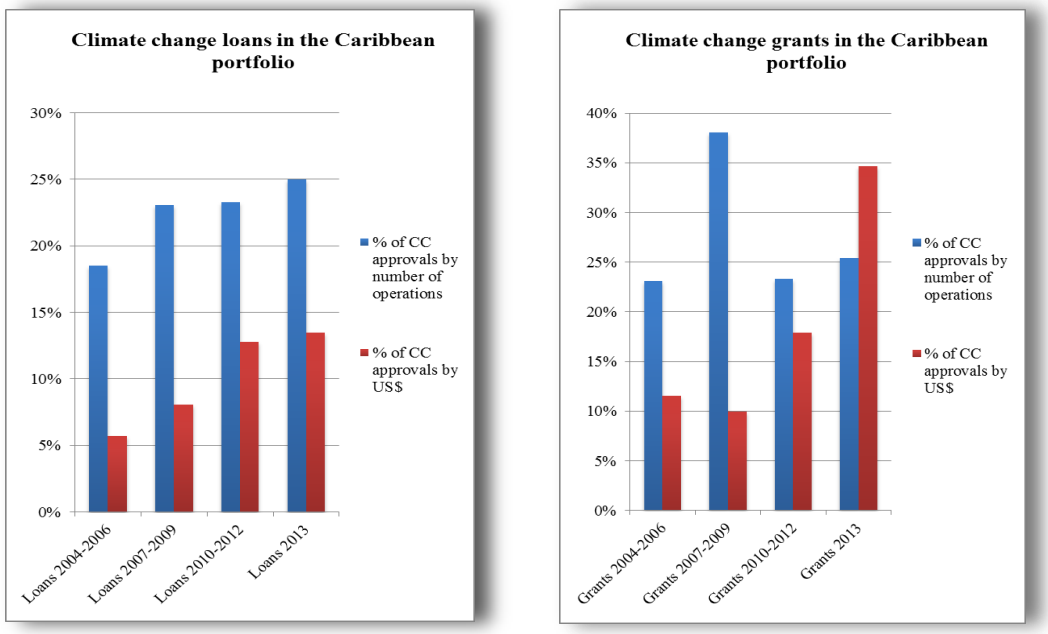
4.8 **There has been an increase in the numbers of climate-related operations, in particular since 2010.** Perhaps as the result of GCI-9,[37] 2011 saw the greatest number of approvals of climate-related loans and grants—policy-based loans (PBLs) for Barbados, Haiti, and Trinidad and Tobago, as well as private sector wind power projects in Dominican Republic (Figure 7). (This spike was accompanied by an equivalent increase in the overall portfolio.) The profile of grants appears to have changed over the years—the average amount per grant devoted to climate change has increased considerably (Annex D, Table D.4). It is unclear whether this overall increasing trend will be sustained in the future. Although the pipeline of loans contains several mitigation projects to be approved over the next two years, the Bank will have to substantially increase its

[36] This evaluation excludes operations with original approved amounts equal to or below US$150,000 (220 operations, US$18 million) and cancelled operations (two additional operations, US$9 million). Operations from the MIF and the Inter-American Investment Corporation (IIC) are also excluded.

[37] Following the GCI-9 the Bank committed to devote 25% of its lending to climate change, renewable energy, and environmental sustainability in 2012-2015, from an estimated baseline of 5% during 2006-2009.

approvals to reach the 25% lending target for the CSIDS. No operations with a likely negative climate change impact were registered in the Caribbean.

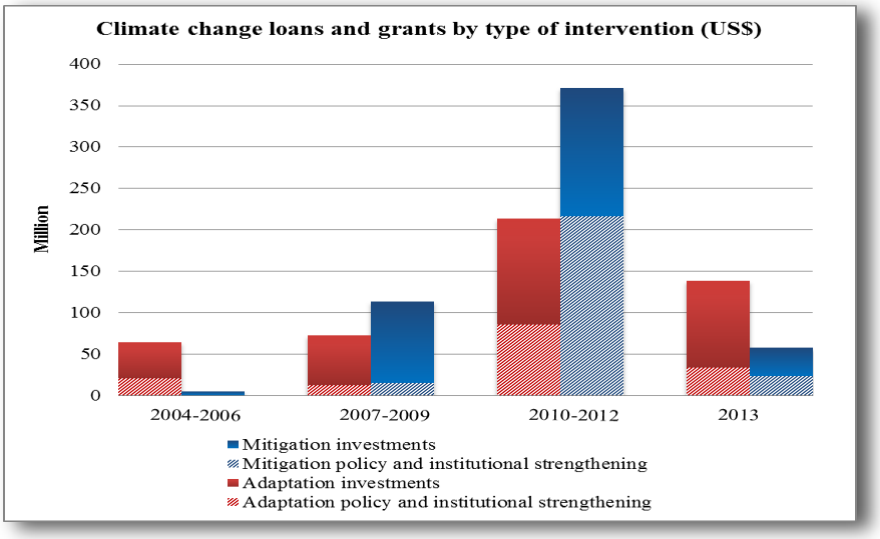
Figure 7. Climate change portfolio relative to overall Caribbean portfolio



Source: OVE calculations.

4.9 **The portfolio was almost evenly distributed between adaptation and mitigation, in contrast to other regions, where mitigation has received greater interest.** Of the US$488 million devoted to adaptation, 31% was targeted at drafting policies and legislation, institutional strengthening, and research, and 69% to adaptation investments such as investments in protective infrastructure works and ex-post recovery actions. Of the US$548 million used for mitigation, the Bank has committed almost as much to mitigation policy (47%) as to mitigation investments—53% was for rehabilitation works in energy and transport, pilot energy efficiency measures, renewable and waste-to-energy projects, and funding mechanisms to support sustainable energy projects. Ex-post disaster and emergency response loans and grants alone accounted for US$40 million (Figure 8).

Figure 8. Evolution of the climate change adaptation and mitigation portfolio



Source: OVE calculations.

1. Distribution by instrument

4.10 **The Bank has used a varied mix of instruments to support climate change related reforms and investments.** Emergency PBLs have been used to provide liquidity after extreme weather events, while non-emergency PBLs have supported the implementation of sustainable energy frameworks throughout the Region (Box 7) and agricultural reforms in Haiti and Suriname. The Bank has had limited capacity to provide private sector investments in climate change-related activities—only mitigation, and mainly in Dominican Republic, with two wind-energy projects and a lending facility to finance renewable energy. Sovereign-guaranteed investment loans have funded adaptation measures (Figure 9), mainly in agriculture and LULUCF, and in DRM and CZM (Box 8).

Box 7. The use of a climate change PBL in Trinidad and Tobago

In December 2011 the Bank approved a two-operation programmatic policy-based loan, or PBP (TT-L1022, for US$80 million) to support the Government in implementing a series of policy, legislative, and institutional reforms to promote and monitor the mainstreaming of climate change adaptation and mitigation measures into national development planning and sectoral policies. (The second operation was initially planned for 2013, but it has not been approved to date; thus limiting the assessment of the outcomes of the program must be limited).

Policy conditions under the first operation supported the mainstreaming of climate change into national policies and institutions:

- The National Climate Change Policy approved by the Cabinet;
- The National Protected Areas Policy approved by the Cabinet;
- The National Forest Policy approved by the Cabinet;
- Multilateral Environmental Agreements with climate change focal points appointed in key ministries;
- The proposal for the development of a Green Government Policy approved by the Cabinet;
- The approval by the Cabinet of a high-level committee on climate change comprising key ministers with portfolios related to climate change;
- The amendment of the legal framework on the Green Fund to allow nonprofit organizations and community groups to access finance to implement climate change-related projects;
- The approval by the Cabinet of the 2010-2014 strategic action plan for the Environmental Management Authority;
- The placement of the Institute of Marine Affairs under the aegis of the Ministry of Environment to help guide the development of an ICZM program.

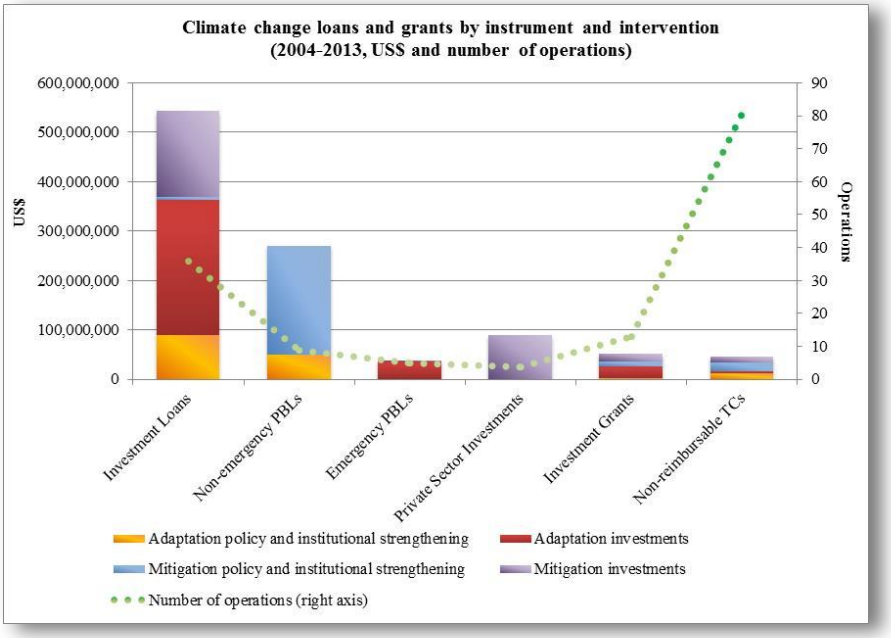
The PBP also aimed at building resilience to climate change by developing instruments to assess and reduce vulnerability and risks. The Government committed to establish a National Planning Task Force to review the Planning and Development of Land Bill, and to develop a proposal for an ICZM policy framework, strategy, and action plan, along with a steering committee to oversee them. The PBP also included a climate change mitigation objective through the promotion of carbon markets and policies to reduce GHG emissions. This component fostered the development of demonstration projects through the reforestation of a wetland system—a previously prepared project and the sole action on the ground in this PBP—and through the identification of additional Clean Development Mechanism projects; it is not clear whether the Bank had any role in the identification or preparation of these projects, or if they were already in the portfolio.

Most of the policy conditions were necessary to address climate change challenges in the country, but they are not sufficient to ensure a positive outcome in terms of climate change mitigation, or to build concrete resilience to the effects of climate change; investment operations will have to fill this void. In addition, the achievement of meaningful reforms is constrained by the deferment or, more likely, the cancelation of the second operation, which was designed to build on the first operation with important policy changes, which now will probably not be made.

4.11 **In CSIDS, grants were used to pilot renewable energy and energy efficiency projects as well as CZM and agriculture support accompanying broader policy reforms.** An adaptation investment grant was used to transfer technology to small farmers in Haiti (US$25 million). Other grants piloted wind and solar energy in The Bahamas, Barbados, Guyana, Haiti, Jamaica, and Suriname, and sustainable land, forest, and watershed management to prevent deforestation and soil erosion in Haiti. Of 81 non-reimbursable technical cooperations (TCs), 11 (US$2.2 million) provided emergency assistance to The Bahamas, Belize, Dominican Republic, Guyana, Haiti, Jamaica, and Suriname. The remaining adaptation-related TCs financed assessments and studies in CZM, natural disaster risk analysis and planning instruments, watershed management plans for preventive disaster risk, strategic plans for the agriculture sector, design concepts for

climate-change-resilient buildings, and cross-sectoral institutional strengthening and capacity building. On the mitigation side, the great majority of TCs were designed to support energy PBLs and investment loans, but some strengthened capacities to implement REDD+ and supported climate change scientific research for the Iwokrama forest in Guyana, as well as studies for the Dominican metro system and the development of a national strategy for transport and freight logistics (Annex D, Table D.5).

Figure 9. Climate change adaptation and mitigation portfolio by type of instrument



Source: OVE calculations.

Box 8. Barbados case study review: Climate change, coastal vulnerability, and economic development

(Annex A provides the complete case study.)

Coastal zone is one of Barbados' main economic assets. Sandy beaches, fringing reefs, and a rich coastal ecosystem distinguish this 432km^2 island in the Lesser Antilles. The tourism industry, which has been the economy's driver of growth for the past 40 years since Barbados shifted from its dependence on the sugar industry, has benefited from these coastal resources. Beach locations attract more than 1.1 million tourists per year, mostly from the UK, US, and Canada. Directly and indirectly, the sector accounts for 39% of the country's GDP and employs 38% of the labor force. In addition, more than 50% of Barbadians live in or near the coast, and 95% of tourism-related plants and other critical infrastructures are also concentrated in these areas. Climate change is likely to increase the vulnerability of the coastal zone and impair Barbados' economic development.

A non-volcanic island of coral-limestone landmass located on the southern edge of the Atlantic hurricane belt, Barbados is at moderate risk from hurricanes and tropical storms—even though history has shown rare episodes of extreme weather events.[a] However, low-lying areas are often prone to inland flooding—SLR has averaged 2-4cm per decade—with prolonged consequences because of poor drainage infrastructure. Saline intrusion into coastal freshwater aquifers is likely to become more pronounced with SLR, while eroding coastlines is a major threat along the west and south coasts.[b] Simpson et al. (2012) modeled its impacts for beaches with high-end tourism resorts to show that 73% of the beach at Holetown would be lost under a 0.5m SLR and almost half of Sandy Lane beach would be lost under a 1m rise. Simpson et al. (2010) estimated the annual costs resulting from a 1m SLR scenario at 2% of GDP by 2050 and 5% of GDP in capital costs. The investments required to protect the coastal zone around the city of Bridgetown would be on the order of US$42 million to construct new levees and US$144 million to construct 8.4km of seawalls. Bueno et al. (2008) estimated the costs of climate inaction for Barbados to range from 6.9% of GDP by 2025 to 27.7% in 2100, to cover hurricane damages, tourism losses, and infrastructure damages due to SLR.

The estimated costs of climate change are high, but planned adaptation could reduce it. For more than 30 years, the Bank has partnered with the Government to support progress in CZM. The Bank has been strategically and financially relevant over the years, investing more than US$58 million (through loans and TCs; see Annex A, Figure A.2) to support the enactment of key legislation and policies, strengthen local capacities and foster exchanges with international experts, and sustain engineering projects to protect the shoreline. For instance, the Bank supported the Holetown beach improvement project and the Rockley to Coconut Court waterfront improvement project, which created 4.5km of continuous safe beach access and increased beach volume by 16,000m^3. Physical investments are still ongoing, with offshore breakwaters, groynes, beach nourishment, and walkways extending over 1.5km along the west coast between Holetown and Heron Bay, as well as the restoration of the Holetown Lagoon to improve water quality and reduce flooding. The Richard Haynes Boardwalk, included in the Rockley to Coconut Court project, had an important economic and social externality beyond shoreline stabilization: it boosted local economic activities, increased property values (in particular property affected by storm surge and erosion), boosted restaurant revenues, and increased access to the coast by around 16,000 person-days per year.

The long-term sustainability of this type of intervention is critical in both technical and financial terms. The coastal stabilization works the Bank has been supporting have been designed on the basis of top scientific information and modeling, meeting international engineering and design standards. However, despite their medium-term environmental and economic benefits, their high maintenance costs relative to natural interventions and the possibility of exacerbating coastal erosion have called into question their efficacy and sustainability. The financial sustainability of such investments will depend on the Government's capacity to adequately monitor and maintain the structures and to define a mechanism to share costs when property owners and the private sector are the main beneficiaries of these investments.

Altogether, the effectiveness of Bank operations has been enhanced by a combination of institutional capacity, ownership, and resources devoted to coastal research. As one of the first national ICZM programs for a developing country, it has become a reference for similar initiatives in the Caribbean. Barbados has been called upon to provide technical assistance to other countries that consider its model a

best practice; as a result, the Bank has been able to extend its support to The Bahamas, Dominican Republic, Haiti, Suriname, and Trinidad and Tobago.

Barbados' CZM experience constitutes a springboard for the rest of the Caribbean, but there have been hurdles. Bank support has faced continuous delays in implementation even after several years of collaboration. Structural bottlenecks related to the approval of contracts and the appointment of key staff are common in Barbados. Moreover, the CZM sector has faced several inherent challenges: (i) the high degree of complexity in designing shoreline infrastructures, requiring the understanding of the dynamics of the physical environment (i.e., sediment transport, wave action) and engineering; (ii) the specialized procurement required to sustain these investments, in particular the definition of technical specifications for necessary construction materials; (iii) the lengthy process involved in obtaining construction permits in coastal areas (approvals from the Town and Country Development Planning Office and National Conservation Commission); and (iv) the high turnover in property ownership, which means repeated negotiations with new owners to gain access to construction sites.

Addressing disaster risk and climate change adaptation demands a continuous effort to improve the country's understanding of the interplay of physical, ecological, and socioeconomic factors. The CZM Unit must be able to maintain high-quality risk information on coastal and near shore processes and to benefit from climate modeling and appropriate monitoring and evaluation tools (Geographic Information System). In addition, it is important to continue to invest in shoreline stabilization, through hard structures or soft engineering methods, as is ongoing Bank support addressing. The links among water resources management, agriculture, and CZM should also be strengthened to prevent land use impact on environmental conditions (erosion and increased beach losses, sedimentation, and water pollution). The Government must therefore harmonize the legislation related to ICZM, environment, disaster risk management, water management, and town planning; and it must strengthen its enforcement capacity.

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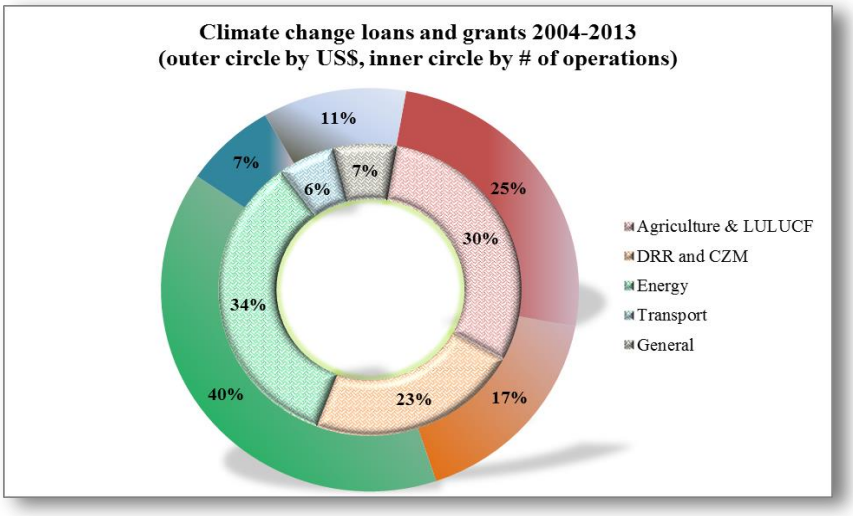
[a] Nonetheless, the Bank's 2008 Risk Management Index pointed out that the likely losses from a catastrophic event (hurricane or earthquake) with a 10% probability of occurrence in 10 years could total US$423 million, or 11% of GDP.

[b] Freshwater aquifers account for 98.6% of potable water supply, with only three catchments on the island sourcing the great majority of the potable water. The World Resources Institute considers Barbados one of the most water-stressed countries in the world, with less than 350 m^3 per capita per year of natural water resources and occasional water deficits during the dry season.

2. Distribution by sector

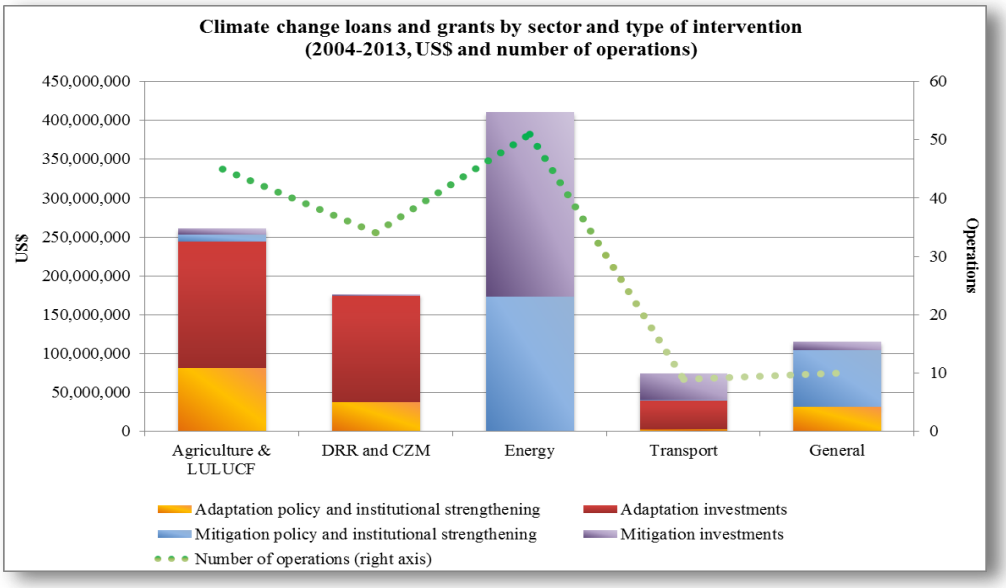
4.12 **Sustainable energy was the main sector of climate change-related intervention (US$411 million), followed by agriculture/LULUCF (US$266 million).** Those two sectors and DRR and CZM represented the vast majority of climate change operations in the Caribbean (Figures 10 and 11). The Bank devoted a large amount of its resources to supporting energy policy reform and institutional strengthening, with four strategic PBLs to develop sustainable energy frameworks in Barbados, Guyana (Box 9), and Trinidad and Tobago. A few grants were used to analyze the potential for renewable energy, waste-to-energy, and natural gas in The Bahamas, Barbados, and Haiti, as well as bioenergy alternatives in Dominican Republic, Haiti, and Suriname. The remaining 58% promoted mitigation investments such as the rehabilitation of electricity distribution systems in Dominican Republic, Guyana, Haiti, and Suriname; the implementation of energy efficiency measures in public sector buildings in Jamaica; the construction of two wind-energy farms (84 MW) in Dominican Republic; and the establishment of investment funds to finance public and private renewable energy and energy efficiency projects in Barbados. Grants supported the piloting of wind and solar projects and distribution of energy-efficient light bulbs in The Bahamas, Barbados, Jamaica, and Suriname, and solar power generators and refrigerators to support emergency responses in Haiti.

Figure 10. Overall climate change portfolio by sector



Source: OVE calculations.

Figure 11. Climate change adaptation and mitigation portfolio by sector



Source: OVE calculations.

4.13 **Climate change-related operations in agriculture/LULUCF cover areas from land use policy to crop resilience development and watershed management.** Adaptation policy and institutional strengthening operations include agricultural adaptive research and development in Belize, Dominican Republic, and Haiti, where knowledge transfer to local farmers was central to reinforce rural supply chains; the reform of land tenure legislation in The Bahamas and Haiti; the strengthening of Ministries of Agriculture and national agricultural health and food systems in Barbados, Haiti, and Suriname; the

assessment of climate change impacts on Iwokrama forest in Guyana; and the development of watershed management plans and water resources availability in Haiti. Adaptation investments supported sustainable agriculture in watersheds and protective infrastructure works in Haiti; irrigation works in Guyana, Haiti, and Jamaica; technology innovation subsidies to small farmers in Dominican Republic and Haiti; and land information systems in The Bahamas, Belize, and Haiti. On the mitigation side, the Bank supported the design of the REDD+ strategy and the strengthening of key institutions implementing Guyana's Low Carbon Development Strategy, and the restoration of ecosystem services, reforestation, and carbon monitoring in Haiti.

Box 9. Supporting Guyana's Low Carbon Development Strategy

FAO acknowledges Guyana as one of the best-conserved high-biodiversity countries;[a] however, growth in the mining and forestry sectors has had severe environmental consequences, including forest and habitat loss, water contamination, and river sedimentation.[b] Although the rate of deforestation is substantially lower in Guyana than in other South American countries, it has peaked in the past three years as the mining sector responds to the high price of gold in international markets.

In December 2013 the Bank approved the first of a two-operation PBP (GY-L1039, for US$16.9 million) to strengthen the governance of and policy framework for the implementation of Guyana's Low Carbon Development Strategy (LCDS). This PBP builds on previous support to the Office of Climate Change of the President's Office and the Guyana Forestry Commission through technical assistance (GY-T1068, GY-T1076, and GY-G1002). Meaningful policy conditions were part of the first operation, going beyond the approval of strategies and plans. The publication of the LCDS Update was followed by the implementation of two demonstration projects; the review of the legal and regulatory frameworks for mining was paired with a study to identify opportunities and challenges of adhering to the Extractive Industry Transparency Initiative, and the enforcement of the Code of Practice for Timber Harvesting with a training program for local communities. A set of conditions was also included to ensure the effectiveness of the reforms proposed. For instance, this first operation required the carbon impact assessment tools for main drivers of forest change to be approved together with the implementation of a forest cover database that will allow the reporting of carbon emissions resulting from deforestation and forest degradation in Guyana in accordance with IPCC guidelines.

[a] FAO (2010), Global Forest Resources Assessment.

[b] Guyana is an agriculture- and resource-based economy with 90% of its territory covered by forest, wooded land, and inland waters.

4.14 **DRM and CZM operations can be categorized as either ex-post emergency assistance or preventive adaptation.** Emergency assistance (US$40 million) has undertaken urgently required measures to rehabilitate housing infrastructures and electricity systems, and provide food, potable water, and medication in disaster-affected countries—The Bahamas, Belize, Dominican Republic, Guyana, Haiti, Jamaica, and Suriname. Preventive adaptation (US$136 million) promoted flood monitoring and forecasting in Haiti; an insurance facility for emergencies in Dominican Republic and a disaster prevention program helping eight municipalities manage the risk from natural hazards (Box 10); the upgrade of drainage infrastructure and management of water resources to reduce flood risk in Trinidad and Tobago; and the development of ICZM plans and institutional reforms in The Bahamas, Barbados (with physical coastal infrastructure), Dominican Republic, Suriname, and Trinidad and Tobago.

4.15 **Bank support in the transport sector (US$74 million) has been closely tied to DRR.** Transportation infrastructure rehabilitation and clearing of roads following natural hazards have been supported in Belize, Haiti, and Jamaica. Technical assistance to the

Santo Domingo metro system and the National Cargo and Logistics Observatory in Dominican Republic completes the Bank's small transport climate change portfolio in the Region.

4.16 **The general portfolio (US$109 million) regroups cross-cutting climate change operations.** It comprises the PBL to support the climate change agenda in Trinidad and Tobago, related grants to strengthen the Environmental Management Authority, and studies to understand the economics of climate adaptation. The Bank also supported the institutional strengthening of national systems of environmental management in Guyana (through a PBL) and Haiti, as well as studies to develop the Strategic Program for Climate Resilience under the Climate Investment Fund Pilot Program for Climate Resilience in the Caribbean. The general portfolio also includes a private sector lending facility to BHD Bank in Dominican Republic to finance projects in energy and other climate change-related activities.

Box 10. Dominican Republic case study review: Extreme weather events, financial planning, and disaster risk reduction

(Annex B provides the complete case study.)

The ninth-largest economy in Latin America, Dominican Republic (DR) is also the third-largest Caribbean country in terms of population (9.7 million people, after Cuba and Haiti) and the second-largest in terms of area (48,442 km^2, after Cuba). DR is significantly exposed to natural hazards of both hydrometeorological and geomorphological origin. Dilley et al. (2005) rank DR as the third most affected country in terms of mortality risk from two or more hazards and as the fourth with respect to economic risk from two or more hazards. In addition, the social, economic, and fiscal burdens associated with this exposure are considerable: according to the UN Office for Disaster Risk Reduction, DR experienced on average 1.6 natural disasters per year between 1980 and 2010, which affected more than 87,700 people and generated economic losses totaling US$84.1 million annually. The increased intensity of hurricanes and risk of storm surges—as a result of climate change—will likely worsen the situation, particularly considering the population's high exposure to disasters (94.7% concentrated in 87% of the national territory) and the high economic exposure of 95.6% of GDP to the consequences of natural disasters that put important infrastructures at risk.[a]

The Bank has provided continuous support for disaster risk reduction in DR. Since the mid-2000s, the Bank has taken a more proactive approach to DRM, not only considering reconstruction after a disaster but also taking explicitly into account the proper analysis of risk, the need for prevention efforts, and the response to emergencies as part of addressing natural disasters. A fundamental part of this new approach is financial planning: the Bank provides mechanisms that foster fiscal protection to cope with disasters, while enhancing effectiveness in case disasters happen. In a nutshell, the scheme proposes a financial toolkit that combines risk retention and risk transfer in a way that better addresses the variability in the severity and frequency of disasters. This toolkit includes the establishment of reserve funds, fast-disbursing contingency credit lines, and sovereign insurance facilities.

DR was the first country in the Region that took advantage of this new set of instruments, as reflected in the approved portfolio between 2004 and 2013—although several measures for prevention and adaptation had been proposed in the context of the Emergency Program for Hurricane Georges (DR0135, approved in 1998). In 2005, the Bank approved a US$5 million investment operation (DR-L1007) to improve DR's capacity to reduce disaster risks and enhance the country's overall DRM framework. This operation was central to establishing mechanisms to better manage the National Risk Management Plan, which was then tied, as a necessary condition, to the contingency loan approved later in 2009 (DR-X1003). This contingency credit line is a risk retention facility that offers resources at a faster pace if a disaster occurs, giving coverage for up to US$100 million. Access to funds is conditional both on parametric thresholds relative to the severity of the disaster and on indicators that measure how well the country is implementing the National Risk Management Plan—which is directly related to the execution of DR-L1007. In 2011, the Bank approved a sovereign insurance facility to strengthen DR's finances to meet the

costs of natural disasters (DR-L1045). The insurance coverage, initially for a period of five years and up to US$100 million per year, takes the form of a parametric policy that transfers the country risk to international financial markets through reinsurance.

This combination of traditional emergency loans (such as the one approved in 2007—DR-L1029, US$20 million—to help the country with reconstruction endeavors after Hurricane Noel) and contingency credit lines is relevant in design: the whole program has been aligned with country requests and needs, acknowledging that fiscal vulnerability is a major threat to the country's ability to respond to natural disasters but also trying to control for potential failures that usually arise in this context (e.g., moral hazard is deterred with the parametric coverage and the Good Samaritan effect—that ex-post aid reduces ex-ante prevention—is significantly precluded by not using ex-post assistance only).

However, there is a question of relevance at the implementation level: given the Government's priorities and the fact that changes are costly and highly dependent on political will, such a complex scheme of risk reduction faces considerable obstacles that have hindered its effectiveness.

As a pilot program, this is a valuable experience, indirectly providing a demonstration effect on both what to do and on what not to do (i.e., sequential financing beyond ex-post aid vis-à-vis the intervention per se). Moreover, it has innovative elements compared with similar initiatives advanced by other development partners (such as the Caribbean Insurance Facility the World Bank has been supporting).

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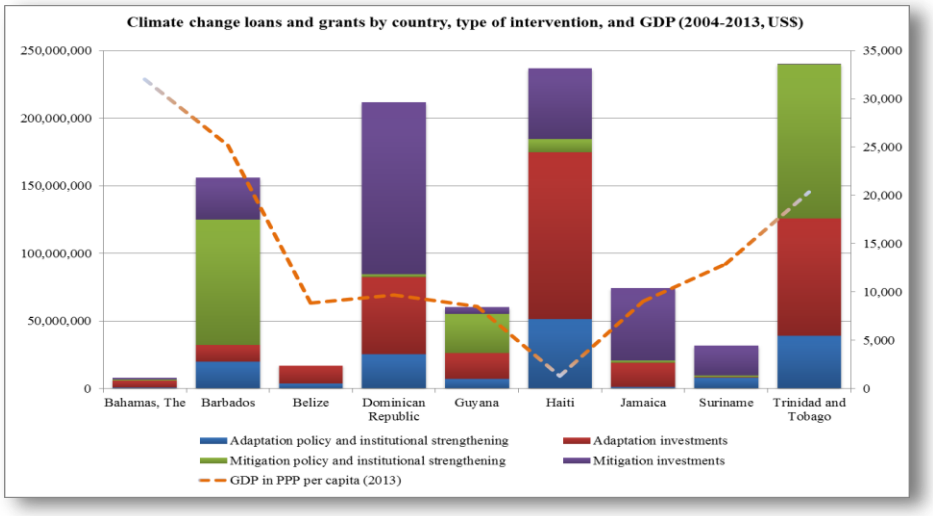
[a] See World Bank (2010).

3. Distribution by country

4.17 **Trinidad and Tobago, Haiti, and Dominican Republic received 66% of the Caribbean climate change portfolio.** Trinidad and Tobago received the greatest amount of climate change funding, with climate change and sustainable energy PBLs and a total of 11 operations—slightly above the 9 in The Bahamas and Suriname (Figures 12 and 13). Climate change interventions are often linked to poverty reduction, however Bank support does not appear to have been focused on the most economically vulnerable countries, except Haiti. Although the CSIDS all have similar exposure to climate change, the amounts and types of Bank support have been very different across countries with similar GDP per capita levels.

4.18 **The Bank has concentrated its climate adaptation work mainly in Haiti and Trinidad and Tobago and its mitigation work in Dominican Republic, Barbados, and Trinidad and Tobago (through significant budget support in the last two)**. Adaptation has been preponderant in Bank activities with The Bahamas, Belize, Haiti, and Trinidad and Tobago. The Bank has devoted more resources to mitigation in the remaining partner countries, which from a climate change perspective is at odds with the Bank's mandate of building resilience to climate change impacts in vulnerable countries.

Figure 12. Climate change adaptation and mitigation portfolio by country

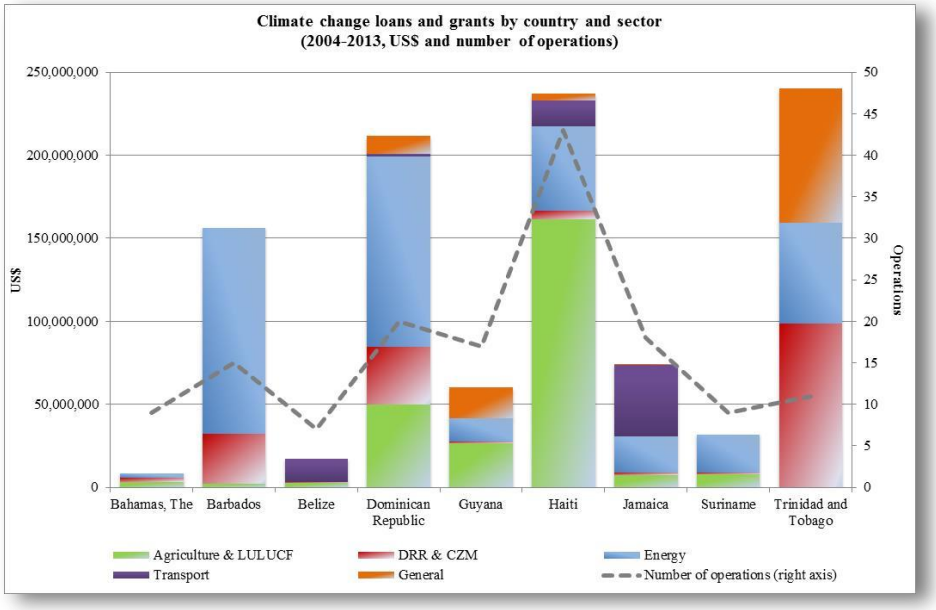


Source: OVE calculations. GDP figures from IMF World Economic Outlook (2013).

4.19 **The climate change portfolio has concentrated on key strategic areas for a few countries.** In Haiti, the Bank has largely focused on agriculture, which is one of the major drivers of the country's economy (Box 11), and it has focused on sustainable energy in Dominican Republic, where the energy sector has been facing financial issues over the last decade. The Bank provided limited support to address climate change-related issues in The Bahamas and in Belize. In The Bahamas, the Bank supported energy efficiency measures through grants and emergency responses through a PBL; more recently it is analyzing the possibility of supporting an ICZM program contemplating a component for coastal infrastructure. In Belize, the Bank focused mainly on the transport sector, supporting adaptive road rehabilitation works through a PBL, an investment loan, and a TC. In Barbados, the Bank concentrated on two relevant sectors, CZM and energy; it has taken a programmatic approach to supporting key energy reforms, combining a programmatic PBL with strategic TCs and two investment loans to provide financing support for public and private investments in renewable energy. In Guyana, the Bank had a prominent role in promoting the Low Carbon Development Strategy (LCDS) and also in strengthening agricultural health and food safety services and rehabilitating drainage and irrigation systems. Bank climate change support in Jamaica went to rehabilitate transportation infrastructure damaged by flood waters, establish the energy efficiency program for the public sector, and construct a LEED-certified hotel.[38] In Suriname, the Bank favored rural energy efficiency and the modernization of agricultural services through a PBL. Besides providing two PBLs to Trinidad and Tobago (climate change and energy), the Bank has also piloted a CZM program and invested in drainage works to reduce flood risk.

[38] LEED (Leadership in Energy and Environmental Design) is a set of ratings for the design, construction, operation, and maintenance of green buildings.

Figure 13. Sectoral climate change portfolio by country



Source: OVE calculations.

Box 11. Haiti case study review: Climate change adaptation practices in a fragile state

(Annex C provides the complete case study.)

Haiti, the poorest country and the only fragile state in LAC, is among the countries in the world that are most vulnerable to the effects of climate change. A combination of high geographical exposure, deforestation and land degradation, high poverty rates, lack of access to technology, weak institutional capacity, and unstable governments has limited Haiti's ability to adapt to the impacts of climate change.

In 2006 Haiti submitted its first National Adaptation Program of Action, focused mainly on adaptation needs in agriculture and fisheries, water, land, and forestry. Because of various implementation challenges—among them the country's unstable political situation; the lack of funding, of integrated national policies for environmental matters, and of research and statistics at the national and subnational levels; ineffective coordination among institutions involved in environmental issues; and weak institutional capacity—the program was updated in 2013. The Ministry of Environment and the Inter-Ministerial Committee for Territorial Planning (focal point for the Pilot Program for Climate Resilience and the Strategic Program for Climate Resilience) have the lead role in addressing climate change, although the lack of technical capacity, coordination issues, and insufficient financial resources have constrained their operations.

The Bank's climate change-related portfolio in Haiti has shifted from projects based on infrastructure and productivity objectives in specific rural areas (HA-L1009, HA-L1021) to more integrated agriculture programs (HA-L1087). Agriculture programs focused on productivity have had limited results because of the complexity of their design and execution constraints (lack of ownership of the execution agency, low availability of local credit, lack of data and studies, weaknesses in risk analysis). The Flood Warning Program (HA-L1005) approved in 2005 did not achieve satisfactory results, and sustainability of the investments is questionable given the low institutional commitment and the limited maintenance of the equipment acquired. After several projects in agriculture intensification and watershed management, in 2012 the Bank approved the only investment program related to land tenure security linked to climate change adaptation and environmental sustainability (HA-L1056)—providing incentives for climate-resilient agricultural practices. The program has disbursed only 7% of the original approved amount and there is no relevant information about implementation issues during this short period of time.

Policy-based grants (PBGs) in the agriculture sector (HA-L1074, HA-L1082) are part of the Bank's new

strategy to improve program execution and achievement of development goals. They present simple conditionalities related to the basic management of the sector. To improve the capacities of executing agencies, new projects under the Ministry of Agriculture, Natural Resources and Rural Development are expected to include some of the PBG triggers as conditions for their approval. In addition, the program for technology transfer to small farmers (HA-L1059, HA-X1015), approved in 2011, is the first to have explicit references to climate change in the diagnosis section. With less than 13% disbursed, there is not enough information to assess the program's effectiveness, although the limited participation of the potential beneficiaries may be a major concern.

The 2006 strengthening program for the Ministry of Environment (HA-L1006) is considered to have failed; IDB specialists consider that no positive outcomes have resulted from the program. With the approval of the disaster risk mitigation program in priority watersheds (HA-L1041) in 2009, the Bank introduced an integrated environmental management vision in the Haiti portfolio. The program is still only 40% disbursed; the weak institutional capacity of the execution agency appears to be one of the main risks to the effective implementation of the program.

Nonetheless, addressing climate change—and particularly adaptation—in such a complex and fragile context could bring several opportunities. Climate change could lay the groundwork for increased coordination among several ministries and execution agencies that are involved in related activities at both national and subnational levels, as well as among international institutions and nongovernmental organizations to better guide technical and financial support in the country. Furthermore, integrating adaptation measures into development planning, particularly under the areas related to water management, agriculture, fisheries, land use, and forestry, could boost the resilience of vulnerable groups and of important sectors in Haiti. TC could offer support for the development of climate change databases and information resources to design and monitor programs (indicators, baseline, and targets) and build knowledge capacity in the Government.

4. Regional operations

4.20 **More than one fourth of the regional operations (28%) approved over 2004-2013 are related to climate change in agriculture and forestry, disaster risk management, energy, and transport.** Overall, between 2004 and 2013 the Bank approved 641 regional grants, 22 regional private sector loans and one private sector guarantee, and two regional investment loans to the Caribbean Development Bank, for a total of US$2.14 billion. Before 2010, the Bank also made use of 43 regional support grants—an instrument that no longer exists—for US$51.3 million.[39] Climate change-related regional grants are made up of 149 TCs (US$108. million) and 4 investment grants (US$13.5 million), while almost all loans (19 for US$1.02 billion) are relevant to climate change. Only one grant was classified as having a potential negative climate change impact by promoting hydrocarbons market integration in the Mesoamerican Region (approved in 2006 for US$1.5 million).

4.21 **Regional operations directly benefitting the CSIDS have focused on sustainable energy, agriculture, and DRR** (Annex D, Table D.6). In the energy sector, the Bank has provided a private sector facility to help the Caribbean hotel industry with the LEED certification process and has supported the definition of the Caribbean hotel energy efficiency action program. The Bank also supported the Caribbean sustainable energy road map, complemented by feasibility studies and other technical work for the introduction of natural gas, wind energy (under the Strategic Program for Climate

[39] These figures exclude regional operations with original approved amounts lower than or equal to US$150,000 (648 operations, US$60 million), as well as regional MIF and OMJ operations.

Resilience), and other renewables in the Region, and for the energy efficiency of the Caribbean Electric Utility Services Corporation (CARILEC). In agriculture and forestry, Bank support was essentially directed to Belize, for the management of the Selva Maya Ecosystem; Dominican Republic, for adaptation of coffee planting to climate change and support to small producers of organic bananas; and Guyana and Suriname, with studies and institutional strengthening initiatives for the management of biodiversity and, in particular, to help indigenous communities prepare for potential opportunities of REDD+ and carbon markets in general. Rehabilitation and reconstruction assistance for OECS countries, particularly the loan channeled through Caribbean Development Bank for Grenada (Box 12), is part of the DRM climate change portfolio and in line with the Bank's policy for reconstruction activities. The Bank also supported a regional DRM framework for the tourism sector. However, it has provided very little support in the transport sector and has concentrated that support in Belize and Dominican Republic. The Bank's regional knowledge products focus on the analysis of freight logistics and the definition of national plans.

Box 12. The Grenada Reconstruction, Recovery, and Development Program

Grenada was severely hit in September 2004 by Hurricane Ivan, a category 3 storm. Major infrastructures, roads, water supply, electricity, and telecommunications were damaged, with losses amounting to 211% of GDP. In addition, 39 people were killed and an estimated 60,000 people were affected. While still recovering from the impact of Hurricane Ivan, Grenada was hit by Hurricane Emily in July 2005, sustaining damages that were less severe than those brought by Ivan but still amounted to US$110 million and affected nearly 1,650 people.

Climate change has intensified the risks from tropical storm and hurricane incidents. Island temperatures, which have increased roughly 0.1° to 0.2°C per decade over the last 33 years, are projected to increase above the global mean and thus to lead to an increase in the intensity of extreme weather events.

In 2005, the Bank approved the Grenada Reconstruction, Recovery, and Development Program (RG-L1006), a loan of US$10 million to be managed by the Caribbean Development Bank, to support long-term investments in recovery and reconstruction of the country's economic, social, and environmental assets, including housing infrastructure and private sector credit. Although the operation is highly relevant, the effectiveness and sustainability of such measures are doubtful. Grenada will continue to be vulnerable to natural disasters; it is therefore crucial that measures be taken to reduce the risk of future disasters through appropriate risk management and adaptation to climate change planning.

V. CONCLUDING REMARKS AND THE WAY FORWARD

5.1 **The Caribbean is already feeling the impacts of climate change, and the cost of inaction is high.** Climate change, which is likely to increase the severity of natural disasters in the Caribbean, has the potential to affect the Region's key economic sectors—agriculture and the tourism industry—as well as private property in general, shoreline stability, and the health of coastal and marine ecosystems. SLR will exacerbate these effects and add the severe risks of groundwater saline intrusion and amplified beach erosion. Thus it could have serious implications for water resources—the Caribbean is among the most water-stressed regions in the world—and land use in highly populated coastal areas. For the CSIDS, climate change poses too serious a threat to human development not to act. According to Bueno et al. (2008), the cost of inaction in the

Caribbean is projected to total US$22 billion annually by 2050 and US$46 billion by 2100—10-22% of the current size of the Caribbean economy.

5.2 **More resources need to be leveraged to build resilience in the Caribbean, bringing co-benefits to economies struggling to reduce oil import bills and external economic shocks.** More needs to be done to better prepare the Region, and its varied countries, against the foreseen impacts of climate change. The Bahamas, Suriname, Guyana, Trinidad and Tobago, and Belize are expected to suffer the greatest economic losses and damages in absolute economic terms (Simpson et al., 2010). Climate change resources could also help reduce dependence on imported oil and exposure to the variability of its price, with gains for climate change mitigation, especially in Belize and Trinidad and Tobago, which are among the largest emitters of GHG per capita. Despite the extremely low level of GHG emissions of the Caribbean, the Bank could still promote significant energy efficiency measures and the adoption of renewable energies that would help reduce the government and private sector energy bill. The tourism industry in the Region and other major foreign exchange earning sectors would likely gain competitiveness as a result of savings in energy bills. In addition, the Bank could leverage Guyana's experience in supporting a low-carbon development strategy to engage in policy dialogue across the Region.

5.3 **IDB is the major climate change adaptation and mitigation partner in the Region.** The Bank's program has been relevant, strategic, and innovative in a few countries—Barbados, Dominican Republic, Guyana, and Trinidad and Tobago—combining different instruments to advance key policies and promote resilience to climate change impacts while moving toward a low-carbon economy. IDB's value added in the Caribbean has involved supporting meaningful policy reforms to promote renewable energy and energy efficiency measures through policy-based lending, as well as promoting an integrated approach to CZM combining physical infrastructure investments with knowledge generation. The Bank has had an important role in supporting Caribbean SIDS in recovering from extreme weather events and it has more recently pursued a more effective preventive and proactive approach to DRM. However, program implementation and effectiveness across sectors have been hindered by the difficulties all development efforts face in the Caribbean: slow execution, difficult procurement processes, and lack of absorptive capacity. Furthermore, there are disparities among the Caribbean countries, and not all of them will take the same approach to responding to the challenges of climate change. Haiti, in particular, is very special case: in a context of conflicting pressing issues, climate change may be superseded by other major hurdles and challenges, and Bank support can only adapt to them.

5.4 In light of the findings of this analysis, OVE suggests the following:

1. **Promote a Bank regional strategy to address climate change challenges in the Caribbean and to guide countries in accessing global climate finance, sustained by the use of regional instruments to strengthen climate and economic modeling capacities.** Caribbean SIDS need baseline data and modeling tools to enhance the understanding of the long-term impacts of climate change and the resilience of their economies to disaster risk and projected climate change. The Bank could therefore adopt an appropriate strategy or action plan to work with small developing states that would encompass their specificities and needs, and would ultimately favor a stronger

adaptation approach to climate change while maintaining the support for an enabling environment for greener and more sustainable energy matrices. Acting as a broker, IDB could also play a major role in supporting countries in accessing global climate finance.

2. **Adopt an adaptation measure to quantify or qualify the (positive or negative) impacts of Bank operations on their ability to support resilience to climate change in the Caribbean.** As the Bank's Safeguards Department has started estimating the impact of IDB operations on GHG emissions, the Bank should also consider defining a measure to assess their contribution to adaptation—which would likely be more difficult to quantify than GHG emissions. This would serve as a measure of the quality and relevance of IDB support targeted at the needs of SIDS, and could also be extended to operations from other regions. This adaptation measure could assume different forms and methods but should allow for screening and ranking operations at the design stage.

3. **Strengthen IDB's classification of climate-related operations to develop a clear understanding of IDB support to the Caribbean—especially in adaptation.** To assess IDB's efforts to achieve the 25% lending target for climate change, renewable energy, and environmental sustainability it has committed to under the GCI-9, the Bank should consider classifying components of operations, rather than entire operations, as related to climate change for sovereign-guaranteed investment loans and grants, and adopting an analogous criterion for policy-based loans and non-sovereign-guaranteed operations. This would allow including operations not previously considered and giving less weight to operations that have a marginal impact on reducing climate change impacts, thereby providing a more accurate assessment of Bank support. The methodology used in this report to estimate IDB support in the region is a first step in that direction.

4. **Better combine CZM with disaster risk reduction and sustainable spatial planning.** As Barbados' experience illustrates, coastal investment projects should favor planned adaptation measures such as incorporating spatial dynamics, sea-level rise and storm surge projections in the construction process, and when feasible pilot the use of natural coastal protection measures. Furthermore, the Bank could support private partnerships to overcome the costs of public investments in places where the private sector is the main beneficiary—that is, involving the tourism industry in coastal conservation measures.

5. **Continue to explore the use of market-based solutions to hedge against the risks of climate-related damages and as a response to extreme weather events.** Drawing on the piloting of insurance schemes in the Dominican Republic, the Bank could—after carefully assessing and mitigating financial risks—explore the possibility of replicating them or of providing support to established insurance mechanisms such as the Caribbean Catastrophe Risk Insurance Facility.

Today, Walcott's words are more than relevant. There is agreement in the scientific community that climate change will pose additional challenges to most countries in the world—in particular to vulnerable small states of the Caribbean.

The more we scream, the more they are heard. No matter how the future changes.

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ANNEXES

ANNEX A. BARBADOS CASE STUDY: CLIMATE CHANGE, COASTAL VULNERABILITY, AND ECONOMIC DEVELOPMENT

A. The importance of coastal areas for Barbados' development

Coastal zone is one of Barbados' main economic assets. Sandy beaches, fringing reefs and a rich coastal ecosystem distinguish this 432 km^2 island in the Lesser Antilles. Barbados depends greatly on its 96-km coastal zone. The tourism industry, which has been the economy's driver of growth for the past 40 years since Barbados shifted from its dependence on the sugar industry, has largely benefited from these coastal resources. Beach locations attract more than 1.1 million tourists per year, mostly from the UK, US, and Canada.[1] Directly and indirectly, the sector accounts for 39% of the country's GDP and employs 38% of the labor force.[2] In addition, more than 50% of Barbadians live in or near the coast, and 95% of tourism-related plants and other critical infrastructures are concentrated in these areas.

Coastal zone is also central for maritime transport and the fisheries sector. Barbados receives on average 600,000 cruise passengers every year through its deepwater port in Bridgetown. Yachts from around the world dock in its marinas to benefit from the relatively calm waters on the Caribbean coast and the warm tropical climate. In addition, the fisheries sector is a source of income for an estimated 2,000 self-employed people and provides indirect employment to an additional 4,000 who earn their livings from coastal resources. The sector also supports the tourism industry by providing restaurants and hotels with fresh fish; the Oistins fish market, on the south coast of Barbados, has become a popular tourist attraction.

B. A changing climate and coastal vulnerability

Barbados' temperatures have increased over the last decades. Barbados has become 1.0°C warmer over the last century, with an increase of 0.1° to 0.2°C per decade since 1980. Mean temperature is projected to increase at about the global mean rate, and the change is likely to lead to an increase in the intensity of extreme weather events. Precipitation has decreased over the past 33 years. In particular, mean rainfall has decreased from June to August by about 4 mm per month per decade between 1960 and 2006, while it has increased in the wet season (September-November). Although the trend for precipitation intensity is not clear, most general circulation models indicate a reduction in mean precipitation and a greater number of consecutive dry days.[3]

Barbados will continue to face risks from tropical storms and hurricanes. A non-volcanic island of a coral-limestone landmass located on the southern edge of the Atlantic hurricane belt,

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1 Includes tourist stop-over arrivals (48% on average for the past four years) and cruise passenger arrivals (52%). Caribbean Tourism Organization (2013).

2 World Travel and Tourism Council (2013) and Central Bank of Barbados (2013). The sector contributes directly to 12% of GDP and of the labor force (including solely hotel and restaurant industries), while indirect contributions consider the indirect benefits from the transportation, wholesale and retail, telecommunications, financial services, and construction sectors linked to tourism.

3 IPCC (2014, 5th Assessment Reports) and UNDP (2010) "Climate Change Country Profiles: Improving the Accessibility of Observed and Projected Climate Information for Studies of Climate Change in Developing Countries. *Bulletin of the American Meteorological Society* 91, 157-166".

Barbados is at moderate risk from hurricanes and tropical storms, even though history has shown rare episodes of extreme weather events. The normal hurricane season, between June and November, has produced storm events that have affected Barbados, but few had severe impacts. The last hurricane that directly hit the country was in 1955, causing 57 deaths. More recently, tropical storm Thomas damaged large areas of vegetation and infrastructure in 2010. Barbados also experienced 58 severe rainfall and wind events between 1955 and 2000. The increasing intensity of hurricanes and tropical storms projected for this century will likely lead to heavier rainfalls in Barbados despite the projected decrease in mean precipitation.

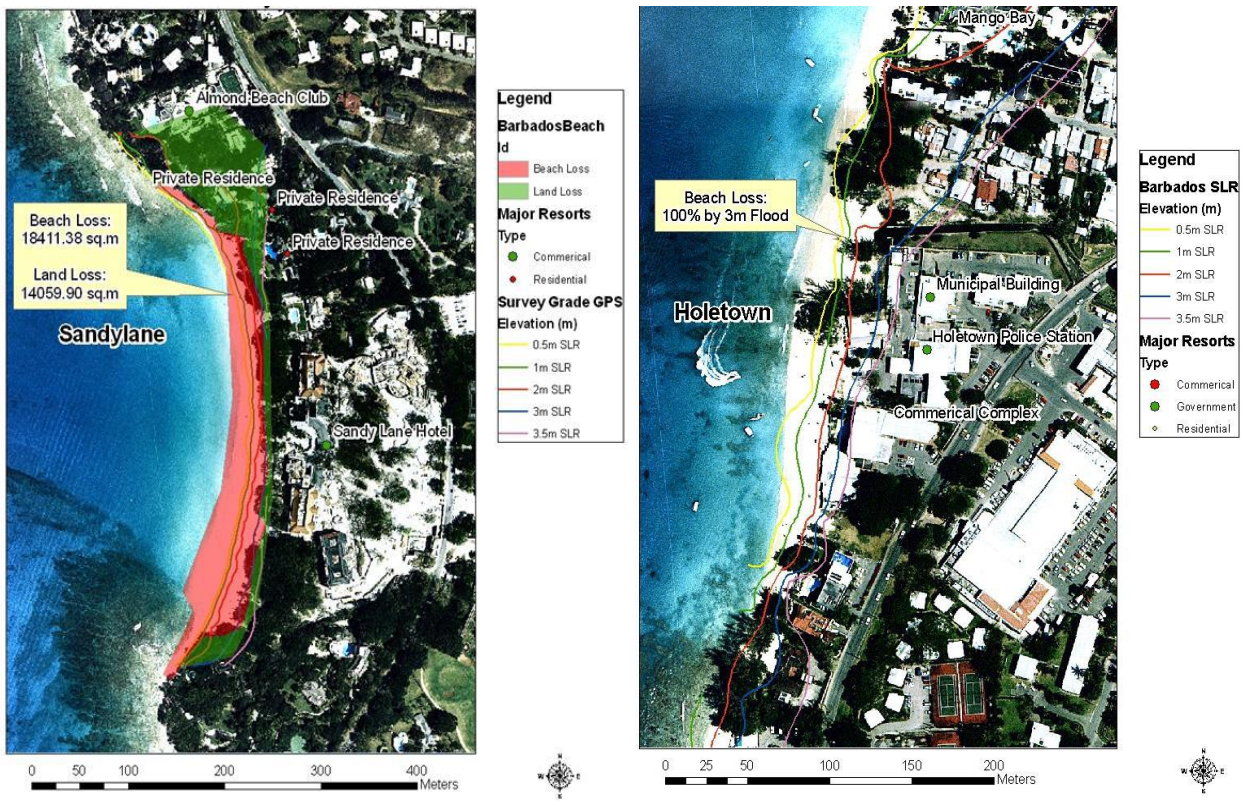
Eroding coastline puts important infrastructures at risk and is a major threat along the west and south coasts. The country is also susceptible to cliff instability along the east coast. Areas at risk are largely concentrated where major income sources are and where most of the population resides. Low-lying areas are often prone to inland flooding, with prolonged consequences because of poor drainage infrastructure. Sea-level rise (SLR) on the order of the current rate of 2-4 cm per decade and possibly accelerating over this century will exacerbate these impacts. Tourism resorts and related infrastructures around Speightstown and Holetown are less than 6m above sea level. Erosion would cause the disappearance of several beaches and the deterioration of coral reefs. Simpson et al. (2012) modeled the impacts of SLR for beaches with high-end tourism resorts at Holetown and Sandy Lane,[4] with striking results (see Figure A.1): 73% of the beach at Holetown would be lost under a 0.5 m SLR, and almost half of Sandy Lane beach would be lost under a 1 m rise.

Saline intrusion and the scarcity of freshwater aquifers could be greatly aggravated by the impacts of climate change. Saline intrusion into coastal freshwater aquifers is likely to become more pronounced with SLR. Freshwater aquifers account for 98.6% of Barbados' potable water supply, with only three catchments on the island sourcing the great majority of the potable water. The projected increase in temperature, reduction in mean precipitation, and increased frequency and severity of droughts will negatively affect the recharge rates of groundwater resources, which are already being strained by ever-increasing water demand (especially from hotels and golf courses). The World Resources Institute considers Barbados one of the most water-stressed countries in the world, with less than 350 m^3 per capita per year of natural water resources and occasional water deficits during the dry season.

Climate change is likely to increase the vulnerability of the coastal zone and impair Barbados' economic development. The threat of climate change therefore has significant environmental and economic implications for the country's coastal ecosystems. Coastal and marine resources—beaches, coral reefs, and fish—are all sensitive to climate change.

[4] Along the west coast of Barbados, where beach loss and flooding events have already been reported.

Figure A.1. Land lost at Sandy Lane (left) and Holetown (right) in a 3 m SLR scenario



Source: Simpson et al. (2012), the Caribsave Climate Change Risk Atlas: Profile for Barbados.

The estimated costs of climate change are high, but planned adaptation could reduce it. The Bank's 2008 Indicators of Disaster Risk and Risk Management pointed out that the likely losses from a catastrophic event (hurricane or earthquake) with a 10% probability of occurrence in 10 years could total US$423 million, or 11% of GDP. Bueno et al. (2008) estimated the costs of climate inaction for Barbados to range from 6.9% of GDP by 2025 to 27.7% in 2100, which includes hurricane damages, tourism losses, and infrastructure damages due to SLR. Simpson et al. (2010) estimated the annual costs resulting from a 1 m SLR scenario to amount to 2% of GDP by 2050 and to 5% of GDP in capital costs. The investments required to protect the coastal zone around the city of Bridgetown would be on the order of US$42 million to construct new levees and US$144 million to construct 8.4 km of seawalls.

C. Government institutions, priorities, and policies

Barbados has paid particular attention to its coastal zone since the late 1970s. Faced with the growing threat of coastal erosion and SLR reported by owners of coastal properties, the Government decided to address the protection of the country's coastline. Understanding the nature and causes of coastal erosion was essential to respond to the risks. Thus in 1981 the Government partnered with the Bank to produce the first prefeasibility study of the south and

west coasts and develop a training program to strengthen the institutional capacity of the Ministry of Environment.

Since then, Barbados has leveraged international support to address coastal vulnerabilities and improve the country's planning capacities. The temporary Coastal Conservation Project Unit, established to oversee the diagnostic studies in 1983, remained active for more than a decade to monitor the island's shoreline and advise the Town and Country Development Planning Office (TCDPO). The temporary project unit eventually grew to become the Coastal Zone Management Unit (CZMU) in 1996—a permanent agency within the Ministry of Environment that added to its previous responsibilities several key functions: long-term coastal planning, the design and management of coastal conservation projects, the review of all coastal developments in conjunction with the TCDPO, updating the inventory of coastal resources, marine research and coral reef monitoring, and awareness raising to increase public participation in coastal management.

Barbados has used a comprehensive approach to manage the environment, the use of the shoreline, and financial and technical resources. Using integrated coastal zone management (ICZM), the CZMU has partnered with other Government agencies, the private sector—in particular, hotels and other tourism-related businesses—schools, civil society organizations, and the general public to promote adaptation measures aimed at increasing the resilience of coastal resources and to mitigate the impacts of climate change, erosion, and flooding on public and private infrastructure in the coastal zone.[5] The CZMU has maintained a strong presence in social media, with television documentaries on SLR and the importance of coastal management, as well as in secondary and tertiary schools with summer internship programs.[6]

ICZM and disaster risk management are linked. Responsibility for coordinating disaster management activities rests with the Department of Emergency Management (DEM), which shares some goals with the CZMU in the area of prevention against damages from extreme coastal flooding. The DEM is concerned with the impacts of climate change and notably the likely increasing intensity of extreme weather events. Its role is not only to respond and recover

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5 Several multilateral institutions have attempted to define ICZM. The World Bank proposes: "ICZM is a process of governance and consists of the legal and institutional framework necessary to ensure that development and management plans for coastal zones are integrated with environmental (including social) goals and are made with the participation of those affected. The purpose of ICZM is to maximize the benefits provided by the coastal zone and to minimize the conflicts and harmful effects of activities upon each other, on resources and on the environment." The European Commission prefers: "ICZM is a dynamic, multidisciplinary and iterative process to promote sustainable management of coastal zones. It covers the full cycle of information collection, planning (in its broadest sense), decision making, management and monitoring of implementation. ICZM uses the informed participation and cooperation of all stakeholders to assess the societal goals in a given coastal area, and to take actions towards meeting these objectives. ICZM seeks, over the long-term, to balance environmental, economic, social, cultural and recreational objectives, all within the limits set by natural dynamics. 'Integrated' in ICZM refers to the integration of objectives and also to the integration of the many instruments needed to meet these objectives. It means integration of all relevant policy areas, sectors, and levels of administration. It means integration of the terrestrial and marine components of the target territory, in both time and space." The Bank's definition of ICZM is presented in Box 2.

6 The CZMU also partners with other international bodies, such as the Intergovernmental Oceanographic Commission, Sub-Commission for the Caribbean and Adjacent Regions, CARICOM, the Organization of Eastern Caribbean States, and UN agencies.

from natural (or man-made) disasters but chiefly to promote disaster risk reduction (DRR) through, for instance, early warning systems and the mainstreaming of DRR in sectoral plans.[7]

Barbados' development strategies have reflected the importance of coastal zone management as a priority area for development. An objective of the 2006-2025 National Strategic Plan is to promote and facilitate the sustainable use of natural resources, placing particular emphasis on ensuring the effective conservation of coastal and marine ecosystems. More recently, the 2013-2020 Barbados Growth and Development Strategy renewed the country's commitment to its coastal zone, linking it with disaster risk reduction by supporting the integration of disaster risk reduction and climate resilience into coastal infrastructure investments.

The second National Communication to the UNFCCC has yet to be finalized, but the Government approved the national climate change policy in 2012. The policy outlines plans to continue institutional and legislative improvements in different sectors and, in particular, to improve the country's national capacity to manage and respond to natural disasters.[8] The legal framework for coastal zone management in Barbados is provided by the 1998 Coastal Zone Management Act. The Act endorsed the development of a Coastal Zone Management Plan, which would guide coastline protection and conservation management, coastal habitat restoration, water quality, zoning and setbacks, and environmental impact assessment in the coastal zone. Although there has been a draft of the plan since 1999, the Government has yet to put it into practice.[9]

D. IDB's strategic partnership to promote coastal zone conservation

The Bank has been strategically and financially relevant in coastal zone management (CZM). For more than 30 years, the Bank has been the Government's major partner in this sector. Investing more than US$58 million through loans and technical cooperations (Figure A.2), the Bank has supported the enactment of key legislation and policies, strengthened local capacities and fostered exchanges with international experts, and sustained engineering projects to protect the shoreline.

Progress in managing the coastal zone gained momentum through continued Bank support with the coastal conservation program. After the first technical cooperation (TC) was completed in 1985 (TC8101149, financed through the Canadian Technology Program Fund, or CTP) and the severity of the beach erosion problem on the island's south and west coasts identified, the Bank embarked on a comprehensive program to thoroughly analyze and protect the west and south coasts. The program included a loan, the Coastal Conservation Pre-Investment Program (BA0048), and three TCs (TC8904410 and TC8905210, financed through the CTP and Japanese trust funds, respectively, and TC8904428) totaling US$6.7 million. Under TC8904410, the Coastal Unit partnered with the Bellairs Research Institute of McGill University to collect data in the areas of coastal geomorphology, water quality, hydrodynamics, and marine

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7 The DEM is part of the CDEMA (Caribbean Disaster Emergency Management Agency) network.

8 The policy also aims to establish a more than US$180 million Green Energy complex to help Barbados move away from its reliance on fossil fuels and promote energy efficiency measures.

9 As a consequence, a few regulations to support the enforcement of the Act—for example, delimiting CZM areas, harmonizing CZM and coastal development, and establishing a clear flow of information—have yet to be passed.

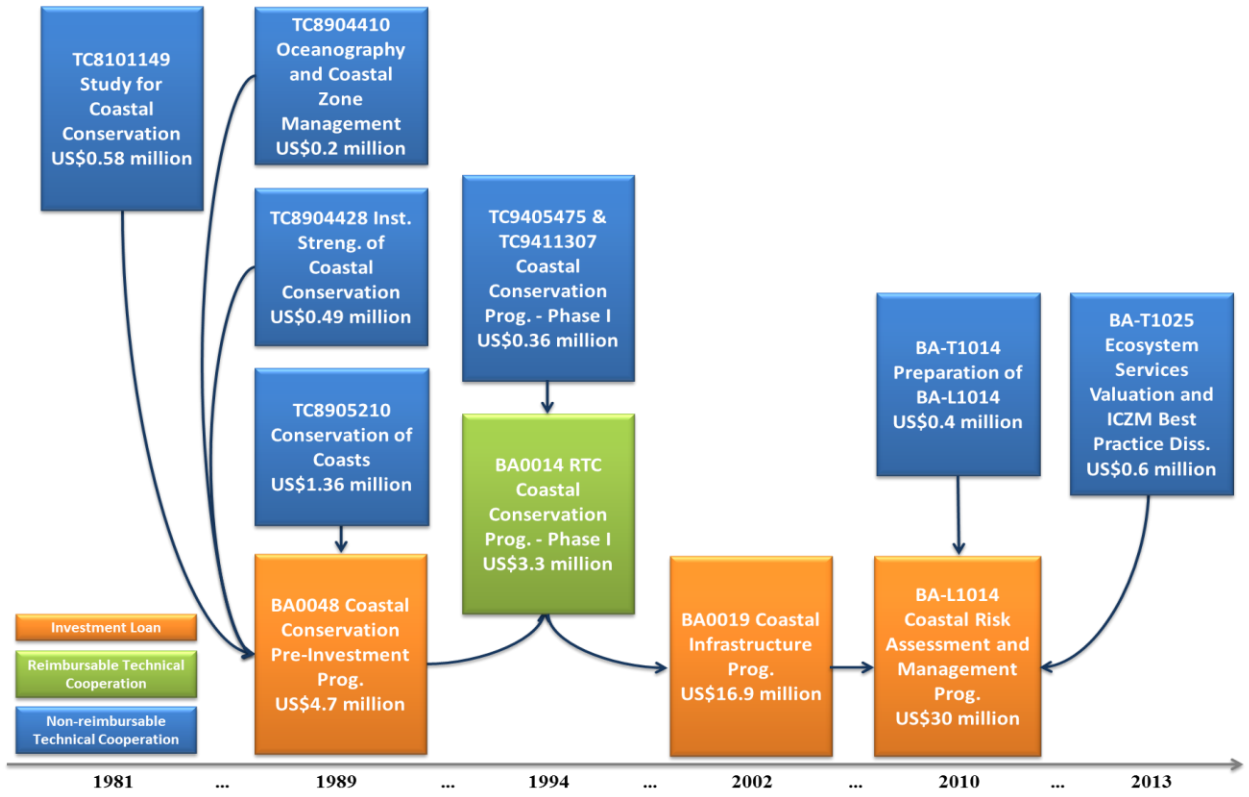
biology. TC8904428 aimed at providing a legal framework and institutional and financial arrangements to sustain the efforts put in place, though most of the legislation recommended took a long time to be implemented.

The coastal conservation preinvestment program designed various measures for beach creation, stabilization, and enhancement along the west and south coasts. The pilot projects have benefited the tourism infrastructure and coastal properties considerably through beach accretion and improved protection. These initial investments also led to increased participation by the private sector, with hotel owners cofinancing construction projects near Speightstown and Hastings. As part of the loan, environmental impact assessments of existing and proposed works were also carried out.

In 1994, the focus of Bank support shifted to the north and east coasts. Using US$3.7 million channeled through one reimbursable and two non-reimbursable TCs, the Government conducted land use surveys and physical and environmental baseline studies of 45 km of the north, east, and southeast coasts. With benefits extending to more vulnerable communities in areas with little tourism infrastructure, five demonstration projects were constructed to protect near shore marine environments and test other cost-effective engineering works. The large amount of new data collected during the diagnostic studies of the near shore and offshore conditions relative to currents, tides, waves, and movement of sand not only benefitted the CZMU's scientific knowledge but also were transferred to local communities and fishermen.

The concept of ICZM took shape in the late 1990s through key policy and legislation. The Government's commitment to pursuing the implementation of a nationwide strategy for coastal management led the Bank to support the development of a national CZM plan and the design of an investment program to promote ICZM. The CZM and the Marine Pollution Control acts were endorsed in 1998, following the institutionalization of the CZMU. Ownership of the CZMU was central to ensuring the effectiveness of the CZM plan and to keeping the public abreast of the investments needed to protect the island's shoreline.

Figure A.2. A 30-year partnership in coastal zone management



Source: OVE.

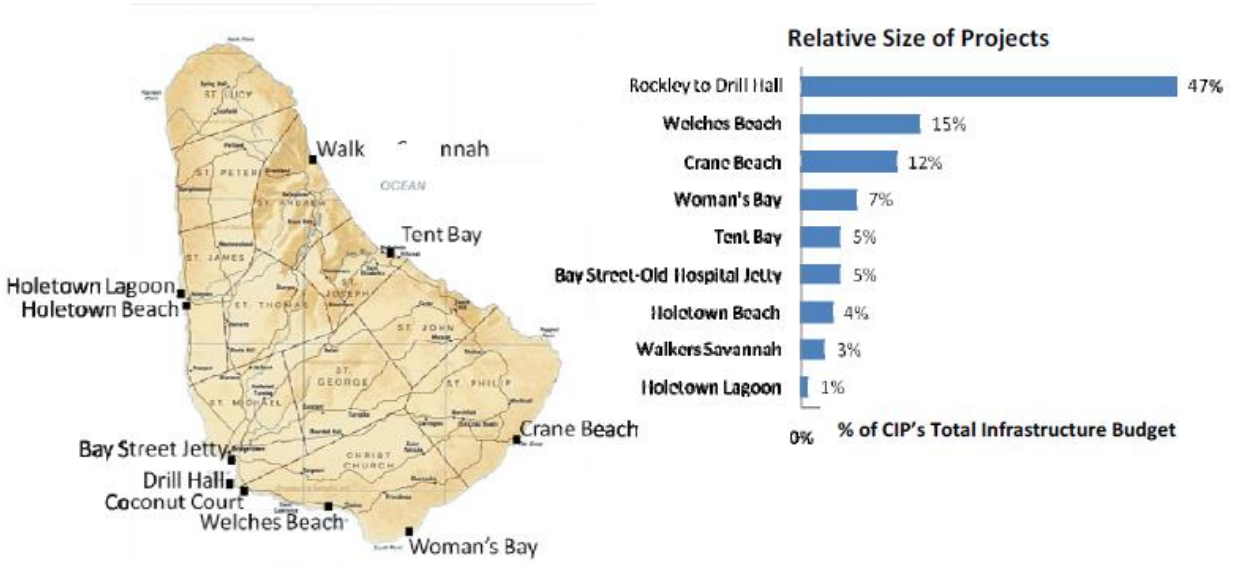
Engineering projects further enhanced shoreline stabilization and erosion control under the 2002 Coastal Infrastructure Program (BA0019). The Bank supported the Holetown beach improvement project and the Rockley to Coconut Court waterfront improvement project, which created 4.5 km of continuous safe beach access and increased beach volume by 16,000 m^3 (including the Government-funded Welches beach improvement project). However, seven smaller (but no less relevant) coastal engineering projects had to be removed from the original program because of delays in implementation, technical and land acquisition issues, and cost overruns (Figure A.3). The Richard Haynes Boardwalk, included in the Rockley to Coconut Court project, had an important economic and social externality beyond shoreline stabilization. It boosted local economic activities, increased property values (in particular property affected by storm surge and erosion), boosted restaurant revenues, and increased access to the coast by around 16,000 person-days per year.[10]

To sustain coastal conservation gains, the Bank continued to support shoreline access and stabilization works. With the conclusion of the Coastal Infrastructure Program in 2010, the Bank approved a US$30 million loan (BA-L1014) and a TC (BA-T1014) to build resilience to coastal hazards by linking CZM with disaster risk reduction and by continuing with hazard-resilient physical investments designed during the Coastal Infrastructure Program. This operation, still ongoing, will build coastal revetments, offshore breakwaters, groynes, beach nourishment, and walkways extending over 1.5 km along the west coast between Holetown and

[10] See BA0019 Coastal Infrastructure Program project completion report (2010).

Heron Bay, and will restore the Holetown Lagoon to improve water quality and reduce flooding. On the east coast, the Bank plans to improve a boat haul-out facility for 20 fishermen. A particular feature of this program is providing qualitative and quantitative data on coastal risk with a view to mainstreaming disaster risk reduction and climate change adaptation in development planning,[11] as well as establishing the conditions needed for long-term sustainability of the physical investments taken.

Figure A.3. Location and relative size of the original nine coastal infrastructure projects for the Coastal Infrastructure Program (BA0019)



Source: BA0019 Project Completion Report, 2010.
Note: Of the original nine construction projects, only Holetown Beach, Welches Beach, and Rockley to Drill Hall/Coconut Court were implemented.

Altogether, the effectiveness of Bank operations has been enhanced by a combination of institutional capacity, ownership, and resources devoted to coastal research. Barbados and the CZMU, in particular, have gained substantial experience in the scientific and engineering aspects of coastal processes and shoreline enhancement activities. The understanding of these processes and their relationship with past and predicted future physical conditions of the island's coast have contributed to build resilience to SLR and climate change-related impacts. The considerable knowledge acquired over 30 years of partnership is valuable to future shore improvement and stabilization applications and could therefore be shared and replicated in other Caribbean countries. Furthermore, the specialized training received with Bank support has also positioned the country to leverage additional resources from the Global Environmental Facility to continue its work in climate change adaptation.

[11] The following studies will be conducted: near shore wave climate, coastal zone (Light Detection and Ranging) LIDAR survey, shoreline change; water quality, circulation and sedimentation; geotechnical surveys and investigations; and sediment transport.

The Bank's innovative support has been vital to Barbados' adopting a comprehensive and integrated approach to CZM. Barbados has one of the first national ICZM programs in a developing country, and it has become a reference point for similar initiatives all over the Caribbean. Barbados has been asked to provide technical assistance to other countries that consider its model a best practice, and as a result the Bank has been able to extend its support to The Bahamas, Dominican Republic, Haiti, Suriname, and Trinidad and Tobago. More recently, in November 2013, the Bank approved a TC (BA-T1025) to build capacities for ecosystem services valuation and ICZM best practices dissemination to document lessons learned in coastal planning and climate-resilient coastal management, while promoting the use of spatial analysis tools for mapping and valuing ecosystem services.

Box A.1. Factors of success in ICZM implementation

Bijlsma et al. (1996) identified three possible coastal response options: (i) protect the land from the sea by constructing hard structures (e.g., seawalls) or using soft measures (e.g., beach nourishment), while pursuing existing land uses; (ii) accommodate through some adjustments (e.g., elevating buildings on piles, growing flood- or salt-tolerant crops), allowing people to continue occupying the land; (iii) retreat, making no attempt to protect the land from the sea.

However, as Klein et al. (2000) noted, successful coastal adaptation embraces more than just selecting one of the technical options to respond to SLR. They emphasize the need to collect data and raise awareness, and to develop planning instruments and a monitoring and evaluation framework. The most effective examples of ICZM implementation occur when a national policy or legislation provides a framework for ICZM, flexible enough to apply at both the national and local levels. New Zealand pioneered ICZM in the early 1990s with the Resource Management Act and the Coastal Policy Statement. The involvement of key stakeholders, including local authorities, private sector, and universities, is key. In Norway, the development of guidelines for incorporating ICZM at the local planning level allowed municipalities to use locally specific solutions.

In addition, zoning of designated areas for particular activities can be an effective coastal management tool. Barbados requires a 30 m minimum building setback along sandy coasts and 10 m along coastal cliffs; Norway enforces restrictions on development within a 100 m buffer of the shoreline; Sri Lanka imposes minimum setbacks of 60 m from the line of mean sea level; in South Australia, building sites should be above the storm-surge flood level for the 100-year return interval; and in New Zealand, an ecosystem-based approach is followed, and the coast is managed according to ecological units.

The long-term sustainability of the physical interventions the Bank has supported is critical in both technical and financial terms. The coastal stabilization works the Bank has been supporting, such as the construction of breakwaters, groynes, and seawalls,[12] have been designed on the basis of top scientific information and modeling, meeting international engineering and design standards. However, despite their medium-term environmental and economic benefits, their high maintenance costs relative to natural interventions (wetland renewal, beach nourishment and vegetation) and the possibility of exacerbating coastal erosion call into question the efficacy and sustainability of such investments. In addition, the financial sustainability of such investments will depend on the Government's capacity to adequately monitor and maintain these structures, and to define a mechanism to share costs when property owners and the private sector are the main beneficiaries of these investments.

[12] Breakwaters are offshore concrete structures forcing waves to break farther out to prevent coastal erosion. Groynes are rigid hydraulic structures made of rock piles that disrupt water flows and the movement of sediment. Seawalls are static concrete structures impeding the exchange of sediment between land and sea, and, like the boardwalk IDB supported, may be used as public space.

E. Challenges

Barbados' CZM experience constitutes a springboard for the rest of the Caribbean, yet several challenges remain. Important gains have been made in terms of technical, legal, and institutional aspects for ICZM in Barbados; however, Bank support has faced continuous implementation delays even after several years of collaboration. Structural bottlenecks related to the approval of contracts and the appointment of key staff are common in Barbados. In addition, the CZM sector has faced other challenges: (i) the high degree of complexity in designing shoreline infrastructures, requiring an understanding of the dynamics of the physical environment (i.e., sediment transport, wave action) and of engineering; (ii) the specialized procurement required to sustain these investments, in particular the definition of technical specifications for necessary construction materials; (iii) the lengthy process involved in obtaining construction permits in coastal areas (approvals from the TCDPO and National Conservation Commission); and (iv) the high turnover in property ownership and the repeated negotiations with new owners to gain access to construction sites.

It is crucial to keep momentum for country ownership and local leadership to improve legislation and convert parts of the CZM Plan into binding regulations. Applications of the current legislation related to ICZM have resulted in conflicts and duplications in interpretation and enforcement. Therefore, the Government must harmonize the legislation related to ICZM, environment, disaster risk management, and water management and town planning, and must strengthen its enforcement capacity. For instance, regulations in the coastal zone are not retroactive for properties developed during the resort boom, and penalties for violations remain low. The CZMU's recommendations are purely advisory and have no binding power, and it has been more successful in planning for low-impact future development along the rockier east coast—which has not yet been coveted by the hotel industry—where the Physical Development Plan envisions a national park.

Addressing disaster risk and climate change adaptation demands a continuous effort to improve the country's understanding of the interplay of physical, ecological, and socioeconomic factors. The CZMU must be able to maintain high-quality risk information on coastal and nearshore processes and to benefit from climate modeling and appropriate monitoring and evaluation tools (Geographic Information System). In addition, it is important to continue to invest in shoreline stabilization, with hard structures or soft engineering methods.[13] For example, beach nourishment, wetland renewal, and beach vegetation programs could enhance the natural resilience of coastal areas. The CZMU recognized the significant capital investment needed for engineered protection, which—like soft engineering methods—may not withstand extreme events or stand the test of time.

The links among water resources management, agriculture, and CZM should also be strengthened. Land use changes in the upper parts of the island's coastal watersheds that extend beyond the narrow area defined as coastal zone can lead to significant changes in environmental quality, including erosion and increased beach losses, sedimentation, and water pollution, which could cause further coral reef degradation. Part of the solution should include a review of the geographic scope of CZM that could be extended beyond the strip of land from the shoreline to the main roads near the coast.

[13] Ongoing Bank support is addressing these issues, as well as part of those identified in the previous paragraph.

ANNEX B. DOMINICAN REPUBLIC CASE STUDY: EXTREME WEATHER EVENTS, FINANCIAL PLANNING, AND DISASTER RISK REDUCTION

A. Disaster risks and climate change in DR

The Dominican Republic (DR) is a middle-income country located on Hispaniola Island, part of the Greater Antilles Archipelago in the Caribbean Region. Around 64% of the island is occupied by the nation of Haiti, making Hispaniola one of two Caribbean islands that are shared by two countries (the other is Saint Martin). The DR is the ninth-largest economy in Latin America, the third-largest Caribbean nation (after Cuba and Haiti) in terms of population (9.4 million people) and the second-largest (after Cuba) in terms of area (48,442 km^2). According to the 2010 census, close to 67.7% of the population lives in urban settlements; Santo Domingo and Santiago are the major cities in the country.

Hispaniola Island is significantly exposed to natural hazards, entailing several challenges for both the DR and Haiti. Dilley et al. (2005) rank the DR as the third most affected country in terms of mortality risk from two or more hazards and as the fourth in terms of the economic risk from two or more hazards.[1] The situation imposes a heavy burden in terms of social damage, economic losses, and fiscal vulnerability. From 1980 to 2010, the DR experienced on average 1.6 natural disasters per year, which affected over 87,700 people and generated economic losses of up to US$84.1 million annually.[2] In 2007, Hurricane Noel and tropical storm Olga caused fiscal expenditures equivalent to 0.6% of GDP, while the two most serious registered events—Hurricane Georges (1998) and Hurricane David (1979)—led to fiscal expenditures that amounted to 16.1% and 18.4% of GDP, respectively.[3]

Global warming could worsen the landscape of risks and challenges the country faces. Hurricanes, tropical storms, and floods are among the disasters that have the greatest impact in DR.[4] According to the Germanwatch Global Climate Risk Index for 2014, the DR and Haiti were among the 10 countries most affected by extreme weather events in 1992-2011, in terms of both deaths and economic damage. Two factors were mentioned: the impact of global warming on rising sea levels, which increases the risk of storm surges, and the increase in the strength of hurricanes.[5] This is particularly problematic, given the country's high exposure to risk: 94.7% of the national population, concentrated in 87% of the national territory, and 95.6% of the GDP, is exposed to the consequences of natural disasters.[6]

The Government acknowledges this situation, but its efforts to handle it have not been effective enough. In spite of the level of disaster risk management (DRM) in the country, DR's advances in the Hyogo Plan of Action are below the mean of countries in Latin America and the

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1 DR is below only Bangladesh and Nepal for the first figure, and below Taiwan, El Salvador, and Jamaica, for the second.

2 See UNISDR, Prevention Web Project: www.preventionweb.net.

3 See Vergara (2008).

4 The country is also exposed to earthquakes and their impact, but these phenomena are not directly related to global warming.

5 CEPAL estimates that 170% the normal amount of rain fell during tropical storm Olga, which was attributed to climate change. See also Dunn (2009).

6 World Bank (2010).

Caribbean, according to figures for 2011 (the latest available for the country). Moreover, the Disaster Risk Management Index proposed by the Bank shows that the country's performance has declined from 2008 to 2012.[7]

This case study reviews IDB's involvement in enhancing DRM in the DR, analyzing how it has helped the country address the risks arising from natural disasters, and also assessing the relevance, effectiveness, value-added, and innovation of this intervention.

B. Institutional and legal framework

The DR's first institution with DRM-like responsibilities dates back to 1966, when Law 257 established the National Office of Civil Defense. The main task of this office is to provide assistance and emergency relief to affected communities in the aftermath of a natural disaster. The law assigned limited resources to the new office, which was intended to deliver proper ex-post response, mainly during the hurricane season (June to September).

Following Hurricane Georges, which devastated the country in 1998, several reforms were undertaken in 2001 and 2002 to enhance the country's resilience, with an integral approach to DRM. In 2001, with Decree 360 that established the National Emergency Commission and the Centre of Emergency Operations, the country began to move toward a more cohesive DRM framework. In 2002, Law 147 created room for emergency budgets and established a new institution to lead all DRM efforts: the National Council of Disaster Prevention, Mitigation and Response. This law also introduced the main tools for a national policy on DRM, and complementary legal frameworks defined the functions and responsibilities of the agencies and ministries in charge of implementation at both the national and municipal levels (Decree 874-2009 and Law 176-07).

As a result, DRM is relatively well organized in the country, but it has several shortcomings. The scheme integrates several institutions and ministries (Economy, Education, Environment, Communications, Agriculture, and Social Protection), and the National Development Strategy considers DRM explicitly as a cross-cutting issue. However, several of the agencies lack technical and financial resources, and coordination among them to implement the defined legal framework has proven difficult to attain. In addition, there have been delays in achieving the main outcomes proposed in the design of this framework—for example, Law 147 establishes a fund for prevention, mitigation, and response that was not launched until almost 10 years later, in 2011).

C. IDB's policy on DRM: The risk finance approach

Until recently, the Bank's traditional approach to natural disasters was oriented toward emergency response. Depending on the magnitude and frequency of disasters, this approach can be extremely onerous for countries: if delays or shocks prevent aid disbursements on time, resources for reconstruction do not necessarily cover the additional costs of these contingent liabilities. And in most cases these interventions reflect only a rebuilding of vulnerabilities.[8]

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[7] For more information on this and for more details on the Disaster Risk Management Index and other indicators not mentioned here, see DGODT-BID (2013).

[8] By rebuilding vulnerabilities, we mean reconstructing damaged infrastructure as it was before the catastrophic event.

For the past several years, the Bank has taken a more comprehensive stance on DRM.[9] The new strategy consists of five lines of action: (i) risk analysis, (ii) prevention and mitigation, (iii) financial risk management, (iv) emergency response, and (v) post-disaster rehabilitation. Thus it not only seeks the reconstruction of conditions before catastrophic events, but also prioritizes the analysis of the underlying causes of risk to define prevention and mitigation actions (DRM) and ways to finance them sustainably.

The Bank has sought the proper balance between attention to the victims of natural disasters and attention to other areas of risk management. By using fast-disbursing operations the Bank can help countries respond to emergencies more effectively; it also channels resources to improve vulnerabilities and ties disbursements to measures and indicators of DRM. By and large, the strategy seeks to integrate ex-ante mitigation and adaptation elements with ex-post response and recovery measures to achieve a more efficient and effective reconstruction, without generating new fiscal problems that could hamper DRM in the future. The new approach integrates the five lines of action mentioned previously by defining mechanisms to finance prevention, emergency relief, and rehabilitation, while providing resources to enhance risk identification, define proper loss functions, and enhance risk data collection and risk mapping.[10] In this regard, fiscal risk management is a cross-cutting innovation.[11]

The Bank has three groups of financial instruments to cope with catastrophes. The complete scheme for risks that cannot be properly prevented or mitigated is based on the inverse relationship between the level of damage from a natural disaster and its probability of occurrence:[12] the probability that an extreme disaster will actually happen is small but not negligible.[13] The risks arising from high-probability and low-cost events are effectively covered through risk retention, as it is more practical and efficient for a country to use its own resources as a self-insurance mechanism in this situation. For disasters with low probability but higher

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9 In 2004, OVE conducted an evaluation of the strategy that was in place before 2006 (RE-292). One of the main findings was that although this strategy did consider elements related to preparation and mitigation, those elements were enforced not in a proactive but in a reactive fashion, implying a bias towards ex-post response and a decoupling between planned strategies and actual implementation. As a result of the evaluation, at the end of 2007 the Bank developed the Integrated Disaster Risk Management and Finance Approach (OP-47),which is consistent with the Disaster Risk Management Policy and the guidelines for its application (GN-2354-5 and GN -2354 to 11) and the Action Plan for Natural Disaster Risk Management (GN-2339-1).

10 Theoretically, risk analysis is a *sine qua non* for the rest of the proposed DRM framework. In practice, it is usually not feasible to do risk analysis in advance, so it is carried out in parallel with the broader DRM activities recognized by the Bank's strategy. More details are available in another OVE background paper on disaster risk management.

11 We decided to analyze fiscal risk management separately because (a) it is a necessary condition for sustainable DRM as a whole, and (b) it is the most salient feature of the new strategy, encompassing previous efforts and bringing in knowledge that had not been considered before at the institutional level. Further information on the overall structure of IDB's DRM and on the remaining lines of action not analyzed here is available in the background paper mentioned in the previous footnote.

12 As mentioned in Ghesquiere and Mahul (2010).

13 This relationship could be shifted upwards or downwards, depending on the level of prevention, mitigation, and preparedness of a given society. The strategy is clear in the sense *that "Efficiently allocating investment to prevention and mitigation should be the first priority (…)"* (OP-47). Here we considered that investment in this layer is a particular form of risk retention equivalent to paying for risk avoidance. Instruments to finance this layer of DRM include international aid, prevention and mitigation funds, and special multilateral loans. We focus on risks after prevention and mitigation since they are the main focus of the Bank's activity in DR.

associated losses, risk retention is not feasible; the only option is to transfer risk to agents that are willing to bear it for a fee or a premium in the insurance markets, or to actually remove it by fostering financial private protection at the local level. Only the remaining risks, stemming from extremely low-probability events, are to be tackled with ex-post financing. Box B.1 lists the main financial tools identified in the strategy grouped by risk strategy.

Among available instruments, in the new strategy the Bank initially defined four pathways for fiscal sustainability and natural disasters: (a) developing sovereign insurance facilities for risk transfer; (b) strengthening reserve funds, or their implementation where applicable; (c) developing contingent credit facilities to help countries with their risk retention mechanisms; and (d) strengthening insurance markets at the local level. These alternatives, if adequately implemented, convey a wide variety of benefits. In theory, an appropriate combination of these instruments, on a country-specific basis, has the potential to narrow the fiscal gap after a disaster takes place, achieve better long-term fiscal planning, and better handle contingent liabilities. Nevertheless, in practice several political economy issues arise that in the end are key determinants of success or failure, as shown for DR in the next sections.

Box B.1. Financial instruments per risk layer in IDB's DRM strategy

- **Risk-retention:** Contingent credit, international aid, reserve funds, budget transfers, long-term public debt.
- **Risk removal/transfer:** Disaster insurance/reinsurance, CAT bonds, domestic casualty and property insurance, weather bonds.
- **Residual risk:** Bilateral aid, multilateral debt, long-term commercial debt.

D. IDB's strategic partnership with DR

The first elements of integrated DRM that the Bank fostered in the country can be traced back to 1998. Several measures for prevention and adaptation were proposed in the context of the Emergency Program for Hurricane Georges (1152/OC-DR). Specifically, among the objectives of the program were the prevention of macroeconomic deficits that could threaten social expenditure and the strengthening of disaster-prevention arrangements. Although the hurricane hit the country in 1998, the operation was ratified in 2002 and concluded in 2006. In spite of these delays, one of its main outputs was the National System of Prevention, Mitigation and Response to Disaster Risk, mentioned above.

Even though in recent years the Bank's main focus in DR has been on financial protection from natural disasters, operations related to prevention and reconstruction were proposed as well. In 2005, the Bank approved a US$5 million operation (DR-L1007)[14] whose main objective was to improve DR's capacity to reduce and manage risks of disasters. This operation had three components. The first aimed to foster disaster prevention and risk management at the local level, trying to provide a subset of municipalities (five at present, initially eight) with the tools to better understand and manage the risks to which they were exposed, thus giving the Government a foundation of local risk management that could be efficiently extrapolated to the whole country. The second component, tied to risk management in education, sought to protect national infrastructure from disaster and prepare communities to better address disasters. The

[14] Several execution delays at the beginning slowed the project. After 2010, these problems were largely solved, and as of April 2014, the operation is 98% completed.

third sought to establish mechanisms to manage and consolidate a National Risk Management Plan, which became a necessary condition for accessing contingent funds.

It is important to understand how this financial protection emphasis originated in the country. At the time the change of strategy toward DRM was taking place, the Bank received a formal request from the *Consejo de Secretarios de Finanzas y Ministros de Hacienda de Centroamérica, Panamá y la República Dominicana* (COSEFIN) asking for assistance to develop a regional insurance facility (following the one established for Caribbean countries by the World Bank) and design mechanisms to better manage contingent liabilities associated with natural disasters. The Bank initially approved three regional TCs as part of the technical work needed to assess what instruments would best meet the need. One of these TCs (RG-T1478, US$1 million) was designed to support the four strategic pathways for financial protection discussed earlier and their adaptation to the COSEFIN countries. The remaining two (RG-T1541 and RG-T1590, US$1.5 million together) were specifically directed to finance consultancy services to set up a parametric insurance facility for two country members of the COSEFIN.

In 2009 the Government requested the Bank's assistance in implementing a financial approach to DRM. This approach encompasses revamping the reserve fund for disaster emergencies, developing a fast-disbursing contingency loan (DR-X1003) that is tied to the plan devised with resources from DR-L1007, and creating a parametric insurance facility to further protect public finances against the deleterious effects of natural catastrophes (DR-L1045).

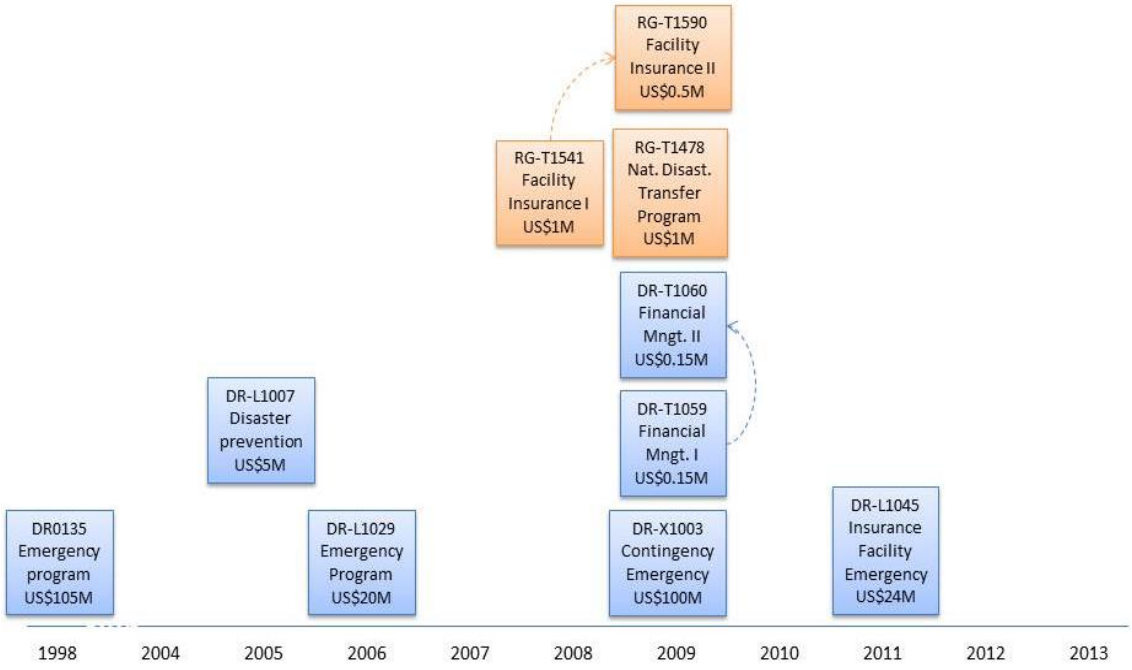
The contingency credit line is a risk retention instrument that has complex characteristics. Approved in 2009, the credit line provides up to US$100 million to address the expenses associated with natural disasters. To access these resources, the country could tap the remaining balances of certain existing operations financed by the Bank or could request fresh funds. The coverage provided is parametric: not all catastrophic events are eligible for disbursements; instead, to deter the moral hazard of declaring more emergencies to use the proceeds of the loan, disbursements are conditioned on objective measures and analyses related to the severity of, and damage caused by, the emergency. Furthermore, access to this credit line depends on how well the country complies with indicators established in the National Risk Management Plan and monitored and updated on a rolling basis. The country has never lost its access to the contingency funds.

The Bank also approved the first insurance facility for natural disasters in DR. The objective of this operation, which was approved in 2011, is to finance parametric insurance coverage of up to US$100 million, which will cover the additional costs of severe earthquakes and catastrophic-intensity tropical cyclones. The resources of the loan (US$24 million) will be used to create a captive insurance company whose only purpose is to manage the sovereign risk stemming from natural disasters; the company will sign an insurance policy covering the Dominican state for the amount of the coverage, and will transfer the risk to international markets through reinsurance. Theoretically, this risk transfer mechanism will allow the country to tap resources faster when it needs them.

In addition, the Bank has supported the financial management of disasters in the country by using TCs and knowledge products. Between 2004 and 2013, the Bank approved two TCs, designed to work in the rehabilitation phase after a natural disaster, specifically to improve the systems of registration, appraisal, and monitoring of infrastructure assets that are used for the provision of public services that may be affected in the event of a natural disaster. Phase I (DR-

T1059, US$150,000), which culminated in 2013, outlined the diagnostic standards and an action plan, which were implemented in the second phase (DR-T1060, US$150,000). Figure B.1 depicts the broad program of the Bank with DR, for the period analyzed.

Figure B.1. Disaster risk reduction and financial planning portfolio in DR



Source: OVE. DR0135 is included since it set up the base for subsequent operations along this line.

E. Assessing IDB support for financial planning and disaster risk reduction

The complete IDB program has been relevant, but mostly at the design level. Overall, the Bank's support has been aligned with the situation of the country at any given time, acknowledging that fiscal vulnerability is a major threat in terms of natural disasters and trying to control for potential failures defined in the literature: for example, the establishment of parametric coverage protects against potential moral hazard from the Government's side, and the fact of moving towards a more comprehensive scheme, with a variety of instruments mapped to occurrence, damage, and mitigation helps preclude the so called Good Samaritan dilemma (in our context, that ex-post aid reduces ex-ante prevention). However, relevance at the implementation level is harder to assess, since the Government's priorities are fuzzy and changes are costly and highly dependent on political will. The many delays in the ratification process reveal that this is not a *de facto* priority for the country.

In terms of value-added, this experience could be understood as a pilot program, with potential demonstration effects. Besides being a salient experience, both on what to do and on what not to do (i.e., sequential financing beyond ex-post aid vis-à-vis the complexity of the intervention and the country institutional setting), it fostered coordination among different

divisions of the Bank and provided technical support to better understand hazards and their consequences. As for the variety of instruments used, the insurance facility is the most innovative: compared to similar alternatives, such as the Caribbean Insurance Facility financed by the World Bank, it brings to the process more ownership, managerial advantages that could entail faster access to resources, and additional gains represented in more developed financial markets.

Nonetheless, the actual benefits and the effectiveness of the intervention are challenging to assess, given the country context. Because of the country's complex ratification process and the particular ordering of the Government's priorities, it is very difficult to assess effectiveness at this stage. If a disaster had occurred in this period, the natural conclusion for the insurance facility would have been that it did not provide any resources, and no comparison with the *status quo* could have been made—again, as a result of the Congress's approval delays. In other words, a better analysis of this dimension hinges on the materialization both of the operation and of a catastrophe. To be fair, however, it is worth highlighting the Bank's partnership: this well-structured intervention faces challenges that are out of the Bank's direct control. All in all, better tools for DRM are available for the country, if it needs them at some point in the future.

ANNEX C. HAITI CASE STUDY: CLIMATE CHANGE ADAPTATION PRACTICES IN A FRAGILE STATE

A. Vulnerability, fragility, and climate change

Haiti is considered to be among the countries in the world that are most vulnerable to the effects of climate change. Located in the Caribbean seasonal hurricane corridor, Haiti is exposed to natural hazards (hydrometeorological and geo-morphological) and constantly faces extreme natural events (hurricanes, cyclones, floods, droughts, and earthquakes).[1] According to the GAIN Index, Haiti records the highest vulnerability score in Latin America and the Caribbean (LAC) and the lowest readiness score (after Venezuela and Cuba).[2] The Climate Change Vulnerability Index (CCVI) also considers Haiti at the top of the 30 "extreme risk" countries—the only LAC country in this ranking.[3] The effects of natural hazards are intensified in Haiti, with its extreme poverty (more than 78% of population lives below the national poverty line),[4] difficult geographic conditions (slopes exceeding a 20% gradient), inadequate and poor land planning practices (over 97% deforested), and low institutional capacity.[5]

Haiti lacks adaptive capacity to respond to climate change impacts. Haiti is the only least developed country (LDC), the only fragile state, and the poorest country in LAC. LDCs suffer most from the impacts of climate change.[6] Poverty, lack of access to technology, weak institutional capacity, and unstable government limit Haiti's ability to adapt to the adverse effects, or take advantage of any positive effects, of climate change. These constraints were deepened after the 2010 earthquake,[7] and the Haitian Government and international aid agencies have not yet succeeded in restoring the country and developing a strategy to address poverty and institutional weaknesses.

According to the World Bank's Climate Risk and Adaptation Country Profile, mean temperatures in Haiti have increased 0.45ºC since 1960 and are expected to continue to increase. The number of hot days and hot nights has increased by 63 and 48 days per year,

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1 CIAT (2012), Haiti Strategic Program for Climate Resilience.

2 The vulnerability framework has two dimensions: (i) by three core components of vulnerability (exposure to climate-related hazards, sensitivity to their impacts, and the capacity to cope with those impacts), and (ii) by six key sector indicators (water, food, health, ecosystem services, human habitat, and infrastructure). Readiness seeks to measure the ability of a country's private and public sectors to absorb additional investment resources and apply them effectively toward increasing resilience to climate change. The GAIN Index considers three categories of readiness: economic, social, and governance. Readiness scores are calculated by summing component scores on the following weighted scale: 40% economic, 30% governance, and 30% social.

3 The Climate Change Vulnerability Index forms a central part of Maplecroft's Climate Change and Environmental Risk Atlas 2012. The Atlas analyzes the key risks to business in the areas of climate change vulnerability and adaption, emissions and energy use, environmental regulation., and ecosystem services; www.maplecroft.com

4 Haiti is the poorest country in LAC: 78% of Haitians are poor (less than US$2 a day), and more than half (54%) live in extreme poverty (less than US$1 a day). In rural areas, poverty and extreme poverty rates are estimated to be 84% and 69%, respectively (WB, 2013). More than 50% of the population faces moderate food insecurity.

5 Haiti, as a fragile state, is defined by a weak capacity to carry out basic governance functions, and lack of ability to develop mutually constructive relations with society (OCDE, 2013).

6 According to the IPCC, people living in LDCs from 2010 to mid-2013 were five times more likely to die from climate-related disasters than people living anywhere else.

7 The 2010 earthquake cost around US$7.8 billion, equivalent to slightly more than the country's GDP in 2009.

respectively, and the frequency is projected to increase throughout the country in the future. The mean annual rainfall has also decreased on average by 5 mm per decade since 1960, and the projections show a continuing decrease in mean annual rainfalls, particularly during June-August, while rainfall projections during the remainder of the year are less certain. In addition, the sea level is projected to rise by at least 0.82 m by 2100. Slow-onset impacts related to climate change—such as increasing temperatures, land and forest degradation, loss of biodiversity, and desertification—place additional stress on food production systems.

Losses and damages resulting from tropical cyclones and hurricanes have increased in the last decade. In the last decade, 17 hurricanes resulted in 3,600 deaths and affected more than 800,000 people.[8] In 2008 alone, losses and damages resulting from tropical cyclones Fay, Gustav, Hanna, and Ike were around 15% of GDP, destroying more than 60% of agricultural crops and killing more than 1,000 people (WB, 2011). Hurricanes result in deaths, internal displacement to unaffected areas, higher mortality rates from disease, food insecurity due to agricultural production drop, and infrastructure damage, among other things. The intensity of hurricanes has increased substantially since 1980, but the future intensity and frequency are still uncertain.[9] In connection with hurricanes, the intensity of downpours may increase. Floods are the most common fast-onset hazard and the leading factor of vulnerability in Haiti.[10] Haitian policies on territorial planning and infrastructure (road and basic service infrastructures, housing, etc.) are weak, without clear regulations and funding to implement measures to increase resilience to natural disasters.

Haiti faces severe deforestation because of bad agricultural practices, high demand for charcoal for energy uses and trade, fast population growth, and increased competition for land. The direct effects of deforestation (already 97% of the original forest is gone) include soil erosion, which in turn damages basic infrastructures like roads, irrigation systems, and dams and thus affects the environment and socioeconomic organization of the country. High levels of soil erosion can cause desertification under drought conditions and can affect agricultural productivity and environmental conditions. As the intensity and frequency of rains increase, the flooding and landslide risk and damage also rise, especially in areas of deforestation and land degradation.

Changing precipitation patterns associated with climate change are expected to contribute to decreased agriculture yields and crop productivity.[11] Agriculture is the mainstay of Haiti's economy, employing more than half of the national workforce and accounting for 25% of GDP in 2010 (down from 40% in 1990). The sector is highly fragmented and has decreased its performance in the last years, producing only enough to satisfy the food security needs of a rapidly growing population. Fish stocks are also expected to decline as a result of changes to ocean temperature, salinity, and turbidity (Rubenstein, 2012).

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8 CIAT (2012), Haiti, a country at risk. *Primature, Republique d'Haiti*.

9 According to the US Climate Change Science Program, increases in hurricane rainfall and wind speeds are likely, with simulations showing that for each 1ºC increase in sea surface temperatures, core rainfall may increase by 6-17% and the surface wind speeds of the strongest hurricanes will increase 1-8%, with associated increases in storms surge levels (WB, 2011).

10 From 1980 to 2008, 65 floods due to storms events have caused massive damage in Haiti, with more than 8,000 people killed, more than 7.2 million people affected, and economic damage near US$825 million (Reinhart, 2010).

11 Turral, Burke, and Faurès (2011).

B. National policies, plans, and strategies

Strengthening institutional capacities to adapt to climate change is essential to address current and future challenges. The adverse effects of climate change increase the risk of food insecurity and intensify poverty. If Haiti is to take measures to adapt and respond to these adverse effects, it needs not only to define adaptation policies, regulations, and strategies, but also to strengthen its weak institutional capacity. Coordination among actors (international and bilateral aid agencies, NGOs, and the private sector, among others) is also essential to harmonizing effective responses to climate change impacts and managing scarce financial resources.

In the last two decades the Government has made a significant effort to involve its weak institutions in dealing with climate change. Following Hurricane Georges, in 1999 the Ministry of Environment developed the Action Plan for Environment, which gathered several strategies and policies, especially those related to disaster risk management. In 2001, 10 key line ministers and the president of the Haitian Red Cross created Haiti's National Disaster Risk Management System (SNGRD) under the Ministry of the Interior and Territorial Communities. Through the Department of Civil Protection (DPC), the SNGRD was intended to decentralize the dual tasks of risk management and disaster preparedness and response to encompass efforts from the national Government, local authorities, civil groups, and the general public.[12] However, the DPC's limited resources constrained its ability to coordinate disaster-related efforts effectively. In 2004, under the Interim Cooperation Framework set up for the political transition period, a thematic environmental group was created with three main priorities: (i) reduction of pressure on wood resources; (ii) improved environmental resource management and planning; and (iii) sustainable and integrated disaster risk management through the implementation of a National Risk and Disaster Management Plan. Although a new sound national framework was developed under the new plan, projects had mixed results because of poor planning, lack of institutional capacity, lack of coordination among actors, and inadequacy of scope of the program (FAO, 2007).

In 2006, Haiti submitted to the UNFCC its National Adaptation Program of Action (NAPA), financed by the LDC Fund.[13] The NAPA identifies Haiti's main climate-related hazards as flooding, saltwater intrusion, changes in river morphology, droughts and low flows, intense rainfall, and cyclones. Its primary objective is to identify and promote activities that address Haitians' urgent and immediate needs to adapt to the adverse impacts of climate change. It focuses mainly on adaptation needs in agriculture (reduced agricultural production), water (shortage, groundwater depletion, and pollution), fisheries, land (loss or degradation), and forestry (deforestation, desertification).

The NAPA recognizes the impacts of climate change and its consequences in the country's socioeconomic and environmental context, but many challenges remain for its implementation.[14] Some of the challenges are related to the country's unstable political

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[12] Fordyce, E., A-A. Sadiq, and G. Chikoto (2014). Haiti's emergency management: A case of regional support, challenges, opportunities and recommendations for the future. FEMA, US Department of Homeland Security.

[13] The LDC Fund was managed by the Global Environmental Facility (GEF). The NAPA was implemented by UNEP, and the execution agency was the Ministry of Environment.

[14] Oxfam International (2009). Haiti: 'A gathering storm.' Climate Change and Poverty.

situation; lack of integrated national policies for environmental topics, as for watershed management; lack of research and statistics at the national and subnational levels; lack of funding; ineffective coordination among institutions involved in environmental issues; and weak institutional capacity. The Government of Haiti has developed several strategies and programs that integrate climate change adaptation actions, but results are not yet observable. The NAPA was updated in 2013, although the implementation plan and the national climate change strategy are still in progress.

In recent years, several institutions have been involved in climate change activities. The Ministry of Environment and the Inter-Ministerial Committee for Territorial Planning (CIAT)[15] have had the lead role in climate change, although coordination problems, lack of technical capacity, and insufficient financial resources have constrained their achievements. The Ministry of Environment is the Government's focal point for climate change policies and coordination. However, there is no national policy and regulatory framework to develop its responsibilities. It is also the newest ministry in the Government,[16] and several changes of ministries and technical staff have weakened the institution and its coordination with other ministries working on climate change. The recent push to reestablish the environmental sectoral table, along with efforts to build a climate change office within the Ministry of Environment, could partly address the institutional and coordination challenges.

The CIAT established a technical unit to supervise the implementation of the Pilot Program for Climate Resilience (PPCR) and the Strategic Program for Climate Resilience (SPCR) (CIAT, 2012b). The PPCR, financed by the Climate Investment Fund (CIF), is implemented by the Technical Secretary of the CIAT in collaboration with the Climate Change Direction in the Ministry of Environment.[17] In 2012, the CIF endorsed US$25 million for Haiti's strategic program for climate resilience under the PPCR, under the principles of long-lasting post-disaster recovery, linked with regional Caribbean efforts and other existing projects to increase implementation success. The main objective of the program is to reduce the target Regions' vulnerability to climate change while forecasting the consequences and impacts of climate change on key sectors, strengthening the resilience of both rural and urban communities, and promoting long-term climate-resilient development planning. The project is still in the design stages and there are no results yet. However, some coordination challenges among different institutions have already appeared in the first stages of the program.

Generating scientific data to inform climate change policies and to monitor activities is one of the major challenges in reducing vulnerability. Several Government institutions, together with the Ministry of Agriculture, Natural Resources and Rural Development, through the National Meteorological Service and the National Watershed Service; the Ministry of Environment, through the National Observatory of Environment and Vulnerability; and the Ministry of Planning and External Cooperation, through the National Center of Geospatial

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15 Created in 2009, the CIAT has as its mission to define the Government's policy on land use, protection and management of watersheds, water management, sanitation, and urban planning and facilities. Chaired by the Prime Minister, the CIAT is composed of the Ministries of Interior and Territorial Communities, Economy and Finance, Planning and External Cooperation, Agriculture and Rural Development, Public Works, Transport, and Communications and the Environment.

16 The Ministry of Environment was created in 1994. Previously the responsibilities for environmental issues were in what is now the Ministry of Agriculture, Natural Resources and Rural Development.

17 The main sectors of the PPCR are agriculture, coastal management, and post-earthquake reconstruction.

Information, participate with other international development organizations and several NGOs in compiling, processing, and analyzing data on climate change. Lack of coordination and access to existing data, lack of technical capacity and equipment, and insufficient resources for maintenance are the main constraints to managing relevant climate change information. However, some successes have been achieved in recent years (installation of a satellite ground station and a network of weather stations, improvement of the accuracy and lead-time of forecasts and warnings), and efforts are focused on creating an institution to centralize information and resources.

International donors and organizations in Haiti are developing strategies and programs related to climate change, mainly in adaptation activities and institutional strengthening. The World Bank has invested in operations in disaster risk management to improve disaster response capacity and enhance the resilience of critical transport infrastructure. Under the Global Facility for Disaster Reduction and Recovery Funds, the World Bank also supported building codes for public buildings and multi-hazard assessment after the earthquake.[18] UNDP has focused on building adaptive capacity to address climate change threats in coastal communities and in reforestation programs (as in the "Green Border project" with the Dominican Republic). UNDP is also working with the Ministry of Environment to strengthen its capacities and drive the sectoral table with other institutions. FAO is for the first time working on a program of adaptation measures in agriculture to improve resilience to climate change and reduce the risks of natural disasters. The European Union is also working with the Ministry of Environment to reinforce coordination among institutions and manage information related to climate change.

C. The Bank's role

The last IDB Country Strategy for Haiti (2011-2015) included climate change objectives in the agricultural sector, although it did not identify programs and activities to achieve the main goals. The CS was constrained by Haiti's socioeconomic context (poverty, the Government's fragility, and poor infrastructure) and, in particular, by the 2010 earthquake.[19] The IDB defined an ambitious strategy based on six priority sectors (agriculture, education, water and sanitation, transport, energy, and private sector development) and a long-term commitment. The environmental and climate change goals were a 50% reduction in losses from floods and landslides and a 25% increase in agricultural revenues in defined areas.[20] According to the strategy, to alleviate risks related mainly to heavy rains during hurricane season, the IDB will invest in watershed management to increase rainfall absorption and reduce run-off. At the same time, the Bank will support the application of hurricane- and earthquake-proof construction codes.

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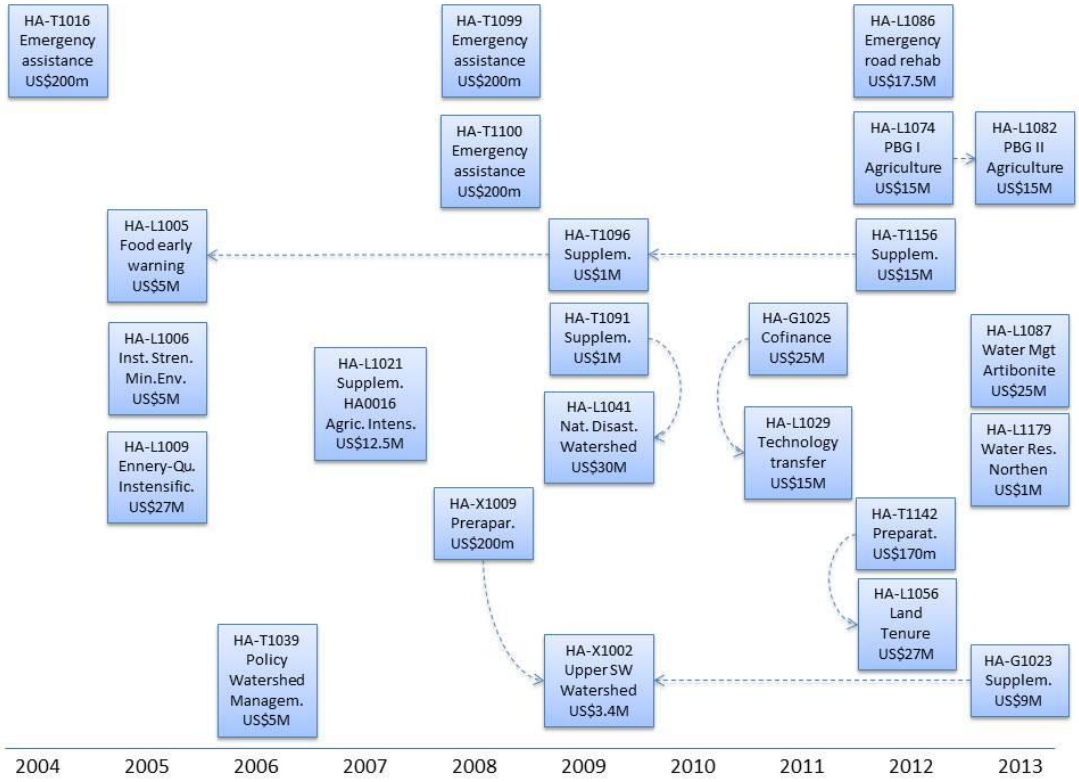
18 For example, in 2012 the World Bank published "Climate Risk and Adaptation Country Profile" for Haiti, focusing on vulnerability, risk reduction, and adaptation to climate change.

19 The earthquake left 250,000 deaths, damaged infrastructure (105,000 households, 1,300 schools, 50 hospitals), caused losses in small and medium enterprises, and so on. Total losses were estimated at some US$7.9 billion, equivalent to 120% of the country GDP (OVE, 2012). The greatest impacts were in Port-au-Prince, but other areas of the country were also directly or indirectly affected. Several sectors—agriculture, transport, education, health, etc.—were also affected.

20 The baseline for this indicator was US$900 million in 4 watersheds, and the goal for 2015 was the reduction of 50% of these losses, although there is no specific explanation about what these losses included.

The climate change-related portfolio in Haiti is mainly focused on adaptation practices in the agricultural sector. During 2004-2013, the IDB approved in Haiti 41 operations related to climate change, 75% of the original approved amount for agriculture programs (25 operations, US$251 million) (Figure C.1 depicts the climate change portfolio).[21] The portfolio also includes other programs with implicit mitigation activities in the energy sector, although their objectives and activities are more weakly linked to climate change.[22] None of the investment programs approved during the period has explicit climate change objectives, although the diagnosis sections of some operations approved in the past two years discuss climate change. The climate change-related portfolio in agriculture includes programs of agricultural intensification, forestry, watershed management, and disaster risk management, mainly in rural areas. IDB support has increased significantly since 2010, mainly through agriculture and forestry projects.[23]

Figure C.1. Climate change portfolio for Haiti



Source: OVE.

21 In 2010, after the earthquake, the IDB cancelled all of Haiti's existing debt (US$479 million) and converted undisbursed loan balances into grants. Since then, all the projects approved in Haiti are considered grants: investment grants, policy-based grants (PBGs), and technical cooperations (TCs).

22 Programs in the energy sector are mainly for the rehabilitation of the Peligre hydroelectric plant and the rehabilitation of the electricity distribution system in Port-au-Prince, with some TCs for specific studies that are not explicitly related to CC.

23 More than 80% of the portfolio approved in 2012 and 2013 is concentrated in the agriculture and forestry sectors, including operations to strengthen and reform the Ministry of Agriculture and Natural Resources.

Although the CS defines a clear climate change-related objective in the agriculture sector, it does not clearly link activities, project objectives, and the strategy. As part of a specific sector (agriculture), climate change does not cut across all sectors. Even within the agriculture sector, none of the programs have explicit objectives related to climate change. However, some of the programs approved in 2012 and 2013 address climate change impacts at the diagnosis level. IDB specialists indicate that the first explicit climate change program will likely be approved in 2014 under the PPCR.

The disbursement level of the climate change-related portfolio is low, although efforts have been made to increase institutional capacity and execution rates. Two phases of the PBG in the agriculture sector were approved in 2012 and 2013 to strengthen the execution agencies and to define conditionalities to be applied later in the approval of new projects. However, some challenges still limit the efficient implementation of the climate change-related portfolio, challenges that are common to the entire IDB portfolio in the country: low capacity of the execution units, cost overruns, endemic lack of information that limits project designs and monitoring and evaluation progress reports, lack of coordination among actors, and difficulties in finding consulting firms, among others. More than 50% of the current disbursements corrrespond to one investment program (HA-L1009) and the PBG. Furthermore, targets for the main indicators in the portfolio do not seem achievable because the objectives do not take into account the country's constraints.

D. Main results

The climate change-related portfolio has shifted from projects based on infrastructure and productivity objectives in specific rural areas to more integrated programs in the agriculture sector. The first programs approved during 2003-2014 were related to productivity objectives (HA-L1009, HA-L1021). In 2005, the IDB approved the only program exclusively focused on DRR (HA-L1005), apart from three emergency TCs (HA-T1016, HA-T1099 and HA-T1100). The DRR activities were later integrated in agriculture programs implemented in watersheds (HA-L1087), more closely linking the water resource with productive activities, although explicit adaptation measures are still very loosely included in the current portfolio. Except for the PBG and two TCs, only the programs approved before 2009 have been highly or totally disbursed and have some results to be discussed.

Design problems and execution constraints limited the results of agriculture programs focused on productivity and approved in the first years of the analysis period . The agriculture intensification program (HA-L1009 and the supplementary financing HA-L1021) was aimed at increasing the income of households in the Ennery-Quinte project area, while reducing the risk and severity of further flood and mudslide damage in the Gonaïves area. Although the objective included DRM, the design of the program was complex (12 components) and the Project Monitoring Report (PMR, 2013) finds unsatisfactory results for the components related to flood control measures, institutional strengthening, rehabilitation of main canals of the Artibonite irrigation systems, and agriculture intensification and market linkages. Furthermore, two components were cancelled for lack of financing and Government collaboration. The Project Completion Report (PCR) lists, among the constraints to achieving the expected results, the absence of collaboration and coordination between the Government and the execution agency, weakness in the local availability of credit that was not appreciated in the design process, lack of data and studies, and weakness in risk analysis (institutional, sociopolitical, and climatic).

Land tenure security is linked to climate change adaptation and environmental sustainability by providing incentives for climate-resilient agricultural practices. After several projects in agriculture intensification and watershed management, in 2012 the IDB approved the only investment program related to land tenure security (HA-L1056, US$30 million. The project identifies the lack of land tenure security as a potential bottleneck for forest conservation practices, watershed conservation initiatives, and sustainable agriculture practices, and as a key issue in reducing vulnerability to natural disasters and the impacts of climate change in rural areas. The program has disbursed only 7% of the total original approved amount, and there is no relevant information about implementation issues during this short period of time.

The PBGs in the agriculture sector are part of the Bank's new strategy to improve program execution and achievement of development goals, replacing traditional programs to support economic and political governance in Haiti. The two first phases of the PGBs (HA-L1074, HA-L1082) were approved in 2012 and 2013 for US$15 million each. In 2014, the third phase of the PBG for institutional strengthening and reform of the agricultural sector will be approved, and the impacts of the three phases will be evaluated at the conclusion of the third program in 2015. The main objective of the PBG is to increase agricultural productivity and market access. One of the specific objectives is linked to flood control, although the diagnosis does not reveal strong connections between topics and links with climate change adaptation issues. The PBG presents simple conditionalities related to basic management of the sector, and, to improve the capacities of execution agencies and the institutional environment, new projects under the Ministry of Agriculture, Natural Resources, and Rural Development are expected to include some of the PBG triggers as conditions for their approval. The Ministry of Environment was the beneficiary of a strengthening program in 2006 (HA-L1006, US$5 million) but results were very limited; IDB specialists consider that this program had no positive impacts because of technical weaknesses and the Ministry's lack of commitment.

The program of technology transfer to small farmers is the first with explicit references to climate change in the diagnosis section. Approved in 2011, the technology transfer program (HA-L1059 and co-financing program HA-X1015) had the goal of contributing to the sustainable improvement of small farmers' agriculture income and of food security in Haiti's north and northeast departments. The program will promote the adoption of agricultural technologies and practices aimed at reducing land degradation, encouraging resilient agriculture, and allowing farmers to adapt to future changes in weather and precipitation patterns. With less than 13% disbursed, there is not enough information about outputs, although the PMR (October 2013) points out initial concerns about the lack of involvement of one of the executing agencies (Service National Semencier). Furthermore, the development of a seed market has failed before—because of monopoly and limitations in offer/demand incentives—and uncertainty about program results and increased income limits the participation of the potential beneficiaries.

Box C.1. Emergency Road Rehabilitation Program in Response to Hurricane Sandy

Approved in 2012 (US$17.5 million), the objective of operation HA-L1086 was to repair, stabilize, and protect road infrastructure damaged by Hurricane Sandy, to reestablish road connectivity and people's access to basic services and to resume the normal flow of economic exchanges and humanitarian aid. The lack of an inventory of works and execution activities and delays in certifying the eligibility of works and authorizing disbursements have limited the implementation of the emergency project (just 20% of the funds have been disbursed).

The Flood Warning Program (HA-L1005) approved in 2005 did not achieve satisfactory results. The sustainability of the investments was questioned as institutional commitment was lacking and handover was not provided for equipment management and maintenance. The investment loan supporting the National Early Warning Program for Floods and Cyclones, approved in 2005 by the Haitian Government, had as its objective to provide the country with the capacity to identify and better prepare for flood risk. Two components were cancelled and part of the amount was reassigned to other components of the program.[24] Although TCs were approved in 2009 (HA-T1096) and 2012 (HA-T1156) to compensate for the lack of budget for these two components, and some results have been achieved, low institutional capacity and lack of resources for the maintenance of the investments have limited the impact of the program.[25] Some activities have not been completed, communication equipment has not been delivered, institutional management of the system has not been clarified and agreed upon between ministries, and half of the hydrometeorological stations are not working, according to the execution agency. Furthermore, the indicators and targets were unrealistic given the context of the country and institutions, and the capacity of the Ministry and Civil Defense, especially in local communities, was very low.

In 2009, with the approval of the mitigation disaster risk program in priority watersheds (HA-L1041, US$30 million) the IDB introduced an integrated environmental management vision in the Haiti portfolio, with non-explicit adaptation measures for some components. TCs had been approved in 2006 (HA-T1039, US$300,000), 2008 (HA-X1009, US$200,000), and 2009 (HA-X1002, US$3.4 million) to prepare and complement the investment loan. The design process was complex, and the lack of data limited the definition of goals and indicators, although the previous experience with the Ennery-Quinte intensification program in some watersheds (HA-L1009 and HA-L1021) contributed some lessons learned, as the HA-L1041 program diagnosis pointed out.[26] Disbursements are low (40%), and the last PMR does not reveal any results yet;[27] however, the weak institutional capacity of the execution agency appears to be one of the main risks to the effective implementation of the program.

E. Challenges

There are several areas of opportunity to address climate change—especially on the adaptation side—in Haiti's complex and fragile context. The agriculture sector has gradually incorporated adaptation measures to tackle climate change impacts, mainly related to disaster risks (flooding, droughts) and watershed management. The CS identifies climate change as a

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24 The final approved amount was US$4,534,522 (9% less than the original approved amount). The amount for component 1 was increased by 54%, and components 3 and 5 were totally cancelled. The amount for "Evaluations and audits" was decreased by 45% decreased, that for component 2 by 30%, and that for component 4 by 53%.

25 The targets for component 1 were achieved. Components 3 and 5 were cancelled, although the team approved two TCs to develop the activities related to these two components. Components 2 and 4 were partially completed and, even if some systems were purchased and installed, they are not working and the institutions are not yet prepared to manage the system. The component most linked with CC (flood warning system) was not complete, and the results were not achieved

26 There are some indicators that are not yet defined (baselines, targets) until some studies under TC HA-1002 are completed.

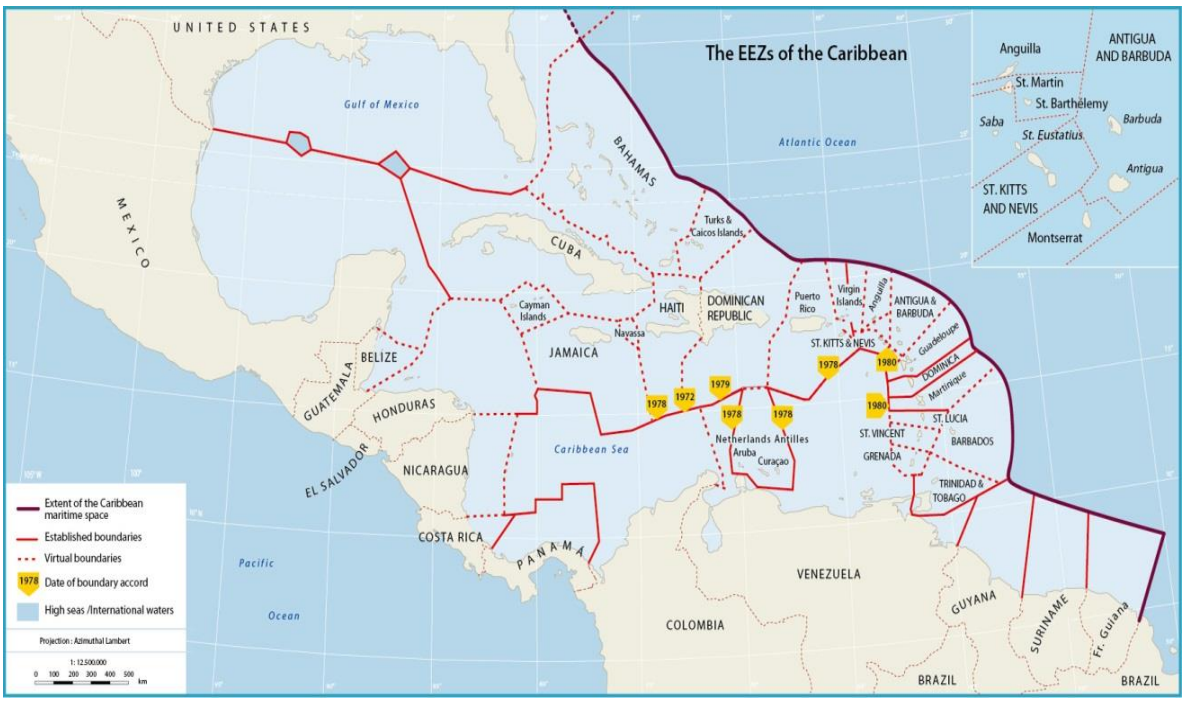
27 The HA-X1009 program has disbursed only 21% of the original approved amount, so results cannot be evaluated yet.

strategic objective, but there is no clear approach to address this objective and turn it into a portfolio with climate change as a cross-cutting issue. Some of the challenges to achieving effective results are as follows:

- Coordination among the several ministries and execution agencies that are involved in climate change activities at the national and subnational level; definition of regulations and distribution of roles to improve plan execution and efficient use of resources.
- Development of sectoral tables with international institutions and NGOs to coordinate technical and financial efforts in the country, led by the sectoral ministries.
- Integration of adaptation measures into development planning under the different areas related to water management, agriculture, fisheries, land use, and forestry.
- Development of climate change databases and information resources to design projects (indicators, baseline, targets) and build knowledge capacity within the Government. Technical cooperation could provide support through studies or capacity building programs at a local and subnational level, and through the preparation of investment programs.
- Better monitoring and evaluation systems to improve ongoing programs and implement lessons learned for new projects.

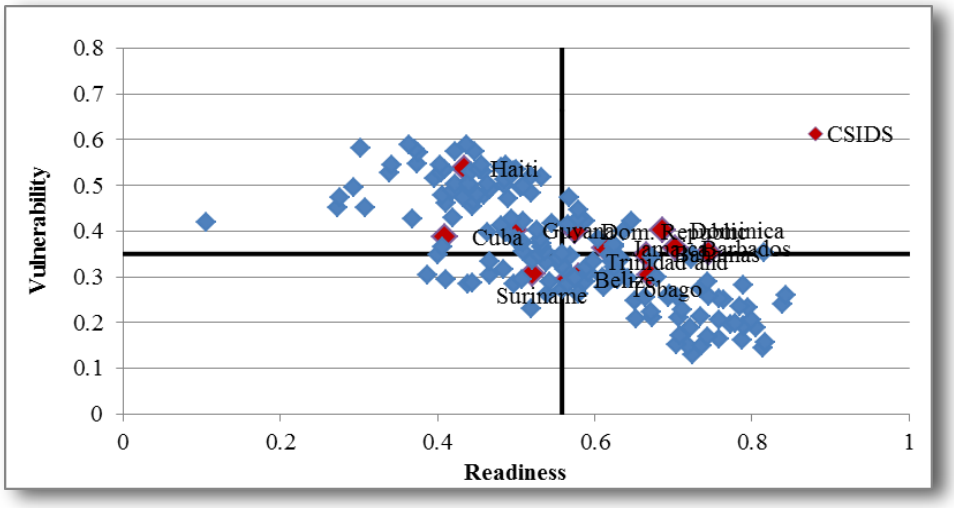
ANNEX D. ADDITIONAL FIGURES AND TABLES

Figure D.1. Map of the Caribbean



Source: Caribbean Atlas, University of Caen.

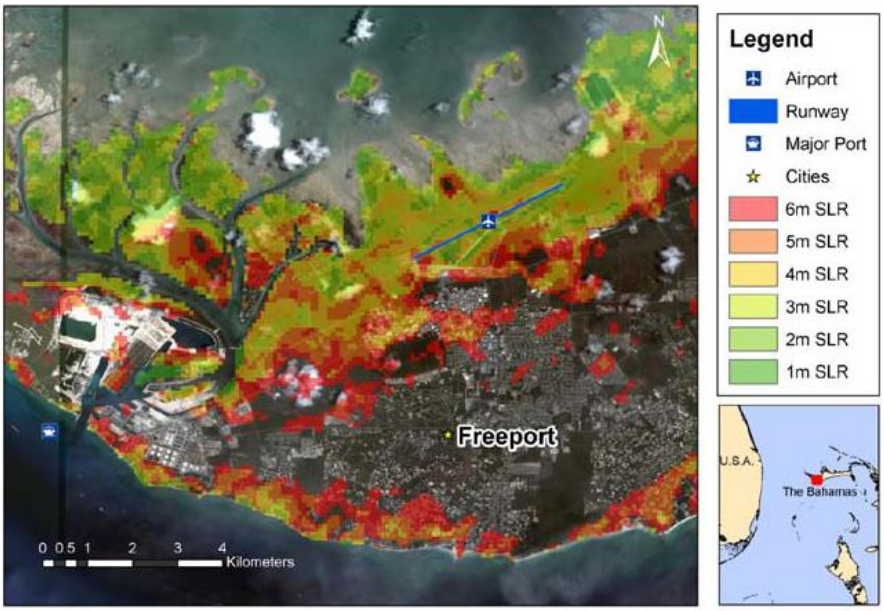
Figure D.2. GAIN matrix, 2012



Source: ND-GAIN Index.

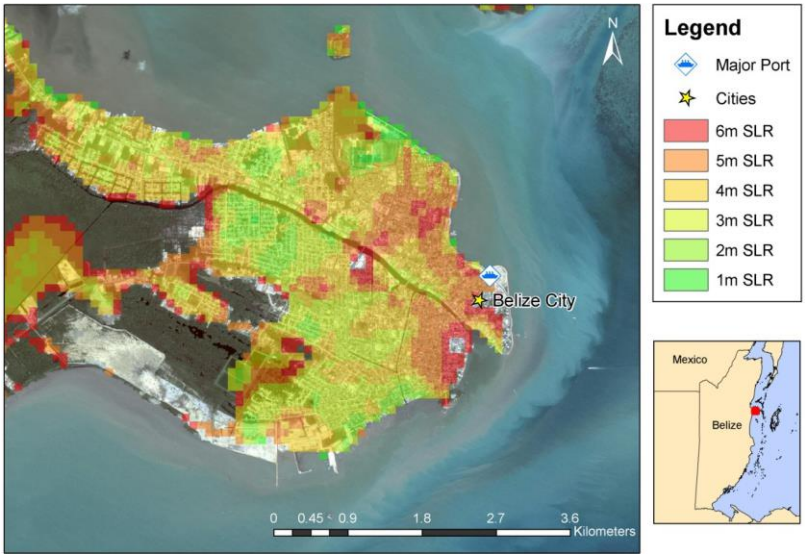
Note: Figure A.7 plots the values for 2012 of the two simple indexes (vulnerability vs. readiness) divided into four quadrants using the median scores for both indexes. We plot the values for all countries with available data, to compare the Region analyzed as a whole in a broader context.

Figure D.3. Vulnerability of Freeport, The Bahamas, to SLR and storm surge (1-6 m)



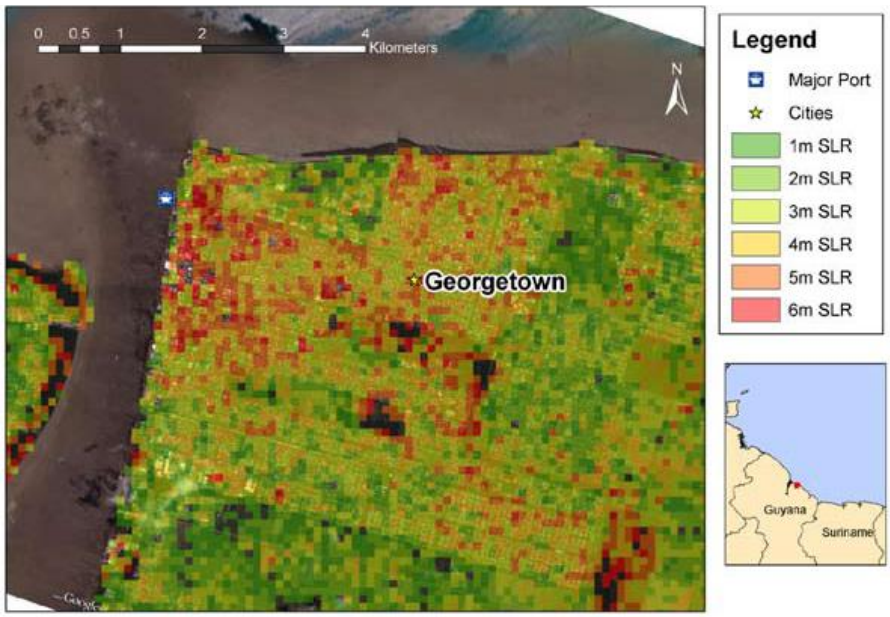
Source: Simpson et al (2009).

Figure D.4. Vulnerability of Belize City, Belize, to SLR and storm surge (1-6 m)



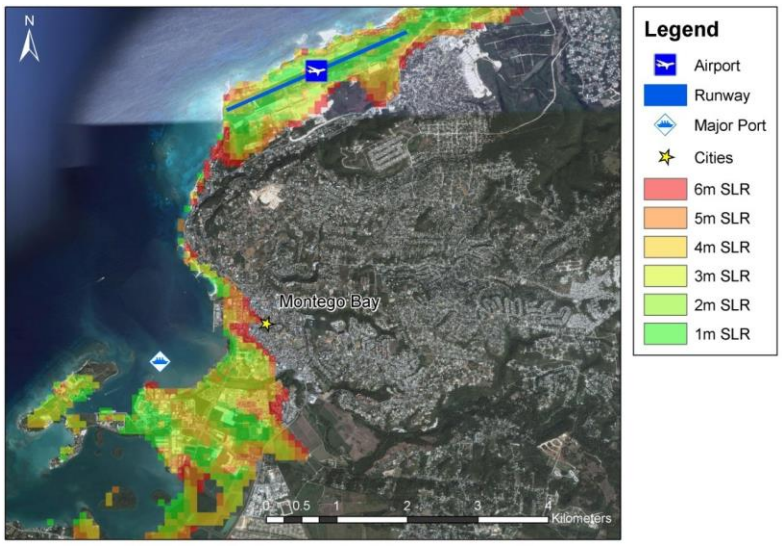
Source: Simpson et al (2009).

Figure D.5. Vulnerability of Georgetown, Guyana, to SLR and storm surge (1-6 m)



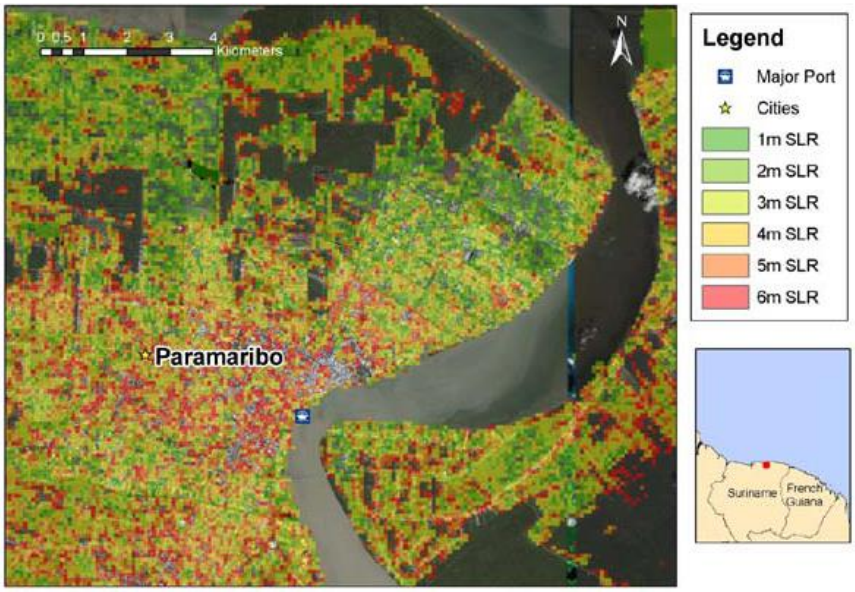
Source: Simpson et al (2009).

Figure D.6. Vulnerability of Montego Bay, Jamaica, to SLR and storm surge (1-6 m)



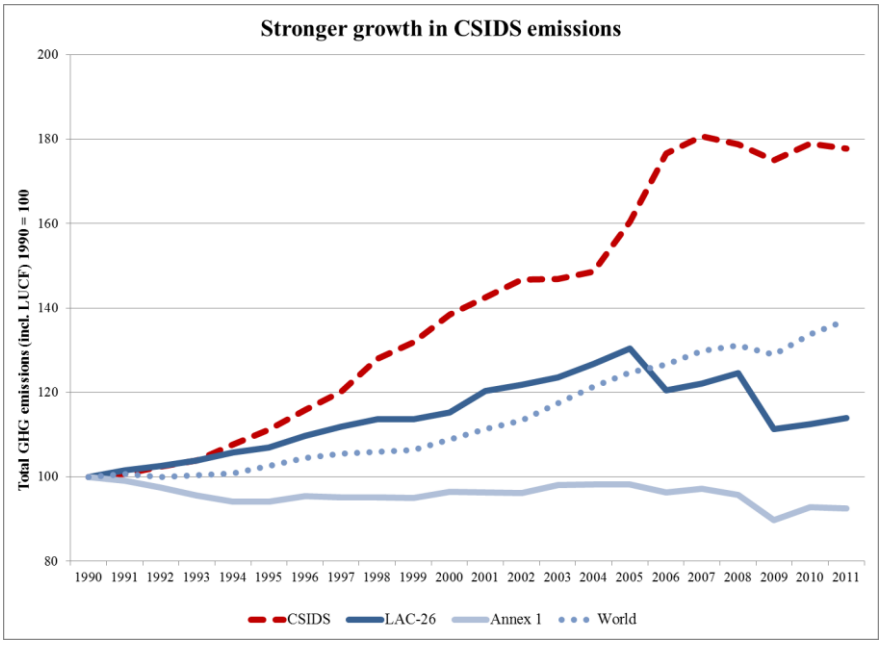
Source: Simpson et al (2009).

Figure D.7. Vulnerability of Paramaribo, Suriname, to SLR and storm surge (1-6 m)



Source: Simpson et al (2009).

Figure D.8. Growth of GHG emissions of CSIDS relative to LAC, Annex 1 countries, and the world



Source: OVE based on WRI, CAIT 2.0 (2014, data for 2011).

Note: LAC-26: IDB 26 client countries. Annex I Countries (Parties to the Convention): Australia, Austria, Belarus, Belgium, Bulgaria, Canada, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Liechtenstein, Lithuania, Luxemburg, Malta, Monaco, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom of Great Britain and Northern Ireland, and United States of America.

Table D.1. CSIDS vulnerability and adaptation status: little improvement in 2012 relative to 2011

Country	Vulnerability status	Adaptation status
The Bahamas	Equal	Worse
Barbados	Equal	Worse
Belize	Equal	Equal
Dominican Republic	Worse	Better
Guyana	Worse	Better
Haiti	Worse	Better
Jamaica	Worse	Better
Suriname	Equal	Worse
Trinidad and Tobago	Worse	Worse

Source: OVE, based on ND-GAIN Index.

Table D.2. Matrix of climate change intensity focus of development partners in the CSIDS

Scale
Up to 15%
]15% - 20%]
]25%-50%]
]50% - 75%]
Above 75%

Climate change related operations (Loans and Grants)

	Adaptation	Mitigation
Multilateral partners		
IDB		
CDB		
UNDP		
Other UN Agencies*		
WB		
Bilateral partners		
Canada		
EU		
UK DFID		
USAID		

Source: OVE based on project description on respective websites and annual reports or strategies.
Note: Red scale denotes the intensity of intervention relative to remaining development partners based on approved amounts. * Other UN agencies include FAO and UNEP.

Table D.3. CSIDS Country Strategies and their focus on climate change

Caribbean SIDS	Country Strategies strategic areas and climate change	
Bahamas, The	2003-2007 CS	2010-2014 CS
	3. Improving environmental management and natural resource conservation. 3.1. Strengthen institutional capacity for coastal zone management 3.2. Assist implementation of coastal zone action plan	1.3. Energy: promote and support sustainable energy programs in The Bahamas, including Renewable Energy (RE), Energy Efficiency (EE) and Waste to Energy (WE) and energy conservation programs. 1.3.1. Energy Matrix includes RE alternatives. EE programs implemented 1.3.2. Participation of Independent Power Producers (IPP) in energy matrix
Barbados	2005-2008 CS	2009-2013 CS
	3. Support improvement in transport, neighborhood and environmental infrastructure 3.3. Coastal infrastructure	1. Build Resilience to Coastal Risks, Natural Disasters and Climate Change 1.1. Improve information for the management of coastal risks and climate change adaptation 1.2. Strengthen regulatory and institutional framework 1.3. Protect and restore priority coastal ecosystems and infrastructure 3. Lower Oil Imports, Promotion of Clean Energy and More Efficient Energy Use 3.1. Strengthen institutional and policy framework for promoting EE and RE 3.2. Expansion of programs to support EE and RE
Belize	2004-2008 CS	2008-2012 CS
	-	1. Strengthen institutional framework for fiscal management 1.5. A strategy to manage fiscal risks due to natural disasters and climate change 4. Rehabilitation of road infrastructure damaged by floods. 4.1. Road infrastructure damaged by floods rehabilitated, stabilized and protected
Dominican Republic	2004-2008 CS	2010-2013 CS
	1. Reduce barriers to private investment and sustainable growth 1.F. Reduce environmental vulnerability	1. Public finances: make public spending more efficicient 1.4. Increased ex ante financial and fiscal coverage of risks of emergencies caused by natural disasters 6. Transportation: improve the quality and management of the road system and the urban transportation system in Santo Domingo 6.2. Increased number of passengers using the subway as a result of the integration of feeder routes
Guyana	2008-2012 CS	2012-2016 CS
	1. Strategic Infrastructure Investments: Power demand efficiently met in adequate quantity and acceptable quality 1.2. Alternative energy project is operationalized with aim of increasing power capacity and reducing commercial energy costs	1. Sustainable energy: Implement a low-carbon energy framework to reduce the cost of electricity and increase coverage 1.2. Increased generation capacity of a more sustainable and greener energy matrix 2. Natural resources management: Support the development of productive use of the country's natural resources, while addressing the challenge of sustainable management of the natural resources at stake 2.2. Increased environmental governance and capacity for sustainable management of natural resources 2.3. Improved capacity for disaster risk management and climate change adaptation
Haiti	2007-2011 CS	2011-2015 CS
	-	3. Agriculture: Protect the environment, respond to climate change, and enhance food security 3.1. Reduction in expected losses for flooding and landslides
Jamaica	2006-2009 CS	2012-2014 CS
	3. Reducing vulnerability to natural disasters 3.1. Appropriate comprehensive disaster risk management	Cross-cutting priority: Disaster Risk Management and Climate Change Adaptation 1. Fiscal Sustainability: (i) increase resilience to earthquake and hurricane hazards; (ii) policy and legal reforms and institutional changes to modernize existing national DRM and CCA information and management systems 2. Social Protection and Safety: reduce social vulnerability via quality checks and upgrades of new and existing environmental safeguards that mitigate the impacts of these hazardous events
Suriname	2006-2010 CS	2011-2015 CS
	3. Integration of the Interior 3.1. To improve the standard of living for the Indigenous and Maroon communities and promote a balanced approach to managing converging interests related to the exploitation of natural resources, property and human rights and environmental protection	Cross-cutting priority: Natural Disaster and Climate Change Management 1. Mainstream disaster risk management and climate resilience standards in strategic infrastructure investments
Trinidad and Tobago	2004-2007 CS	2011-2015 CS
	-	5. Climate change: support the mainstreaming of climate change adaptation and carbon reduction into national development 5.1. Adopted Climate change policy 5.2. Climate Change adaptation integrated into key sectors 5.3. Reduction in Carbon Intensity 6. Energy: support the country in developing a more efficient, sustainable and cleaner energy matrix 6.1. Strengthen regulatory and legal framework to contribute to a more sustainable energy sector with increased efficiency and transparency.

Source: OVE.

Table D.4. Annual average amount and number of climate change operations in the Caribbean

Period	Loans		Grants	
	Annual average amount (US$ million)	Annual average # of operations	Annual average amount (US$ million)	Annual average # of operations
2004-2006	22.58	3.3	0.55	3.0
2007-2009	56.00	5.0	6.15	11.7
2010-2012	179.35	8.0	15.36	11.7
2013	165.79	6.0	30.31	15.0

Source: OVE.

Table D.5. OVE-identified Caribbean climate change portfolio

Operation number	Operation name	Operation type	Approval date	Operation status	Current approved amount (US$)	% disb. (Jan, 2014)	Climate change content
Agriculture and LULUCF							
BA-L1008	Agricultural Health and Food Control Programme	Investment loan	12/2/2009	Active	20,000,000	3%	]0% - 20%]
BA-L1017	PEF: Agricultural Health and Food Safety Program Preparation	Project Preparation Facility (loan)	12/10/2008	Completed	505,084	100%	]0% - 20%]
BA-T1013	Strengthening of the Service Delivery Capacity of the Ministry of Agriculture	Non-reimbursable TC	12/9/2010	Active	350,000	16%	]40% - 60%]
BH-L1001	Land Use Policy and Administration Project	Investment loan	11/17/2004	Completed	3,484,867	100%	> 80%
BL-L1008	Land Management Program III	Investment loan	10/21/2009	Completed	2,500,000	100%	]40% - 60%]
BL-L1009	Agricultural Services Program	Investment loan	11/4/2009	Active	3,700,000	59%	]20% - 40%]
DR-L1031	Program in Support of Subsidies for Innovation in Agricultural Technology	Investment loan	11/3/2010	Active	30,000,000	12%	> 80%
DR-L1048	Agrifood Health and Safety Program	Investment loan	7/25/2011	Active	10,000,000	11%	]20% - 40%]
DR-L1054	Research and Agricultural Development Program	Investment loan	11/14/2012	Active	22,000,000	0%	> 80%
DR-T1055	Study of Agricultural Public Spending and Agricultural Services Strengthening	Non-reimbursable TC	12/9/2009	Completed	500,000	100%	]20% - 40%]
DR-T1074	Support Impact Evaluation of the Agricultural Innovation Supports Program	Non-reimbursable TC	11/5/2010	Active	745,000	51%	> 80%
DR-T1089	Preparation of the Agricultural Research and Development Program	Non-reimbursable TC	1/30/2012	Completed	183,370	100%	> 80%
GY0011	Agricultural Support Services	Investment loan	6/23/2004	Completed	17,428,109	100%	> 80%
GY-L1007	Agricultural Export Diversification Program	Investment loan	12/5/2007	Active	20,900,000	87%	]20% - 40%]
GY-T1069	Measurement of Climate Change Impacts and Eco-system Services in Iwokrama	Non-reimbursable TC	4/2/2009	Completed	224,360	100%	> 80%
GY-T1076	Developing Capacities in Implementing REDD+	Non-reimbursable TC	12/8/2010	Completed	688,896	100%	> 80%

Operation number	Operation name	Operation type	Approval date	Operation status	Current approved amount (US$)	% disb. (Jan, 2014)	Climate change content
GY-T1085	Strengthening of Iwokrama Phase II	Non-reimbursable TC	6/14/2011	Completed	279,630	100%	> 80%
GY-T1097	Forest Carbon Partnership Facility Project in Guyana	Non-reimbursable TC	12/4/2013	Active	3,800,000	0%	> 80%
HA-G1023	Sustainable Management Upper Watersheds South Western Haiti-Macaya National Park	Investment grant	7/31/2013	Active	9,000,000	0%	> 80%
HA-G1025	Technology Transfer to Small Farmers Program	Investment grant	8/31/2011	Active	25,000,000	2%	> 80%
HA-L1003	Rural Supply Chain Development Program	Investment loan	10/24/2006	Active	17,800,000	66%	]40% - 60%]
HA-L1009	Ennery-Quinte Agricultural Intensification Project	Investment loan	7/20/2005	Active	27,105,000	94%	]40% - 60%]
HA-L1021	Supplemental Financing for the Agricultural Intensification Program	Investment loan (grant)	11/20/2007	Completed	12,078,325	100%	> 80%
HA-L1041	Natural Disaster Mitigation Program in Priority Watersheds I	Investment loan (grant)	9/16/2009	Active	30,000,000	49%	> 80%
HA-L1056	Land tenure security program in rural areas	Investment loan (grant)	4/25/2012	Active	27,000,000	7%	]40% - 60%]
HA-L1059	Technology Transfer to Small Farmers	Investment loan (grant)	8/31/2011	Active	15,000,000	18%	]60% - 80%]
HA-L1074	Institutional Strengthening and Reform of the Agriculture Sector I	PBL (grant)	5/30/2012	Completed	15,000,000	100%	]40% - 60%]
HA-L1082	Institutional Strengthening and Reform of the Agriculture Sector II	PBL (grant)	6/12/2013	Completed	15,000,000	100%	]40% - 60%]
HA-L1087	Water Management Program in the Artibonite Basin	Investment loan (grant)	11/27/2013	Active	25,000,000	0%	> 80%
HA-T1039	Policy and Strategy for Integrated Watershed Management	Non-reimbursable TC	6/14/2006	Completed	279,967	100%	> 80%
HA-T1046	Policy and Forestry Action Plan for Haiti	Non-reimbursable TC	12/20/2006	Completed	56,187	100%	> 80%
HA-T1091	Support for Watershed Management Plans for Preventive Disaster Risk Management	Non-reimbursable TC	4/9/2009	Completed	979,802	100%	> 80%
HA-T1101	Support to maritime fishing development	Non-reimbursable TC	4/30/2009	Completed	178,371	100%	]20% - 40%]
HA-T1142	Preparation of the Land Tenure Regularization Program	Non-reimbursable TC	3/23/2011	Completed	165,051	100%	> 80%
HA-T1179	Water Availability and Integrated Water Resources Management in Northern Haiti	Non-reimbursable TC	3/19/2013	Active	1,000,000	0%	> 80%
HA-X1002	Sustainable Land Management of the Upper Watersheds of South Western Haiti	Investment grant	9/23/2009	Active	3,436,364	21%	> 80%
HA-X1009	Preparation of Full-Sized GEF Project HA-X1002	Investment grant	9/5/2008	Completed	170,090	100%	> 80%
HA-X1015	Co-financing - Rural Chains Program - Animal & Plant Health Protection	Non-reimbursable TC	1/4/2010	Completed	1,140,052	92%	]0% - 20%]
JA0106	National Irrigation Development Program	Investment loan	6/30/2004	Completed	11,801,995	100%	]40% - 60%]
JA-L1012	Agricultural Competitiveness Programme	Investment loan	11/3/2010	Active	15,000,000	14%	]0% - 20%]

Operation number	Operation name	Operation type	Approval date	Operation status	Current approved amount (US$)	% disb. (Jan, 2014)	Climate change content
JA-T1052	Support to Agricultural Competitiveness Program	Non-reimbursable TC	2/16/2010	Completed	345,663	100%	]20% - 40%]
JA-T1058	Studies for agricultural sector policy priorities	Non-reimbursable TC	9/9/2010	Completed	185,909	100%	> 80%
JA-T1060	Integrated Management of the Yallahs-Hope Watershed Management Area (PPG)	Non-reimbursable TC	7/5/2011	Completed	137,700	100%	> 80%
SU-L1033	Modernization of Agricultural Public Services - I	PBL	12/13/2013	Active	15,000,000	0%	]40% - 60%]
SU-T1064	Support of Modernization of Public Agricultural Services Program	Non-reimbursable TC	12/11/2012	Active	500,000	49%	> 80%
Disaster Risk Reduction and Coastal Zone Management							
BA-L1014	Coastal Risk Assessment and Management Program	Investment loan	12/8/2010	Active	30,000,000	20%	> 80%
BA-T1014	Preparation of the Coastal Risk Assessment and Management Program	Non-reimbursable TC	2/12/2010	Completed	403,600	100%	> 80%
BA-T1025	Capacity Building Ecosystem Services Valuation ICZM Best Practice Dissemination	Non-reimbursable TC	7/29/2013	Active	600,000	0%	> 80%
BH-L1007	Immediate Response Facility for Natural Disasters and Other Emergencies	PBL	3/8/2005	Completed	3,580,521	100%	]40% - 60%]
BH-T1025	Emergency Assistance: Hurricane Irene	Non-reimbursable TC	9/20/2011	Completed	200,000	100%	> 80%
BH-T1029	Feasibility studies for a climate risk-resilient coastal zone management program	Non-reimbursable TC	12/17/2013	Active	500,000	0%	> 80%
BH-T1032	Emergency Assistance due to Hurricane Sandy	Non-reimbursable TC	1/10/2013	Completed	200,000	100%	> 80%
BL-T1015	Support for the Preparation of an Integrated Disaster Risk Management	Non-reimbursable TC	12/11/2009	Completed	335,626	100%	> 80%
BL-T1036	Emergency Assistance due to Tropical Depression 16	Non-reimbursable TC	12/5/2008	Completed	200,000	100%	> 80%
DR-L1007	Disaster Prevention and Risk Management Program	Investment loan	12/19/2005	Completed	5,000,000	100%	> 80%
DR-L1029	Emergency Assistance in Response to Tropical Storm Noel of October 2007	PBL	12/19/2007	Completed	20,000,000	100%	]20% - 40%]
DR-L1045	Insurance Facility for Emergencies Caused by Catastrophic Natural Disasters	Investment loan	5/18/2011	Active	24,000,000	0%	> 80%
DR-T1037	Support for Emergency Caused by Tropical Storm Noel	Non-reimbursable TC	11/2/2007	Completed	200,000	100%	> 80%
DR-X1001	PDF-B Integrated Management of the Coastal and Marine Zone of Samaná	Non-reimbursable TC	6/28/2005	Completed	234,625	100%	> 80%
GY-T1014	Emergency Assistance due to Guyana's Floods	Non-reimbursable TC	1/26/2005	Completed	200,000	100%	> 80%
GY-T1050	Preparation of the Integrated Management Plan for Natural Disasters	Non-reimbursable TC	8/4/2009	Completed	915,000	100%	> 80%

Operation number	Operation name	Operation type	Approval date	Operation status	Current approved amount (US$)	% disb. (Jan, 2014)	Climate change content
HA-L1005	National Program of Flood Early Warning	Investment loan	7/20/2005	Completed	4,534,522	100%	]60% - 80%]
HA-T1016	Emergency Assistance in Response to Tropical Storm Jeanne	Non-reimbursable TC	9/22/2004	Completed	200,000	100%	> 80%
HA-T1096	Technical Assistance for National Program of Flood Early Warning System	Non-reimbursable TC	4/9/2009	Completed	966,353	100%	> 80%
HA-T1099	Emergency Assistance Due to Hurricane Gustav	Non-reimbursable TC	9/15/2008	Completed	200,000	100%	> 80%
HA-T1100	Emergency Assistance Due to Hurricane Hanna	Non-reimbursable TC	9/15/2008	Completed	200,000	100%	> 80%
HA-T1156	Capacity Building for Sustainable Management of the Flood Early Warning System	Non-reimbursable TC	12/17/2012	Active	440,000	30%	> 80%
JA-T1008	Emergency Assistance due to Hurricane Ivan	Non-reimbursable TC	9/16/2004	Completed	200,000	100%	> 80%
JA-T1019	Natural Hazard Management in Urban Coastal Areas	Non-reimbursable TC	12/18/2007	Completed	712,779	100%	> 80%
JA-T1025	Emergency Assistance Due to Hurricane Dean	Non-reimbursable TC	8/23/2007	Completed	200,000	100%	> 80%
JA-T1056	Developing design concepts for climate change resilient buildings	Non-reimbursable TC	7/11/2011	Active	400,000	88%	> 80%
SU-T1024	Emergency Assistance Due to Flooding in Southern Suriname	Non-reimbursable TC	5/12/2006	Completed	200,000	100%	> 80%
SU-T1035	Integrated Coastal Zone Management Plan	Non-reimbursable TC	12/12/2007	Completed	564,689	100%	> 80%
SU-T1054	Support for Improving Disaster Risk Managt for Climate-Resilient Development	Non-reimbursable TC	11/24/2010	Completed	293,048	100%	]60% - 80%]
TT-L1036	Flood Alleviation and Drainage Program	Investment Loan	12/4/2013	Active	120,000,000	0%	> 80%
TT-T1017	Improving the Delivery of Comprehensive Disaster Management	Non-reimbursable TC	9/7/2010	Completed	484,882	100%	> 80%
TT-T1034	Piloting the Integration of Coastal Zone Management & CC Adaptation in Tobago	Non-reimbursable TC	7/10/2012	Active	600,000	43%	> 80%
TT-T1038	Feasibility Studies for a Risk-Resilient Coastal Zone Management Program	Non-reimbursable TC	8/15/2013	Active	500,000	0%	> 80%
TT-T1043	Preparation for Flood and Alleviation Program in Trinidad and Tobago	Non-reimbursable TC	12/12/2013	Active	600,000	0%	> 80%
Sustainable Energy							
BA-L1020	Sustainable Energy Investment Program	Investment loan	12/10/2010	Active	10,000,000	21%	> 80%
BA-L1021	Support for Sustainable Energy Framework For Barbados (SEFB) II	PBL	11/2/2011	Completed	70,000,000	100%	]60% - 80%]
BA-L1022	Support for Sustainable Energy Framework for Barbados (SEFB) I	PBL	9/15/2010	Completed	45,000,000	100%	]60% - 80%]

Operation number	Operation name	Operation type	Approval date	Operation status	Current approved amount (US$)	% disb. (Jan, 2014)	Climate change content
BA-L1025	Public Sector Smart Energy (PSSE) Program	Investment loan	6/25/2012	Active	17,000,000	0%	> 80%
BA-T1007	Sustainable Energy Framework for Barbados	Non-reimbursable TC	2/3/2009	Completed	998,441	100%	> 80%
BA-T1008	Support Studies for the Upgrade and Expansion of the Natural Gas Network	Non-reimbursable TC	12/10/2009	Completed	485,000	100%	> 80%
BA-T1016	Support to the Preparation of Program BA-L1021	Non-reimbursable TC	5/23/2011	Active	1,000,000	93%	> 80%
BA-X1001	Support to the Sustainable Energy Framework for Barbados	Investment grant	3/10/2010	Active	1,000,000	10%	> 80%
BA-X1003	Support for the Public Sector Smart Energy Program	Non-reimbursable TC	6/25/2013	Active	7,664,000	0%	> 80%
BH-T1012	Strengthening the Energy Sector in the Bahamas	Non-reimbursable TC	12/17/2008	Completed	690,730	100%	]40% - 60%]
BH-T1016	Promoting Sustainable Energy in the Bahamas	Non-reimbursable TC	1/22/2009	Completed	747,788	100%	> 80%
BH-X1001	Implementing Sustainable Energy Projects in the Bahamas	Investment grant	10/15/2009	Active	1,000,000	83%	> 80%
BH-X1002	Promotion of Energy Efficient Residential Lighting	Investment grant	9/21/2009	Completed	436,135	100%	> 80%
DR-L1026	Electricity Distribution Network Rehabilitation Project	Investment loan	10/29/2008	Active	70,000,000	72%	]40% - 60%]
DR-L1049	Bani Wind Power Project	Private sector investment	7/13/2011	Active	27,600,000	0%	> 80%
DR-L1051	PECASA Wind Power Project	Private sector investment	7/13/2011	Active	50,700,000	0%	> 80%
DR-T1036	Support to Renewable Energy and Bioenergy Programs	Non-reimbursable TC	9/20/2011	Active	750,000	64%	> 80%
DR-T1043	Energy Efficiency analysis in Dominican Republic	Non-reimbursable TC	6/21/2010	Completed	116,764	100%	> 80%
DR-T1063	Biodiesel for Jatropha Project	Non-reimbursable TC	9/30/2009	Completed	134,075	100%	> 80%
GY-G1004	Sustainable Energy Program for Guyana	Investment Grant	7/12/2013	Active	5,000,000	0%	]0% - 20%]
GY-L1014	Power Sector Support Program	PBL	12/12/2007	Completed	12,000,000	100%	]60% - 80%]
GY-L1037	Sustainable Operation of the Electricity Sector and Improved Quality of Service	Investment loan	9/7/2011	Active	5,000,000	62%	]60% - 80%]
GY-T1041	Expanding Bioenergy Opportunities in Guyana	Non-reimbursable TC	4/1/2008	Completed	71,117	100%	> 80%
GY-T1061	Expanding Bioenergy Opportunities in Guyana	Non-reimbursable TC	4/1/2008	Completed	649,989	100%	> 80%
GY-T1075	Amaila Falls Hydroelectric Project Preparation Studies	Non-reimbursable TC	7/7/2010	Active	1,210,000	98%	> 80%
HA-L1014	Rehabilitation of Electricity Distribution System in Port au Prince	Investment loan	12/6/2006	Active	18,090,000	77%	]20% - 40%]

Operation number	Operation name	Operation type	Approval date	Operation status	Current approved amount (US$)	% disb. (Jan, 2014)	Climate change content
HA-L1032	Peligre Hydroelectric Plant Rehabilitation Program	Investment loan (grant)	12/2/2008	Active	12,500,000	97%	> 80%
HA-L1035	Rehabilitation of the Electricity Distribution System in Port-au-Prince	Investment loan (grant)	7/21/2010	Active	14,000,000	4%	> 80%
HA-L1038	Supplementary Financing for the Peligre Hydroelectric Plant	Investment loan (grant)	12/14/2011	Active	20,000,000	6%	]60% - 80%]
HA-T1040	Support for Port-au-Prince Electrical Distribution Rehabilitation Program	Non-reimbursable TC	4/28/2006	Completed	247,509	100%	]40% - 60%]
HA-T1058	Support for Design EDH's Mid Term Investment Plan	Non-reimbursable TC	12/18/2007	Completed	550,000	100%	> 80%
HA-T1077	Bioenergy Action Plan	Non-reimbursable TC	8/26/2010	Active	429,000		> 80%
HA-T1080	Support to the Design of the HA-L1035 Program	Non-reimbursable TC	12/8/2009	Completed	589,812	100%	> 80%
HA-T1094	Support for Design EDH's Mid Term Investment Plan	Non-reimbursable TC	12/18/2007	Completed	200,000	100%	> 80%
HA-T1150	Artibonite 4C Hydroelectric Project - Studies	Non-reimbursable TC	5/22/2012	Active	1,500,000	25%	> 80%
HA-T1176	Sustainable Energy for Haiti	Non-reimbursable TC	5/22/2013	Active	500,000	2%	> 80%
HA-T1178	Sustainable Energy for Haiti	Non-reimbursable TC	5/22/2013	Active	500,000	4%	> 80%
HA-T1183	Sustainable Energy for Haiti	Non-reimbursable TC	5/22/2013	Active	2,000,000	5%	> 80%
HA-X1018	GEF Emergency Program for Solar Power Generation and Lighting	Investment grant	3/16/2010	Completed	500,000	100%	> 80%
HA-X1019	SECCI: Emergency Program for Solar Generation	Investment grant	3/1/2010	Active	1,000,000	96%	> 80%
JA-L1025	Energy Efficiency and Conservation Programme	Investment loan	11/17/2011	Active	20,000,000	7%	> 80%
JA-L1045	Caribe Hospitality Kingston	Private sector investment	12/18/2012	Active	6,750,000	0%	]0% - 20%]
JA-T1031	Support to Promote Energy Efficiency, Energy Conservation and Sustainable Energy	Non-reimbursable TC	12/10/2009	Active	593,000	88%	]60% - 80%]
JA-T1044	Energy Efficiency and Conservation Technical Assistance	Non-reimbursable TC	6/12/2009	Completed	349,030	100%	> 80%
JA-X1001	Wind and Solar Development Program	Investment grant	9/24/2009	Active	750,000	99%	> 80%
SU-G1001	Development of Renewable Energy, Energy Efficiency and Electrification	Investment grant	4/11/2013	Active	4,400,000	0%	> 80%
SU-L1009	Support to Improve Sustainability of the Electricity Service	Investment loan	11/6/2013	Active	30,000,000	0%	]40% - 60%]
SU-T1002	Power Sector Assessment and Alternatives for its Modernization	Non-reimbursable TC	12/20/2004	Completed	197,540	100%	> 80%

Operation number	Operation name	Operation type	Approval date	Operation status	Current approved amount (US$)	% disb. (Jan, 2014)	Climate change content
SU-T1042	Support to the Energy Sector: Renewable and Bioenergy	Non-reimbursable TC	11/30/2009	Completed	399,805	100%	> 80%
TT-L1023	Sustainable Energy for Trinidad and Tobago	PBL	11/8/2011	Completed	60,000,000	100%	> 80%
TT-T1027	Support to the preparation of the Sustainable Energy Program (TT-L1023)	Non-reimbursable TC	11/14/2011	Active	720,000	76%	]60% - 80%]
			Transport				
BL-L1010	Emergency Road Rehabilitation Program Flooding Tropical Depression	PBL	4/7/2009	Completed	5,000,000	100%	> 80%
BL-L1013	Flood Mitigation Infrastructure Program for Belize City	Investment loan	9/7/2011	Active	10,000,000	19%	> 80%
BL-T1050	Support to sustainable urban infrastructure systems in Belize City	Non-reimbursable TC	7/7/2011	Active	450,000	36%	> 80%
DR-T1065	Support to the SIRA of Santo Domingo's Metro	Non-reimbursable TC	8/5/2009	Completed	995,198	100%	> 80%
DR-T1102	MEPYD strengthening in freight logistics and transport economics	Non-reimbursable TC	12/4/2013	Active	500,000	0%	> 80%
HA-L1086	Emergency Road Rehabilitation Program in Response to Hurricane Sandy	PBL (grant)	12/18/2012	Active	17,500,000	63%	> 80%
JA-L1015	Emergency Assistance in Response to Flood Damage	PBL	2/4/2008	Completed	9,999,781	100%	> 80%
JA-L1016	Transportation Infrastructure Rehabilitation Program	Investment loan	10/8/2008	Active	50,000,000	82%	]60% - 80%]
JA-T1051	Flood Risk Management in the Highway 2000 Corridor	Non-reimbursable TC	12/9/2009	Completed	275,000	100%	> 80%
			General				
DR-L1038	BHD Bank Lending Facility	Private sector investment	12/7/2009	Completed	17,500,000	100%	]60% - 80%]
GY-G1002	Institutional Strengthening in support of Guyana LCDS	Investment grant	2/1/2012	Active	5,940,000	51%	> 80%
GY-L1039	Environment sector strengthening-I	PBL	12/4/2013	Completed	16,920,000	100%	> 80%
GY-T1068	Supporting Guyana's Low Carbon Development Strategy	Non-reimbursable TC	9/17/2009	Completed	314,978	100%	> 80%
HA-L1006	Institutional Strengthening for Environmental Management	Investment loan	10/21/2005	Completed	4,691,594	100%	> 80%
JA-T1068	PPCR in Jamaica Phase I	Non-reimbursable TC	5/23/2011	Completed	507,000	100%	> 80%
TT-L1022	Program to Support the Climate Change Agenda I	PBL	12/2/2011	Completed	80,000,000	100%	> 80%
TT-T1016	Mainstreaming climate change into national development	Non-reimbursable TC	6/7/2010	Completed	269,082	100%	> 80%
TT-T1033	Understanding the Economics of Climate Adaptation (ECA)	Non-reimbursable TC	7/12/2012	Active	360,000	75%	> 80%

Operation number	Operation name	Operation type	Approval date	Operation status	Current approved amount (US$)	% disb. (Jan, 2014)	Climate change content
TT-T1035	Institutional Strengthening of the EMA in Relation to Climate Change	Non-reimbursable TC	8/13/2012	Active	350,000	1%	> 80%

Source: OVE.

Table D.6. OVE-identified regional climate change portfolio directly benefitting the nine CSIDS

Operation number	Operation name	Operation type	Approval date	Operation status	Current approved amount (US$)	% disbursed (Apr, 2014)	CSIDS involved
Agriculture and LULUCF							
RG-T1151	BPR 38: Sustainable Management of the Amazonas' Biodiversity	TC - Strengthen institutions	6/22/2005	Completed	1.859.257	100%	Guyana, Suriname
RG-T1201	Management of the Trinational Selva Maya Ecosystem (ME-GU-BE)	TC - Knowledge	12/14/2006	Completed	800.000	100%	Belize
RG-T1274	Monitoring and Evaluation Biodiversity Program for Central America	TC - Knowledge	12/18/2007	Completed	642.209	100%	Belize
RG-T1655	Adaptation of Coffee Planting to Climate Change	TC - Knowledge	6/30/2010	Active	770.000	84%	Dominican Republic
RG-T1794	Technology Innovation Strategy for mititgating food price impact in Central America	TC - Knowledge	8/12/2010	Completed	1.000.000	100%	Belize, Dominican Republic
RG-T1813	Database Management System For A Regional Integrated Observing Network For Envir	TC - Knowledge	12/8/2010	Active	600.000	85%	Belize, Dominica, St. Lucia, and Guyana
RG-T2012	Development and Strengthening of Official Environmental Statistics	TC - Knowledge	12/8/2011	Active	1.300.000	6%	The Bahamas, Dominican Republic, Jamaica, Suriname
RG-T2331	Establishment of Priority Ecosystems for the Biodiversity and Ecosystem Services	TC - Knowledge	6/20/2013	Completed	418.000	100%	Guiana Shield and Caribbean Large Marine Ecosystem
RG-X1206	Strengthening small producers of organic bananas	TC - Stand-alone project	10/17/2013	Active	399.906	0%	Dominican Republic
RS-T1239	Strategic Environmental Studies for Guyana and Suriname	TC - Knowledge	10/11/2006	Completed	240.000	100%	Guyana, Suriname
Disaster Risk Reduction and Coastal Zone Management							
RG-L1006	Grenada Reconstruction, Recovery and Development Program	Loan through CDB	6/29/2005	Completed	9.923.013	100%	Grenada
RG-T1205	Regional Disaster Risk Management for Sustainable Tourism in the Caribbean	TC - Knowledge	11/1/2006	Completed	757.959	100%	Caribbean
RG-T1478	Development of Natural Disaster Risk Transfer Programs	TC - Strengthen Institutions	1/13/2009	Active	1.000.000	75%	Dominican Republic

Operation number	Operation name	Operation type	Approval date	Operation status	Current approved amount (US$)	% disbursed (Apr, 2014)	CSIDS involved
RG-T1579	Application and Update of the Indicators of Disaster Risk and Risk Management	TC - Knowledge	10/3/2008	Completed	718.104	100%	The Bahamas, Barbados, Dominican Republic, Guyana, Jamaica, and Trinidad and Tobago
RG-T1587	Country Risk Evaluations and Indicators of Disaster Risk and Risk Management	TC - Knowledge	11/20/2008	Completed	988.821	100%	Belize
RG-T1677	Monitoring & Evaluation Framework for Disaster Risk Management in Tourism Sector	TC - Knowledge	12/11/2009	Completed	342.782	100%	Caribbean
RS-T1095	Emergency Assistance for OECS Countries Affected by Hurricane Ivan	TC - Stand-alone project	9/22/2004	Completed	200.000	100%	Caribbean
RS-T1319	Mainstreaming Disaster Risks Management in OECS Countries	TC - Strengthen institutions	9/11/2008	Completed	313.737	100%	Caribbean
TC0002034	Adaptation for Climate Change and Disaster Mitigation in the Caribbean	TC - Knowledge	10/22/2004	Completed	189.959	100%	Caribbean
			Sustainable Energy				
RG-L1028	Caribe Hospitality LEED Financing Facility	Private sector facility	-	-	42.000.000	-	Caribbean
RG-T1431	Caribbean Hotel Energy Efficiency Action Program	TC - Knowledge	1/22/2009	Completed	1.000.000	100%	The Bahamas, Barbados, Belize, Dominican Republic, Guyana, Haiti, Jamaica, Suriname, Trinidad and Tobago
RG-T1555	Support to the Caribbean Sustainable Energy Road Map	TC - Knowledge	6/14/2010	Completed	391.051	100%	Caribbean
RG-T1639	Energy Efficiency and Renewable Energy Project for CARILEC	TC - Strengthen institutions	2/20/2009	Completed	537.100	100%	The Bahamas, Barbados, Guyana, Jamaica, Suriname, Trinidad and Tobago, and OECS
RG-T1886	Assessment of the potential for Distributed Generation using Renew. Ener. & EE	TC - Knowledge	10/23/2010	Active	958.000	63%	Belize
RG-T2022	Pilot Programme for Climate Change for the Caribbean Region (Phase 1 - SPCR) Developing wind energy investment for Latin America and the Caribbean	TC - Stand-alone project	6/27/2011	Completed	239.047	100%	Caribbean
RG-T2034	Developing wind energy investment for Latin America and the Caribbean	TC - Knowledge	11/10/2011	Active	1.000.000	60%	Dominican Republic
RG-T2058	Smart Grid and Its Application in Sustainable Cities	TC - Knowledge	3/7/2012	Completed	250.000	100%	Jamaica
RG-T2181	Increasing Renewable Energy Markets with Knowledge and Capacity Building	TC - Knowledge	12/19/2012	Active	750.000	3%	The Bahamas, Barbados, Belize, Guyana, Haiti, Jamaica, Suriname, Trinidad and Tobago
RG-T2179	BRIDGE in Sustainable Energy and Information and Communication Technologies	TC - Strengthen institutions	9/19/2013	Active	200.000	0%	Caribbean

Operation number	Operation name	Operation type	Approval date	Operation status	Current approved amount (US$)	% disbursed (Apr, 2014)	CSIDS involved
RG-T2243	Natural Gas in the Caribbean - Feasibility Studies	TC – Project preparation	5/3/2013	Active	1.000.000	39%	Caribbean
RG-T2376	Substitution of Fossil based Electricity Generation with Renewable Energy	TC - Knowledge	11/14/2013	Active	950.000	0%	Central America and Caribbean
RG-T2385	Updating of the Strategy for the Introduction of Natural Gas in Central America	TC - Strengthen institutions	9/6/2013	Active	980.000	28%	Belize
			Transport				
RG-T1660	Analysis of the Freight Logistics and Trade in Mesoamerica	TC - Knowledge	11/8/2010	Active	1.500.000	84%	Belize, Dominican Republic
RG-T2013	Mesoamerican Observatory on Freight Transport and Logistics	TC - Knowledge	12/12/2011	Active	910.000	11%	Belize, Dominican Republic
RG-T2275	Support for Definition, Development and Implementation of Natl Logistics Plans	TC - Knowledge	9/4/2013	Active	1.500.000	9%	Belize, Dominican Republic
RG-T2324	Support for Definition, Development and Implementation of Natl Logistics Plans	TC - Knowledge	9/4/2013	Active	1.000.000	2%	Belize, Dominican Republic
			General				
RG-L1051	Central American Mezzanine Infrastructure Fund II	Private sector loan	1/30/2013	Active	100.000.000	0%	The Bahamas, Barbados, Belize, Dominican Republic, Guyana, Haiti, Jamaica, Suriname, Trinidad and Tobago
RG-T1874	Climate Change and Indigenous Peoples of the Amazon	TC - Stand-alone project	12/15/2010	Active	882.300	100%	Guyana, Suriname
RG-T2357	Regional Support for the Development of Nationally Appropriate Mitigation Action	TC - Strengthen institutions	10/21/2013	Active	1.000.000	0%	Dominican Republic
RG-X1107	The Impact of Climate Change and Policy Options in CA and Dom.Rep.	TC - Knowledge	11/26/2012	Active	668.297	5%	Dominican Republic

Source: OVE.