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# REGIONAL ANALYSIS OF THE NATIONALLY DETERMINED CONTRIBUTIONS IN THE CARIBBEAN

Gaps and opportunities in the agriculture  
and land use sectors

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## Gaps and opportunities in the agriculture and land use sectors

Krystal Crumpler, Giulia Gagliardi, Alexandre Meybeck, Sandro Federici, Tanja Lieuw, Mario Bloise, Valentyna Slivinska, Olga Buto, Mirella Salvatore, Ignacia Holmes, Julia Wolf and Martial Bernoux

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# FOREWORD

**The Paris Agreement** seeks to limit global warming to below a 2°C rise above pre-industrial levels and pursue efforts to stay within 1.5°C. It also sets a global goal on adaptation within the context of sustainable development. Nonetheless, recent estimates indicate that mean temperature has already increased to 1.1°C, and if only current goals of NDCs are pursued, mean temperature could increase to nearly 3°C by 2100. It is with this in mind that FAO is developing a series of regional-level analyses of the NDCs to assess the current commitments and identify gaps and opportunities in the agriculture sectors for enhancing mitigation and adaptation ambitions ahead of the next round of revisions of the NDCs in 2020.

According to a FAO analysis, around 90 percent of the countries' NDCs refer to the agriculture sector. The study shows a strong commitment from FAO member nations for climate actions. FAO is providing support to countries with their NDC formulation and implementation, a line of work aligned to the FAO Climate Change Strategy.

FAO's Climate Change Strategy and Plan of Action has three outcomes:

- 1 Enhanced capacities of Member Nations on climate change through FAO leadership as a provider of technical knowledge and expertise.
- 2 Improved integration of food security, agriculture, forestry and fisheries within the international agenda on climate change through reinforced FAO engagement.
- 3 Strengthened coordination and delivery of FAO work on climate change.

The following are key findings of this publication related to the agricultural sector<sup>1</sup> and NDC in the Caribbean:

- ▶ All countries in the Caribbean, with the exception of one,<sup>2</sup> communicated an adaptation component in their NDCs, all of which include the agriculture and land use sectors.
- ▶ All countries with an adaptation component include at least one policy or measure related to institutions and governance.
- ▶ All countries with an adaptation component include at least one policy or measure in ocean and coastal zone ecosystems.
- ▶ Eighty-five percent of countries with an adaptation component include at least one policy or measure targeting water resource use and management.
- ▶ Ninety-two percent of countries with an adaptation component include at least one policy or measure targeting land and soil resource use and management.
- ▶ Ninety-two percent of countries with an adaptation component in the region include at least one policy or measure related to socio-economics and well-being.
- ▶ Sixty-two percent of all countries report at least one priority need for implementing climate action in the agriculture and land use sectors, primarily for adaptation (80 percent of needs) rather than for mitigation (20 percent).

Addressing agriculture in national responses to climate change and the achievement of the Sustainable Development Goals (SDGs) are mutually reinforcing. Agriculture is uniquely placed to deliver simultaneously on climate and development. This is particularly true for the core goals of eradicating poverty and hunger, SDGs 1 and 2. The region's food and nutrition security is very vulnerable, given the

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<sup>1</sup> For the purpose of this document, the "agricultural sector" comprise crops, livestock, fisheries and aquaculture, and forestry.

<sup>2</sup> Trinidad and Tobago includes adaptation measures in National Communications.



high occurrence of tropical storms, floods and droughts.<sup>3</sup> FAO is therefore also focusing on lessons learned from disaster risk reduction and emergency responses to current hazards and support for long-term climate change adaptation and mitigation efforts.

FAO is committed to work closely with Caribbean member countries providing technical assistance and support to identify opportunities to raise ambitions and promote resilient and sustainable food systems, and to secure adequate food and nutrition for population. This report is part of this commitment, with the conviction that together we can achieve the increasingly ambitious goals needed to overcome one of the main challenges of our time.

**Julio Berdegúe**

Assistant Director-General

Office for Latin America and the Caribbean

A handwritten signature in black ink, appearing to read 'J. Berdegúe', enclosed within a simple, hand-drawn rectangular border.

---

<sup>3</sup> FAO. 2015. State of Food Security in the CARICOM Caribbean. Meeting the 2015 hunger targets: Taking stock of uneven progress.

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# ACRONYMS AND ABBREVIATIONS

<b>AFOLU</b>	Agriculture, Forestry and Other Land Use
<b>BAU</b>	Business-as-usual
<b>BUR</b>	Biennial update report
<b>CARICOM</b>	Caribbean Community
<b>CCA</b>	Climate Change Adaptation
<b>DRR/M</b>	Disaster Risk Reduction and Management
<b>FAO</b>	Food and Agriculture Organization of the United Nations
<b>GDP</b>	Gross domestic product
<b>GHG</b>	Greenhouse gas
<b>(I)NDC</b>	(Intended) Nationally Determined Contributions
<b>IPCC</b>	Intergovernmental Panel on Climate Change
<b>LULUCF</b>	Land Use, Land Use Change and Forestry
<b>NAMA</b>	Nationally Appropriate Mitigation Action
<b>NAP</b>	National Adaptation Plan
<b>NC</b>	National Communication
<b>NDC</b>	Nationally Determined Contributions
<b>NGHGI</b>	National greenhouse gas inventory
<b>SDG</b>	Sustainable Development Goal
<b>SIDS</b>	Small Island Developing States
<b>TNA</b>	Technical Needs Assessments
<b>UN</b>	United Nations
<b>UNEP</b>	United Nations Environment Programme
<b>UNFCCC</b>	United Nations Framework Convention on Climate Change
<b>UNSD</b>	United Nations Statistics Division
<b>USD</b>	United States Dollar
<b>2030 Agenda</b>	2030 Agenda for Sustainable Development

# CHEMICAL FORMULAE

**CO<sub>2</sub>**

Carbon dioxide




















































**Mt CO<sub>2</sub> eq**

Million tons of carbon dioxide equivalent

# EXECUTIVE SUMMARY

TABLE 1.

NDC CARIBBEAN SUMMARY TABLE

FAOSTAT COUNTRY NAME	MITIGATION IN AGRICULTURE SECTOR INCLUDED	MITIGATION IN LULUCF SECTOR INCLUDED	ADAPTATION IN AGRICULTURE INCLUDED	DRR/M <sup>4</sup> IN AGRICULTURE INCLUDED	GENDER MENTIONED	CO-BENEFITS MENTIONED	SDGs <sup>5</sup> MENTIONED	NAP <sup>6</sup> MENTIONED	LOSS AND DAMAGE MENTIONED
ANTIGUA AND BARBUDA									
BAHAMAS									
BARBADOS									
CUBA									
DOMINICA									
DOMINICAN REPUBLIC									
GRENADA									
HAITI									
JAMAICA									
SAINT KITTS AND NEVIS									
SAINT LUCIA									
SAINT VINCENT AND THE GRENADINES									
TRINIDAD AND TOBAGO									

<sup>4</sup> Disaster risk reduction and management (DRR/M).

<sup>5</sup> Sustainable Development Goals (SDG).

<sup>6</sup> National Adaptation Plan (NAP).

# 1.1 MITIGATION IN AGRICULTURE AND LAND USE SECTORS: GAPS AND OPPORTUNITIES

While the Caribbean contributes to less than 0.5 percent of global GHG emissions (WB–Open Data, undated), and is disproportionately impacted by climate change and variability, all countries are committed to mitigation in their NDCs. All but two countries,<sup>7</sup> representing 74 percent of economy-wide net emissions in the region, set a general GHG target. Without implementation of the NDCs, net emissions are expected to increase by around 30 percent in 2030 compared to 2015, rising from 121.2 Mt CO<sub>2</sub> eq. to 157.3 Mt CO<sub>2</sub> eq.

Under the mitigation scenario set forth in the NDCs, total net emissions in the region are expected to decrease by roughly 17 percent compared to the 2030 counterfactual scenario, or from 157.3 Mt CO<sub>2</sub> eq. to 131 Mt CO<sub>2</sub> eq. in 2030, which equates to a cumulated net reduction of -245.1 Mt CO<sub>2</sub> eq. over the implementation period. Around 80 percent of that reduction is conditional to international financial support.

The Agriculture, Forestry and Other Land Use (AFOLU) sector<sup>8</sup> represents the second largest share of emissions in the region (17 percent of emissions), after Energy (68 percent). Achieving the 36 percent reduction in net emissions by 2030 as set forth in country NDCs will largely depend on greater investment in and uptake of mitigation options in the agriculture and land use sectors.

Around 40 percent of countries in the region include mitigation in the agriculture sector and over half do in the LULUCF sector. Taken together, around 60 percent include mitigation in either the agriculture and/or land use sector. Sectoral mitigation contributions are primarily expressed as policies or measures in the case of agriculture, as well as GHG (Bahamas and Dominica) and non-GHG targets (Antigua and Barbuda) in the case of the LULUCF sector.

At the sub-sectoral level, mitigation on forest land is promoted most frequently (63 percent of countries with mitigation in agriculture and/or land use), followed by bioenergy production from agriculture (38 percent), and mitigation in livestock (38 percent), cropland (25 percent) and integrated systems (25 percent), amongst others.

The most significant GHG hotspots in the agriculture and land use sectors at the regional level are emissions from enteric fermentation, (35 percent of total emissions), followed by managed soils (23 percent), manure management (16 percent) and deforestation (12 percent). However, the LULUCF sector constitutes a net sink at the regional level, mainly from removals by forest management<sup>9</sup> (99.8 percent of total removals).

At the regional level, high to very high mitigation policy coverage gaps<sup>10</sup> are observed in relation to emissions from enteric fermentation and managed soils, as well as from deforestation and manure management.

---

<sup>7</sup> Antigua and Barbuda and Cuba.

<sup>8</sup> The AFOLU sector refers to the Agriculture and LULUCF sector as defined by IPCC (2006).

<sup>9</sup> Forest management accounts for total net emissions related to IPCC (2006) land use category “Forest land remaining forest land” and IPCC (1996) category “Changes in forest and other woody biomass,” when those categories are a net sink at national level.

<sup>10</sup> Only GHG hotspots identified for over a 10 percent share of countries are presented.

## 1.2 CLIMATE-RELATED IMPACTS IN ECOSYSTEMS AND SOCIAL SYSTEMS

Floods, storms, droughts and landslides are amongst the most frequently observed and/or projected climate-related hazards reported in the region. Climate-related water stress, soil erosion and salinization constitute the most frequently reported slow onset events in terrestrial and freshwater ecosystems, while sea level rise, sea surface temperature rise and coastal erosion are reported most frequently in marine and coastal ecosystems.

Out of all ecosystem types, ocean and coastal zones are considered the most vulnerable to climate-related impacts (77 percent of countries), followed by agro-ecosystems (69 percent), primarily in the crops and fisheries sector (54 and 46 percent of countries, respectively).

Water, land and soil resources are reported most frequently amongst natural resource-related impacts (85 percent each) across all ecosystems. Losses in primary production and productivity (80 percent), coastal erosion (69 percent), changes in water availability and quality (69 percent), pest and disease incidence (38 percent) and mangrove mortality and/or coastal reef degradation (38 percent) are amongst the most frequently reported climate-related impacts on ecosystem services.

Loss of productive infrastructure and assets, adverse health and loss of rural livelihoods and incomes constitute the most frequently reported climate-related risks in social systems (92, 92 and 69 percent, each), exacerbated by the underlying economic dependence on agriculture and natural resources reported as a non-climatic driver of vulnerability (61 percent) and challenging geography and topography (100 percent).

## 1.3 ADAPTATION IN ECOSYSTEMS: GAPS AND OPPORTUNITIES

All but one country<sup>11</sup> in the region communicated an adaptation component in their NDCs, all of which include the agriculture and land use sectors (92 percent of countries).

Adaptation in ocean and coastal zones is promoted by all countries with an adaptation component, with a focus on mangrove conservation and replanting (40 percent of countries with adaptation in ecosystems).

Adaptation in agro-ecosystems is promoted by eighty-five percent of countries with an adaptation component, primarily in forestry sector (69 percent of countries with adaptation in agro-ecosystems), followed by fisheries and aquaculture (54 percent) and crops (54 percent), livestock (38 percent) and integrated systems (23 percent).

Water resource use and management is promoted amongst eighty-five percent of countries with an adaptation component, primarily through irrigation and drainage measures. Eighty-five percent also include adaptation measures related to ecosystems and biodiversity management. And up to ninety-two percent include measures targeting land and soil resource use and management, primarily coastal zone management.

At the regional level, moderate adaptation policy coverage gaps are found in relation to the crops sub-sector and freshwater resources, as well as the control of pests and diseases and nutrient cycling. Moderate policy coverage gaps are also found in relation to inland water ecosystems and around climate-related storms, floods and wildfires.

<sup>11</sup> Trinidad and Tobago includes adaptation measures, however, in NC.

## 1.4 ADAPTATION IN SOCIAL SYSTEMS: GAPS AND OPPORTUNITIES

**All countries with an adaptation component include at least one policy or measure related to institutions and governance.** The majority of those countries promote policy mainstreaming and coherence (85 percent of countries with adaptation in social systems), followed by law and regulation (62 percent), institutional capacity building (54 percent), participatory governance and inclusion (31 percent), gender equality (25 percent), and land tenure reform and DRR (23 percent each), amongst others.

**Ninety-two percent of countries with an adaptation component in the region include at least one policy or measure related to socio-economics and well-being.** The majority of those countries promote resilient infrastructure and credit and insurance services (69 percent, respectively), followed by resilience and adaptive capacity building (62 percent), health information and services (31 percent), food security and nutrition (23 percent), disease management and prevention (23 percent) and poverty and inequality reduction (17 percent), amongst others.

**Eighty-five percent of countries with an adaptation component include measures related to knowledge and capacity.** The majority of those countries promote awareness raising and education, climate information services, and research and development (R&D) (60 percent each), followed by early warning systems, and hazard and vulnerability mapping (45 percent each), amongst others.

**A high adaptation policy coverage gap is found in relation to climate-related migration and displacement.** Low to moderate policy coverage gaps are also observed in relation to climate-related adverse health, rural livelihoods and income loss and gender and youth inequality.

## 1.5 SYNERGIES AND CO-BENEFITS

**Overall, 85 percent of countries in the Caribbean explicitly recognize the co-benefits of either mitigation or adaptation in the agriculture and land use sectors within their NDCs** – the majority from adaptation. Adaptation in forestry, as well as in ocean and coastal zones, represent the main areas where mitigation co-benefits are reported, while mitigation in forests, wetlands and integrated systems represent the main areas where adaptation and/or sustainable development co-benefits are most frequently referenced.

**Only 15 percent of countries in the region promote food loss and waste reduction-related measures** in their NDCs, either through prevention, recovery, or reuse.

**Alignment between the climate and sustainable development agenda presents a unique opportunity for countries to co-deliver.** After SDG 13 “Climate Action,” the greatest area of convergence between NDCs in the agriculture and land use sectors and the SDGs, are found around SDG targets 2.3 “Assure agricultural productivity for marginalized”, 8.1 “Sustainable economic growth”, 12.2 “Efficient use of natural resources”, 1.5 “Resilience of poor to climate events” and 15.3 “Restore degraded land and combat desertification”.

**Around two-thirds of countries in the region promote climate change adaptation measures that also contribute to the Sendai Framework for Disaster Risk Reduction,** with the greatest areas of convergence found around priority for action III “Investing in disaster risk reduction” (77 and 69 percent of countries with adaptation) and I “Understanding disaster risk” (69 percent). However, more can be done to strengthen disaster risk governance (priority II) and enhance disaster preparedness and “build back better” (priority IV) in the agriculture and land use sectors.



## 1.6 BARRIERS TO CLIMATE ACTION AND SUPPORT NEEDS

**Climate action in the agriculture and land use sectors will require rapid mobilization of financial resources, enhanced capacities and the transfer of technology in the region.** Over 90 percent of countries in the Caribbean reference capacity-building, financial and technology transfer support needs.

**Financial, human, institutional and organizational-related barriers are cited most frequently amongst factors impeding the implementation of sectoral climate action in the region** (63 percent of countries with barriers reported), followed by technical, informational, and legal and regulatory-related barriers are (50, 50 and 38 percent, respectively).

**Sixty-two percent of countries explicitly report at least one priority need for implementing climate action in the agriculture and land use sectors**, particularly in relation to adaptation and mitigation in forestry, ocean and coastal zones and water resources. Adaptation represents 80 percent of priority needs, as opposed to mitigation with a 20 percent share. Priority technology needs include data collection and management (15 percent of total technologies), climate information and early warning systems and mapping and monitoring (13 percent each) and irrigation and drainage (12 percent).

## 1.7 CONCLUSION

By highlighting the gaps in the coverage of mitigation and adaptation in the agriculture and land use sectors, as well as illustrating opportunities for enhancing climate action ambitions in the next round of NDCs, this analysis can serve as an important roadmap for informing programming and directing future investments in support of low-emission and climate-resilient agriculture and food systems in Latin America.

# INTRODUCTION

## BACKGROUND

**The Paris Agreement constitutes a landmark achievement in the international response to climate change, as developed and developing countries alike committed to do their part in the transition to a low-emission and climate-resilient future.** The Agreement seeks to limit global warming to below a 2°C rise above pre-industrial levels and pursue efforts to stay within 1.5°C, as well as sets a global goal on adaptation within the context of sustainable development. Underpinning the Agreement are the (Intended) Nationally Determined Contributions, (I)NDCs,<sup>12</sup> representing the main national policy framework, under the United Nations Framework Convention on Climate Change (UNFCCC), by which Parties communicate a commitment to act at the national level to mitigate greenhouse gas (GHG) emissions and adapt to changes in climate, report on progress made, and identify support where it is needed.

**The success of the Paris Agreement rests upon the enhanced ambition of Parties to progressively revise and strengthen their respective mitigation and adaptation plans over time.**<sup>13</sup> At the twenty-second Conference of Parties (COP) of UNFCCC, a facilitative dialogue<sup>14</sup> was convened to assess collective efforts made towards achieving the long-term goal of the Agreement, with the view of enhancing pre-2020 ambitions and the provision of means of implementation. In 2023, and every five years thereafter, Parties shall periodically take stock of the implementation of the Agreement to assess the collective progress towards achieving its purpose and long-term goals.<sup>15</sup> The outcome of the global stocktake shall inform Parties in updating and enhancing, in a nationally determined manner, their actions and support in accordance with the relevant provisions of this Agreement, as well as in enhancing international cooperation for climate action.

**The tracking of NDC implementation will take place under the Enhanced Transparency Framework,<sup>16</sup> which provides a foundation for building mutual trust and confidence.** The “Paris Rulebook” requires Parties to report reliable, transparent and comprehensive information on GHG emissions, climate actions and support, with built-in flexibility for developing countries under the principle of common but differentiated responsibilities and respective capabilities.<sup>17</sup>

**Linked to the Paris Agreement and NDCs are the 17 Sustainable Development Goals (SDGs) of the 2030 Agenda, which sets out a vision for a hunger-free, more equitable, sustainable, peaceful and resilient world in 2030.** Closing the emissions gap while safeguarding food security and pulling millions out of extreme poverty can only be achieved in a context of sustainable development, and sustainable development can only be achieved if coupled with a low-emissions and climate-resilient future.

**The agriculture and land use sectors<sup>18</sup> feature prominently in the NDCs,** with up to 86 and 97 percent of developing countries highlighting mitigation and adaptation in agriculture and land use, respectively (FAO, forthcoming). As such, FAO has a critical role to play in supporting Member Countries to leverage the mitigation and adaptation potential in the agriculture and land use sectors and harness their synergies, while “leaving no one behind.”

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<sup>12</sup> For the purpose of this document, the (I)NDCs and NDCs are collectively referred to as NDCs.

<sup>13</sup> Article 4.2 of the Paris Agreement.

<sup>14</sup> Talanoa dialogue decision 1/CP.22, paragraph 16 (COP22, Fiji).

<sup>15</sup> Article 14 of the Paris Agreement.

<sup>16</sup> Article 13 of the Paris Agreement.

<sup>17</sup> Modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement (FCCC/CP/2018/L.23).

<sup>18</sup> For the purpose of this document, the ‘agriculture sectors’ comprise crops, livestock, fisheries and aquaculture, and forestry.

# OBJECTIVE

FAO recognizes that its goals to eliminate hunger, food insecurity and malnutrition, reduce rural poverty, and make agriculture, forestry and fisheries more productive and sustainable cannot be fulfilled without decisive action on climate change (FAO, 2013a). Building on its longstanding leadership as a provider of technical knowledge and expertise on sustainable food and agriculture, FAO is committed to supporting member countries prepare for and respond to the adverse impacts of climate change. FAO's Climate Change Strategy outlines its commitment to enhancing countries' institutional and technical capacity to plan and implement NDCs; to improving the integration of food security, agriculture, forestry and fisheries within the international climate agenda; and to strengthening the coordination and delivery of FAO's work (FAO, 2017a).

**It is with this in mind that FAO is developing a series of regional-level analyses of the NDCs to assess the current commitments and identify gaps and opportunities in the agriculture and land use sectors** for enhancing mitigation and adaptation ambitions ahead of the next round of revisions of the NDCs in 2020. At COP 22, FAO launched an extensive global analysis of the NDCs, evidencing the significant role of the agriculture and Land Use, Land Use Change and Forestry (LULUCF) sectors<sup>19</sup> in the NDCs (FAO, 2016a). In 2016, FAO assessed the main challenges countries face when moving from NDC planning to implementation and identified five priority areas for international support in the agriculture and land use sectors (FAO, 2016b). To date, FAO has published regional analyses of the NDCs in Eastern Africa (FAO, 2017b), Central Asia and Eastern and Southern Europe (FAO, 2019a), Asia (FAO, 2020a), the Pacific (FAO, 2020b) and the Caribbean (FAO, 2020c).

**This report provides a unique, sector-specific synthesis of the NDCs in the Caribbean.** It summarizes the substantial contributions already put forward by countries, opportunities for further action and the gaps, barriers and needs that will need to be addressed if the agriculture and land use sectors in the Caribbean are to raise mitigation and adaptation ambitions. The findings of this report will help member countries to reflect on their progress in advancing toward NDC priorities for agriculture and land use and associated national climate goals including related targets under the SDGs. The analysis also helps to make clear the links between the NDCs from the region and the Sendai Framework for Disaster Risk Reduction (SFDRR). Finally, the report serves as a guide to FAO, as well as other international actors, for the support that will be required to help countries in the region move forward to implement agriculture sector priorities in their NDCs and ensure that future commitments from the agriculture sector are quantifiable, verifiable and sufficiently ambitious.

**The report is divided into six chapters:**

**Chapter 1** describes the geographical scope, data sources and methodological approach underlying the analysis.

**Chapter 2** provides an overview of the regional and sub-regional trends driving emission trajectories, climate vulnerabilities, adaptive capacities and food security and nutrition outcomes in the region.

**Chapter 3** presents a common framework for the synthesis and analysis of the NDCs in the agriculture and land use sectors. It reflects the heterogeneous nature of country commitments and illustrates regional trends. It analyzes the scope, specificity, measurability and timeline of the mitigation and adaptation contributions in the agriculture and land use sectors. The data informs the gap and opportunity analysis in Chapter 4.

<sup>19</sup> For the purposes of this document, the Agriculture and LULUCF sectors, as defined by Intergovernmental Panel on Climate Change (IPCC), are also collectively referred to as the "agriculture sectors."

**Chapter 4** describes the results of the gap and opportunity analysis of the mitigation and adaptation contributions in the agriculture and land use sectors to support the NDC revision process and ambition-building mechanism of the Paris Agreement.

**Chapter 5** assesses the opportunities for capturing adaptation and mitigation co-benefits, as well as leveraging synergies between climate actions in the agriculture and land use sectors and the 2030 Agenda for Sustainable Development and Sendai Framework for Disaster Risk Reduction.

**Chapter 6** presents key messages and policy recommendations.



# CHAPTER 1



# METHODOLOGY

## 1.1 GEOGRAPHIC SCOPE

The Caribbean Region comprises of 28 insular states bordering the Caribbean Sea and the Gulf of Mexico.<sup>20</sup> The Caribbean Community (CARICOM) is a grouping of twenty countries: fifteen Member States and five Associate Members.<sup>21</sup> The main difference between the Caribbean region and the CARICOM is the inclusion of mainland countries Suriname and Guyana as CARICOM member states. The CARICOM comprises 16 of the 28 insular states in the Caribbean. For this analysis, the Caribbean refers to the following 13 countries: Antigua and Barbuda, Bahamas, Barbados, Cuba, Dominica, Dominican Republic, Grenada, Haiti, Jamaica, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, all of which are classified as Small Island Developing State (SIDS) (UNSD, undated). The assignment of countries or areas to specific groupings is for statistical convenience and does not imply any assumption regarding political or other affiliation of countries or territories by the UN.

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<sup>20</sup> Caribbean territories: Anguilla, Antigua and Barbuda, Aruba, Bahamas, Barbados, Bonaire, Sint Eustacius and Saba, British Virgin Islands, Cayman Islands, Cuba, Curacao, Dominica, Dominican Republic, Grenada, Guadeloupe, Haiti, Jamaica, Martinique, Montserrat, Puerto Rico, Saint Barthélemy, Saint Kitts and Nevis, Saint Lucia, Saint Martin, Saint Vincent and the Grenadines, Sint Maarten, Trinidad and Tobago, Turks and Caicos Islands, United States Virgin Islands.

<sup>21</sup> [www.caricom.org](http://www.caricom.org). Members are: Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Haiti, Jamaica, Montserrat, Saint Lucia, Saint Kitts and Nevis, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago. Associate Members are: Anguilla, Bermuda, British Virgin Islands, Cayman Islands, Turks and Caicos Islands.



## 1.2 DATA

This analysis is based on the information reported in the latest NDCs, National Communications (NCs), Biennial Update Reports (BURs) and Technical Needs Assessments (TNAs) of 13 non-Annex I Parties to the UNFCCC as of 1 December 2019. **Annex 1** contains a list of the documents assessed.

## 1.3 COMMON FRAMEWORK

A common framework was developed to facilitate the synthesis and analysis of the NDCs in the agriculture and land use sectors. The NDCs are the product of diverse national capacities and processes, meaning they vary greatly in terms of format, scale and detail. The framework provides a structure for assessing the clarity, measurability, transparency and ambition of NDCs over time. The common framework was based on a stocktaking of the NDCs to quantify and qualify the types of climate change mitigation and adaptation contributions in the agriculture and land use sectors by means of a common set of categories and sub-categories.<sup>22</sup>

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<sup>22</sup> The full methodological notes are contained in a separate publication (FAO, 2019b).

# CHAPTER 2



# REGIONAL CIRCUMSTANCES

Understanding the environmental, economic and socio-economic variables driving GHG emissions and climate-related vulnerabilities in the region is critical for identifying context-specific adaptation and mitigation options that simultaneously support – rather than limit – food security and nutrition and sustainable development objectives. Indeed, most countries refer to their specific national circumstances when outlining why their NDCs are fair and ambitious. This section provides an overview of the regional trends driving and conditioning emission trajectories, climate vulnerabilities, adaptive capacities and food security and nutrition outcomes in the region.

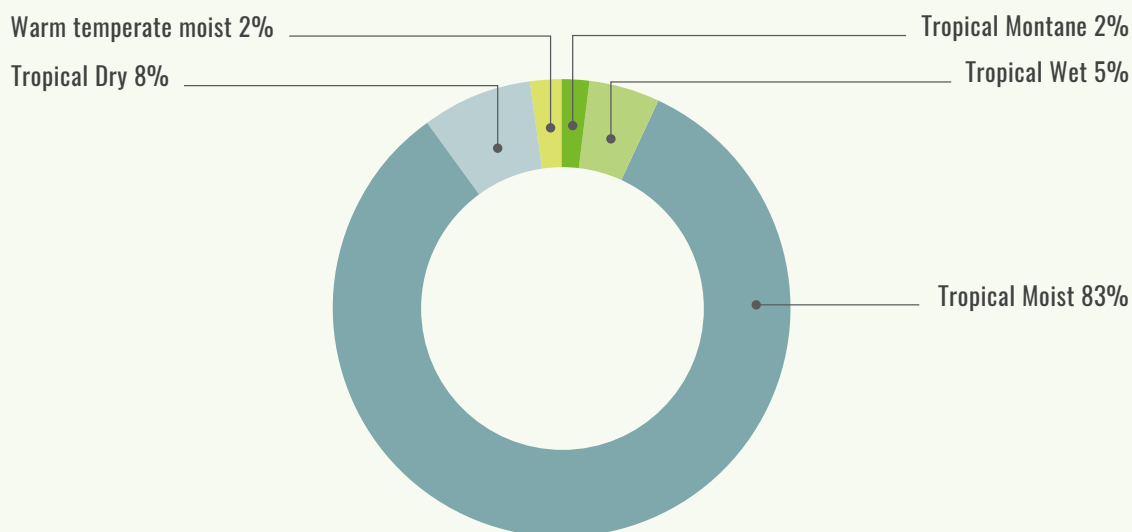
## 2.1 CLIMATE AND NATURAL RESOURCES

Caribbean countries are in the tropics, generally between latitudes 11 and 18 degrees north, from Trinidad and Tobago in the South to the Bahamas in the North. The topography is generally rugged and mountainous with small areas of flat land in coastal areas. Several islands are volcanic in origin, while others are comprised primarily of coral.<sup>23</sup> Climate zones in the Caribbean are a mix of different tropical zones and a smaller share of warm temperate moist. Tropical zones are differentiated by montane (2 percent of total land area), wet (5 percent), moist (83 percent) and dry areas (8 percent), while temperate zones are classified as warm moist (2 percent) (JRC, 2010). **Figure 1** illustrates the major climate zones in the Caribbean by share of total area.

<sup>23</sup> UNEP (United Nation Environment Programme), 2008. Climate Change in the Caribbean and the Challenge of Adaptation. UNEP Regional Office for Latin America and the Caribbean, Panama City, Panama.

FIGURE 1.

## MAJOR CLIMATE ZONES IN THE CARIBBEAN (SHARE OF TOTAL AREA)



Average annual temperatures have remained relatively stable between 1991 and 2015 with an average annual mean temperature ranging between 25.5°C and 26.4°C (WB-Open Data, undated).

Annual precipitation varies substantially between the countries, with an average long-term average of 1687 mm between 1988 and 2017. The lowest amount of average annual precipitation (period of 1988 and 2017) recorded was in Antigua and Barbuda of 1030 mm and the highest record was almost double in Grenada of 2350 mm.<sup>24</sup>

The Caribbean is affected by a diverse set of natural disasters. The most frequently occurring natural hazards and catastrophic events are: hurricanes and tropical storms, drought, storm surges and riverine floods, landslides and tsunamis. Natural disasters can cause severe environmental, infrastructural and economic losses, with countries such as the Bahamas, the Cayman Islands, Dominica, Haiti, and Jamaica particularly at risk (FAO and CDB, 2019).

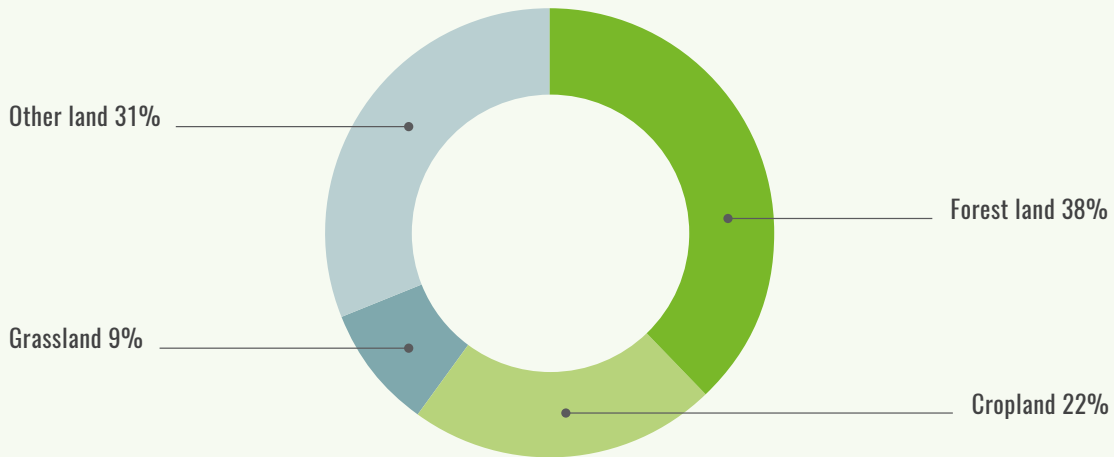
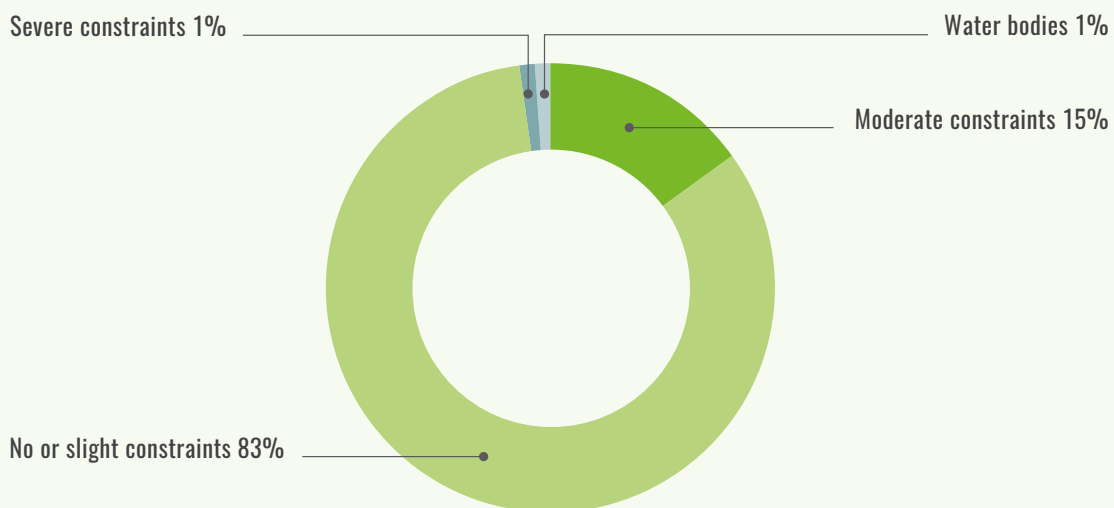
The Caribbean region is also characterized by fragile terrestrial, marine and coastal ecosystems and a high biological diversity. The high level of endemism is attributed to its insularity with an isolated evolutionary pattern that allows speciation. Of vertebrates, excluding fishes, 54 percent are thought to be endemic, as are 59 percent of plants (UNEP, 2005). The region is also home to a number of rare and globally significant endangered species. The small size and significant endemic biological diversity of the islands' ecosystems make for a very fragile environment. The ecological fragility is exacerbated by the constraints of a limited land resource base and the interdependence of the economy and the environment. For example, coral reefs are considered to be among the most fragile; however, they are the most important for tourism and for fisheries, and they also protect against coastal erosion. Equally worrisome is the rapid conversion of agricultural lands to urbanization and uses that are essentially irreversible (UNEP, 2008).

Total land area of the region amounts to 20.91 million ha or 0.2 percent of global land area. Land cover is distributed across forest land (38 percent), cropland (22 percent), grassland (9 percent) and other land uses (31 percent). Per capita share of arable land in the region averages 0.07 ha compared to the global average of 0.84 ha.<sup>25</sup> **Figure 2** shows the distribution of different land uses in the region, by share of total area.

<sup>24</sup> Data refers to year 2017 (FAO, undated).

<sup>25</sup> Data refers to year 2015. Other land use refers to wetlands, settlements and other land automatically calculated.

Around 83 percent of total land area in the region is considered suitable for agriculture, or associated with no or slight soil constraints, as measured by soil depth and quality. On the other hand, around 16 percent of land is either moderately or severely constrained (15 and 1.5 percent of total land area, respectively), marked by poor natural fertility. **Figure 3** shows the suitability of the land for agriculture by share of total area.

**FIGURE 2.****LAND USES IN THE CARIBBEAN, BY TYPE (SHARE OF TOTAL AREA)****FIGURE 3.****LAND AREA SUITABLE FOR AGRICULTURE IN THE CARIBBEAN, BY TYPE OF CONSTRAINT (SHARE OF TOTAL AREA)**

Available freshwater in the Caribbean SIDS is considerably less than in oceanic islands. Average total renewable water resources per capita in the region is 1833 m<sup>3</sup> per year (FAO, undated).<sup>26</sup> At current population levels, the available water supply in some of the Caribbean SIDS is significantly lower than the international limit of 1 000 m<sup>3</sup> per capita per year below which a country is classified as 'water scarce'.

<sup>26</sup> Data refers to year 2015.

This limit places Antigua and Barbuda (566 m<sup>3</sup> per capita per year), Barbados (282 m<sup>3</sup> per capita), St. Kitts and Nevis (432 m<sup>3</sup> per capita) and St. Vincent and the Grenadines (913 m<sup>3</sup> per capita) in the category of water-scarce countries (FAO, undated).<sup>27</sup>

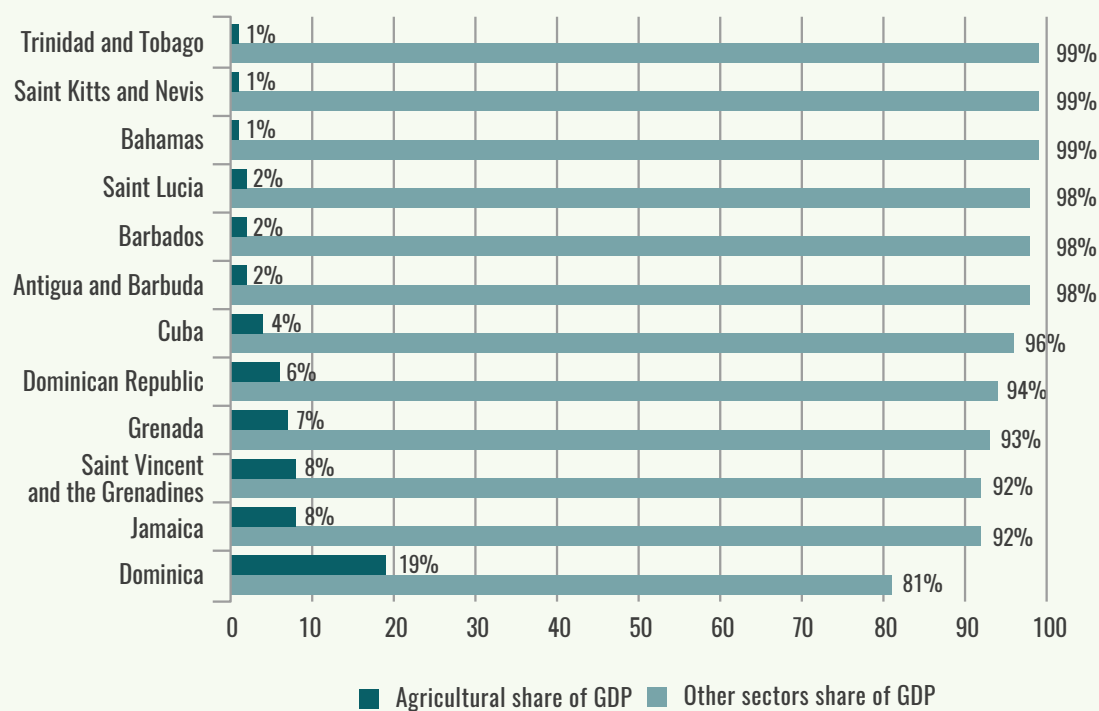
Average water withdrawal for agriculture represents a 10 percent share of total annual renewable resources. Barbados has a share of 69 percent whilst Dominica, Saint Kitts and Nevis, Saint Vincent and the Grenadines and Trinidad and Tobago this is less than 1 percent.

## 2.2 FARMING SYSTEMS

The contribution of agriculture to Caribbean GDP is 12.4 percent on average (more or less equal to the global average), but the importance of the sector varies widely across the subregion, from 19 percent in Dominica and 17 percent in Haiti<sup>28</sup> to as low as 1 percent in Trinidad and Tobago, Bahamas and Saint Kitts and Nevis (FAOSTAT, undated). The sector is a significant export earner and source of livelihood in several countries, accounting for 30 percent of employment, particularly in rural areas such as in Haiti, where agriculture account to 47 percent of employment (FAOSTAT, undated). Farmers now make up the traditional small subsistence farming population which typifies Caribbean agriculture, and which uses traditional farming methods, typically labour intensive, rain-fed systems (UNEP, 2008). There are marked differences between farming systems oriented towards the domestic market and those oriented towards export. **Figure 4** illustrates the share of agriculture in total GDP for each country in the Caribbean, from lowest to highest.

**FIGURE 4.**

### AGRICULTURAL SHARE OF GDP IN THE CARIBBEAN, BY COUNTRY (SHARE OF TOTAL)



<sup>27</sup> Data refers to year 2015.

<sup>28</sup> There is no data on the contribution of Agriculture to the GDP for Haiti in FAOSTATS, but other references suggests the share of 17 percent, see FAO and CDB. 2019. Study on the State of Agriculture in the Caribbean Rome. 212 pp.

## 2.2.1 Domestic agriculture

Domestic agriculture consists primarily of livestock, vegetables, spices and non-traditional export crops (such as fruits and vegetables).<sup>29</sup> This type of agriculture is the characteristic occupation of the subregion's small subsistence farmers who occupy less than two hectares of land on average, scattered on hilly terrains with little or no access to proper roads, irrigation systems and other basic amenities for farming. It was identified that 55 percent of cultivated area in the Caribbean are small farms less than 2 ha in size (FAO, 2012).

The livestock subsector is usually classified under domestic agriculture due to its significant role it plays in providing food security. It consists mainly of small livestock (sheep and goats), piggery, poultry (layers and broilers) and cattle (beef and dairy). The current mode of operation for livestock production in the Caribbean is generally not amenable to coping with extreme weather conditions. Major retrofitting and upgraded technologies will be needed as part of any adaptation strategy used to mitigate climate change effects of the entire livestock subsector of the Caribbean (FAO and CDB, 2019).

The major crops grown for domestic consumption include fruits and vegetables, root crops/tubers (potatoes, cassava, yam, taro, and sweet potatoes), cereals (corn, sorghum and millet), groundnuts and pulses and condiments (nutmeg, cinnamon, escallion). Many of the short-term crops (corn, pigeon peas, sweet potatoes and vegetables) are seasonal, and any significant shifts in climatic conditions such as increased temperatures, more frequent or more intense droughts, and any changes in mean rainfall, could have adverse effects on food production and supply. This type of farming is particularly vulnerable to drought, pests and diseases.

## 2.2.2 Export agriculture

Export agriculture in the Caribbean consists of traditional crops including bananas, sugarcane, coffee, citrus, cocoa and rice. Historically, banana and sugarcane have been the major agricultural exports, targeting the European Union. Reforms of the European Union agricultural policies (reduction of the preferential access agreement) together with the outbreak of diseases however had a dramatic effect on export demand for sugar and bananas (FAO and CDB, 2019). Many of these economies are monocrop exporters, serving one major market, which results in a high degree of vulnerability. So-called traditional exports – including sugar, bananas and basic agricultural commodities – have declined from 60 percent of BMC agri-food exports in the early 1990s to less than 20 percent now. The main growth area has been in processed food exports, including beverages, which have increased from about 15 percent to around 50 percent of BMC agri-food exports (FAO and CDB, 2019).

## 2.2.3 Fishing industry

While the sector employs 1.3 million people directly, it supports the livelihoods of 4.5 million people in the region: CARICOM countries employ over 182,000 people in fisheries, operate 25,000 boats, and produce 161,000 tonnes for a value of about USD 700 million per year (FAO, 2013b). The sustainability of the fisheries sector is under threat as a result of overfishing and natural resource degradation. While fishing in the Caribbean Sea has almost doubled since the 1990s, the annual catch has declined by more than 25 percent. Fifty percent of the catch are species that are being overexploited. The fisheries sector also struggles with challenges including informal labour use, seasonality, remoteness, hazardous working conditions, and value chain complexity (FAO and CDB, 2019).

<sup>29</sup> Traditional crops refer to e.g. sugar and bananas (FAO and CDB, 2019).

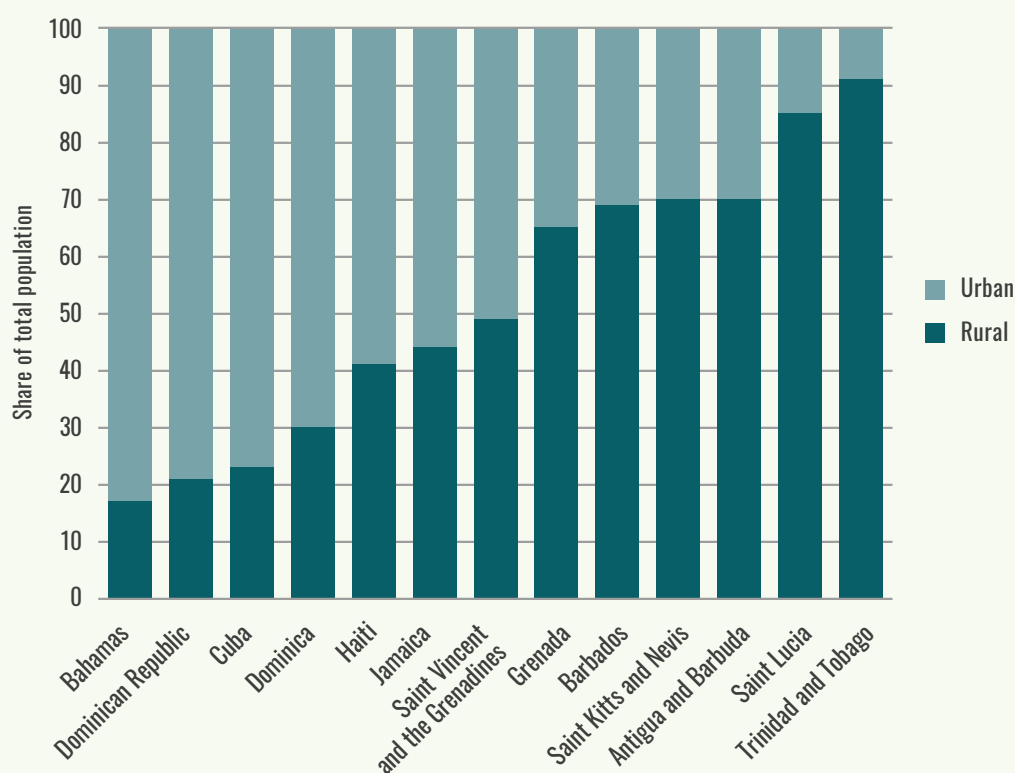


## 2.3 POPULATION AND RURAL ECONOMY

The Caribbean is one of the least populated regions in the world with a total of 17.6 million inhabitants (FAO, 2015).<sup>30</sup> Unlike most developing countries whose populace are found primarily in rural areas, the Caribbean has been characterized as one of the most urbanized region in the world. In 2015, around 70 percent of the population in the Caribbean lived in urban areas (cities and towns, ahead of Asia with 48 percent and Africa with 40 percent). However, urban-rural populations vary from one Caribbean country to another (ILO, 2016). **Figure 5** illustrates the rural-to-urban population share (FAOSTAT, undated), from the most to least urban.Southern American countries.

**FIGURE 5.**

### RURAL-TO-URBAN POPULATION IN THE CARIBBEAN

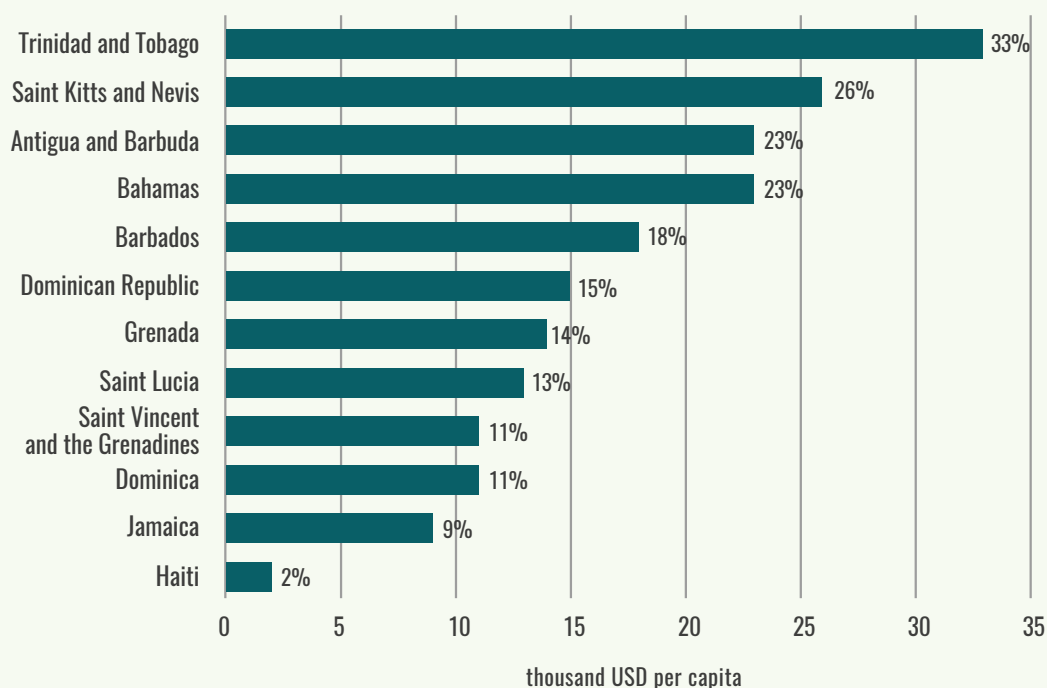


Approximately 70 percent of the Caribbean population lives in coastal cities, towns and villages, a consequence of: the abundance of relatively easy to navigate and, therefore, very accessible natural harbors; the export oriented economy; the importance of artisanal fisheries; and the tourism industry's coastal focus. More than half the population lives within 1.5 km of the coast and international airports, roads and capital cities are commonly situated along the coast (UNEP, 2008).

Women account for 22 to 30 percent of registered farmers, ranging from 22 percent in Grenada, 25 percent in Trinidad and Tobago, and 30 percent in Jamaica. Though, the number of women registered as farmers is lower in Dominica (15 percent) and in Belize (6 percent). Although women account for a significant share of the farmers in the region but, compared to men, experience lower access to finance, land, networks, information, and decision-making in farmer organizations (FAO and CDB, 2019).

<sup>30</sup> This refers to CARICOM countries.

Most Caribbean countries have achieved slow but somewhat consistent economic growth over the years. In 2015, the Region's economic growth was estimated at 3.1 per cent. GDP in the Caribbean is highly heterogenous, from USD 32,000 in Trinidad and Tobago to USD 1,784 per capita in Haiti (WB-Open Data, undated).<sup>31</sup> The GDP growth is on average 2.9 percent with the only negative growth in Trinidad and Tobago of -2.3 percent and the highest in the Dominican Republic of 6.6 percent (WB-Open Data, undated).<sup>32</sup> **Figure 6** illustrates the GDP per capita in the region by country, from highest to lowest.

**FIGURE 6.****GDP PER CAPITA IN THE CARIBBEAN, BY COUNTRY**

Outward migration internationally and intra-regionally is not new to the Caribbean. The Region includes 24 island states and has one of the highest net emigration rates in the world (some 72,000 persons emigrated annually between 1995 and 2000). While there is considerable intraregional migration, such as between Haiti and the Dominican Republic, most Caribbean countries have developed specific labour migration ties to other countries, initially to Central America, UK and other Caribbean countries, and now to the US and to a lesser extent, Canada (ILO, 2016).

High unemployment and lack of economic activity is widespread in the rural Caribbean. Tourism and small scale agriculture, the two most important economic activity in rural areas in most Caribbean territories, only marginally benefit their populations. As a result, rural inhabitants continue to trek to urban areas (ILO, 2016).

<sup>31</sup> Data refers to year 2017.

<sup>32</sup> Data refers to year 2017.

## 2.4 FOOD SECURITY AND NUTRITION

The Caribbean region has made progress in reducing undernourishment and towards meeting the global hunger targets. The number of undernourished persons in the Caribbean has declined from 27 percent to 19.8 percent between 1991 and 2015.<sup>33</sup> Three Caribbean Community countries – Barbados, Guyana and St Vincent and the Grenadines – have met both global hunger targets, that of the World Food Summit (WFS) set in 1996 and the United Nations Millennium Development Goals (MDGs) in 2000. Dominica, Bahamas, Belize, Jamaica and Trinidad and Tobago all have undernourishment levels less than 10 percent of their population (FAO, 2015). The country with the highest prevalence of undernourishment is Haiti at 5 percent (FAOSTAT, undated).<sup>34</sup>

Haiti is a special case in CARICOM and its large population and high levels of underdevelopment skews average results when presented as part of CARICOM regional indicators. Haiti accounts for 28 percent of the region with a population of 10.7 million (FAO, undated). It is estimated that 53 percent of the Haitian population (5.7 million persons) are undernourished and 58 percent of Haitians (6 million persons) are absolutely poor (i.e. cannot meet their own basic food and non-food needs) (FAO, 2015). In Haiti, more than 80 percent of persons in extreme poverty live in rural areas where 38 percent could not satisfy their nutritional needs. Another 1 million persons are vulnerable and could be pushed below the poverty line by a natural disaster or economic shock. Despite these challenges, Haiti has made some progress over the past decade, extreme poverty declined from 31 to 24 percent between 2000 and 2012 (FAO, 2015).

Food imports, as opposed to national food production, are by far the largest source of food for the CARICOM region. The countries currently import in excess of USD 4.5 billion in food annually, an increase of 50 percent since 2000. Food imports are projected to increase to USD 8–10 billion by 2020 if current efforts are not successful in reducing this trend (FAO, 2015). Almost all CARICOM countries import more than 60 percent of the food they consume with half of them importing more than 80 percent of the food they consume. Only three countries (Belize, Guyana, and Haiti) produce more than 50 percent of their consumption. Processed foods, grains (wheat and corn), and livestock products (meat and dairy) are among the top five food import categories, accounting for over USD 1 billion or approximately 25 percent of annual food imports regionally. In several essential food groups, national production per capita has declined, most notably in the fruits and vegetables category (FAO, 2015). **Figure 7** lists the top food importers in the region: Jamaica, Haiti, Trinidad and Tobago, Bahamas, Barbados, Suriname and Guyana.

Food access is a key food and nutrition security problem in the Caribbean. It is linked to poverty, which has been increasing in several countries in the region. In the case of Haiti this number is estimated at 59 percent and contributes to the 40 percent of the region's population considered poor. Further, almost all of the countries are characterized by high levels of income inequality. It is estimated that the consumption expenditure of the highest 10 percent of income earners averages 16 times more than that of the lowest 10 percent of income earners (FAO, 2015).

Much of the imported food available in CARICOM countries is calorie-dense, high-fat, high sweetener food. Expenditure among poor households, globally, is generally on low quality diets, disproportionately in favor of foods that are generally low cost, calorie-dense (especially refined carbohydrates), and high in fats and sweeteners (WHO, undated).<sup>35</sup> Such diets are more affordable than healthier ones, based on lean meats, fish, fresh vegetables, and fruit.

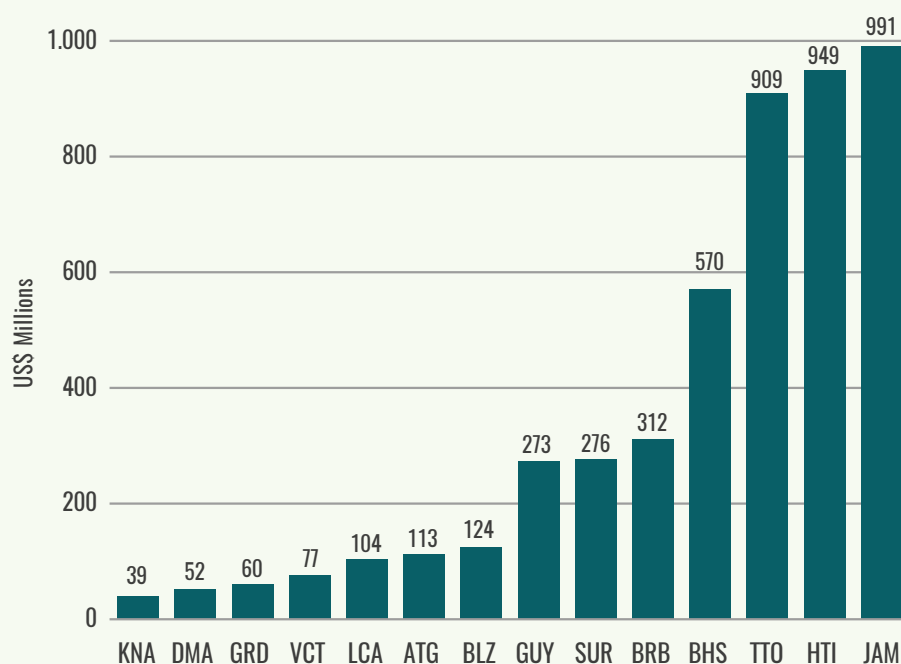
<sup>33</sup> Refers to CARICOM countries, Dominican Republic and Cuba.

<sup>34</sup> Data refers to 2011–2013 period.

<sup>35</sup> Data refers to year 2010.

FIGURE 7.

## CARICOM IMPORTS OF AGRICULTURAL PRODUCTS



Source: FAO. 2015. *State of Food Security in the CARICOM Caribbean. Meeting the 2015 hunger targets: taking stock of uneven progress.*

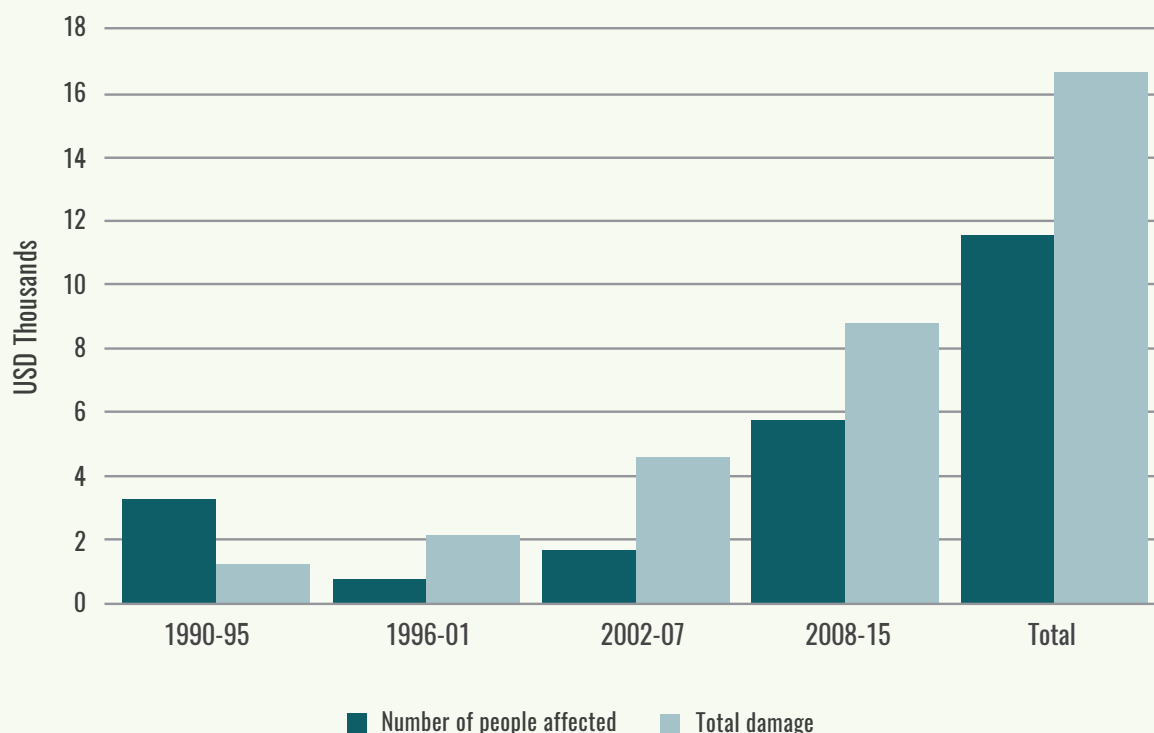
Unlike other regions, the prevalence of undernutrition in children in most CARICOM countries is relatively low. 3.4 percent of children (0 – 5 years) were underweight in 2012, including 1.5 percent who were severely underweight (CFNI/PAHO, 2012). Among males, 3.8 percent were underweight compared with only 2.9 percent of females the same year (CFNI/PAHO, 2012). The study concluded that, while the percentage of underweight children has declined from 4.5 percent a decade ago to 3.4 percent in 2012, there is now a problem of overweight and obesity. The incidence of overweight and obesity among children has doubled in a decade, from 7.4 percent in 2000 to 14.9 percent in 2012 (CFNI/PAHO, 2012).

CARICOM countries are vulnerable to natural disasters, which have adversely impacted not only economic sectors (agriculture, tourism, manufacturing, industry and commerce), but also social sectors (housing stock and settlements, health, education and infrastructure), and food and nutrition security. Over the period 1990–2014, 182 major natural disasters occurred in the Caribbean. These included landslides (1 percent), earthquakes (3 percent), droughts (7 percent), floods (30 percent), and storms/hurricanes (59 percent) (EM-DAT, undated).<sup>36</sup> Over this period, 11.5 million persons were affected, 241,550 deaths were recorded, and the region sustained USD 16.6 billion in damages (on immovable assets and stocks), and loss including disruption to the flow of goods and services due to the disaster (see **Figure 5**). These estimates include the impact of the 2010 earthquake in Haiti, which accounted for 96 percent of the deaths, 32 percent of persons affected and 49 percent of total damage reported for the region. Damage and loss due to natural disasters has been increasing over the past 15 years. **Figure 8** illustrates the number of people in the Caribbean affected and total damage as a result of natural disasters (FAO, 2015).

<sup>36</sup> Data refers to year 2015.

FIGURE 8.

## NUMBER OF PEOPLE AFFECTED AND TOTAL DAMAGE IN THE CARIBBEAN AS A RESULT OF NATURAL DISASTERS



Source: EM-DAT Database, 2015.

## 2.5 GREENHOUSE GAS EMISSIONS PROFILE

The NGHGI data from the last available year was collected from national reports submitted to the UNFCCC between 2000 and 2019.<sup>37</sup>

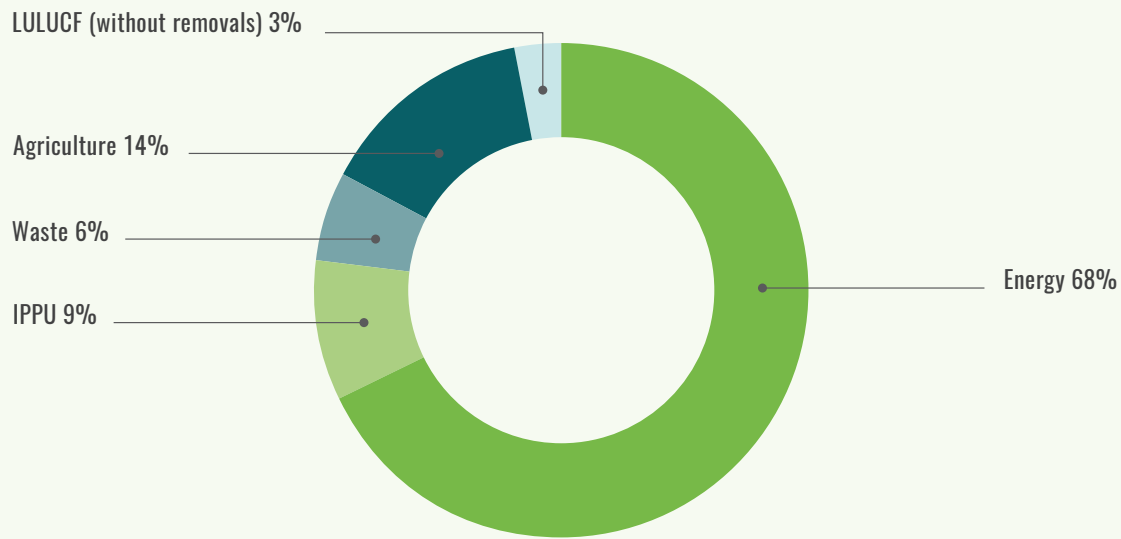
**The Agriculture, Forestry and Other Land Use (AFOLU) sector<sup>38</sup> represents the second largest share of emissions in the region** (17 percent), after the Energy sector (68 percent), followed by the Industrial Processes and Product Use (IPPU) (9 percent) and Waste (6 percent) sectors. Emissions from Agriculture sector (25.56 Mt CO<sub>2</sub> eq) are greater than those from the Land Use, Land Use Change and Forestry (LULUCF) sector, excluding removals (4.7 Mt CO<sub>2</sub> eq), equal to 14 and 3 percent shares of national emissions, respectively. Including removals, the LULUCF sector represents a net sink (19.87 Mt CO<sub>2</sub> eq). **Figure 9** illustrates the share of economy-wide emissions in the region by sector.

<sup>37</sup> Data for Saint Lucia sourced from NGHGI. Data for Antigua and Barbuda, Bahamas, Barbados, Cuba, Dominica, Dominican Republic, Grenada, Haiti, Jamaica, Saint Kitts and Nevis, Saint Nevis and the Grenadines and Trinidad and Tobago from NCs.

<sup>38</sup> The AFOLU sector refers to the Agriculture and LULUCF sector as defined by IPCC (2006).

FIGURE 9.

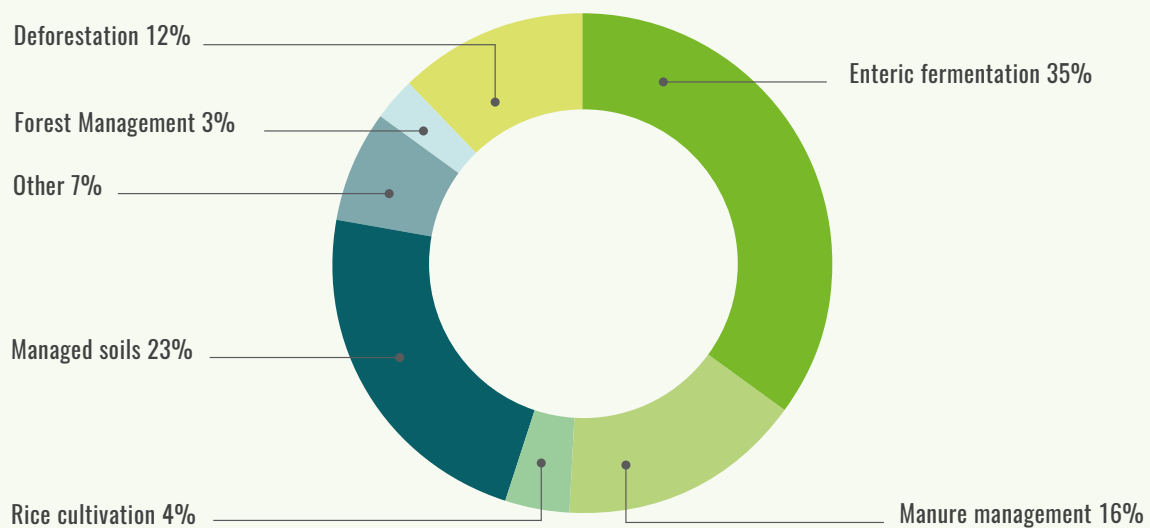
## ECONOMY-WIDE EMISSIONS IN THE CARIBBEAN, BY SECTOR (SHARE OF TOTAL EMISSIONS)



Within the AFOLU<sup>39</sup> sector (5.69 Mt CO<sub>2</sub> eq), the most significant GHG sources are enteric fermentation (35 percent of AFOLU emissions), managed soils<sup>40</sup> (23 percent), manure management (16 percent) and deforestation (12 percent). **Figure 10** illustrates shares of emissions in the AFOLU sector by major category.

FIGURE 10.

## EMISSIONS FROM THE AFOLU SECTOR IN THE CARIBBEAN, BY MAJOR CATEGORY (SHARE OF TOTAL EMISSIONS)



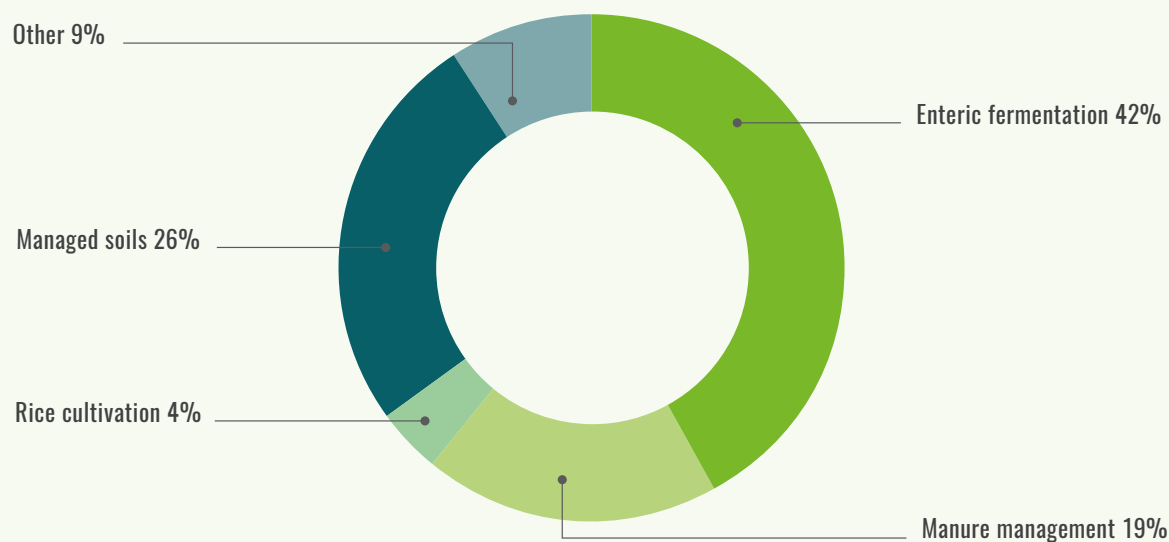
<sup>39</sup> The GHG source/sink categories used in this analysis adhere to IPCC (2006) by integrating country data reported using IPCC (1996) into a common GHG profile framework. **Annex 1** illustrates the methodology that links the IPCC (1996) source/sink categories to IPCC (2006) land use categories, carbon pools and non-CO<sub>2</sub> gases.

<sup>40</sup> Corresponds to the IPCC (2006) categories “Direct and indirect N<sub>2</sub>O emissions from agricultural”, “Liming”, “Urea application” and the IPCC (1996) category “Agricultural soils”.

Within the agriculture sector, the largest sources of emissions are enteric fermentation (42 percent), managed soils (26 percent) and manure management (19 percent). **Figure 11** illustrates share of emissions in the agriculture sector by major category.

**FIGURE 11.**

**EMISSIONS FROM THE AGRICULTURE SECTOR IN THE CARIBBEAN, BY MAJOR CATEGORY (SHARE OF TOTAL EMISSIONS)**



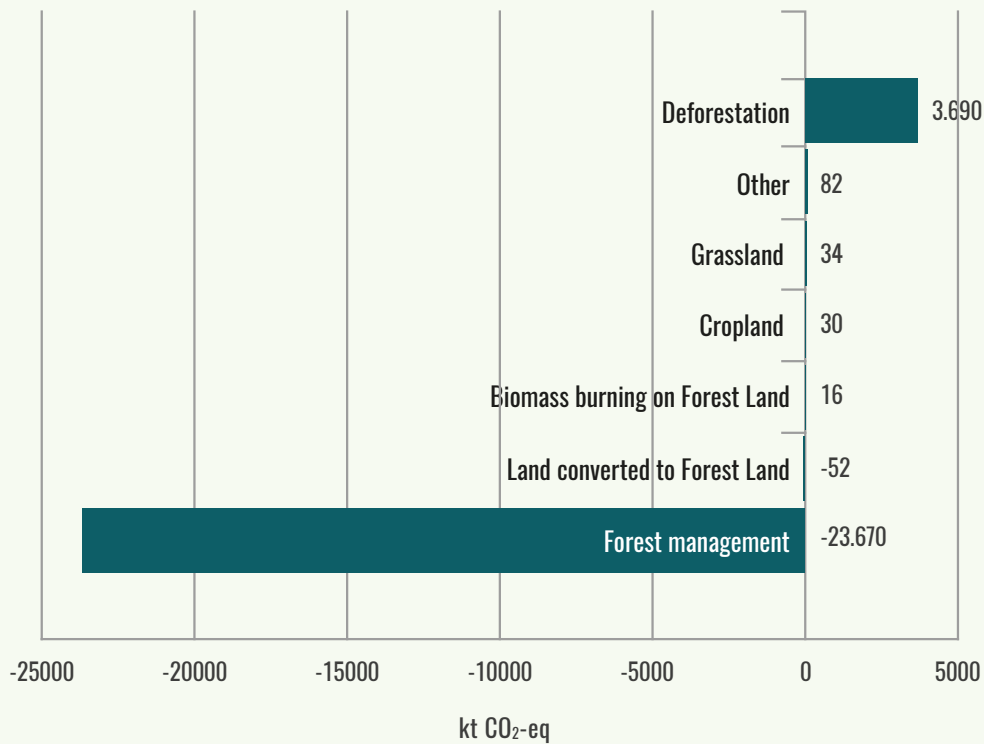
At the national level, however, the distribution of emission sources varies. For instance, in Antigua and Barbuda, enteric fermentation emissions constitute 62 percent of total agricultural emissions, while in Grenada, managed soils hold a 79 percent share of total agricultural emissions.

**The LULUCF sector constitutes a net sink at the regional level, mainly from removals by forest management**<sup>41</sup> (99.8 percent of removals). However, emissions from deforestation represent the greatest source of land use emissions (96 percent of LULUCF emissions). **Figure 12** illustrates the emissions and removals in the LULUCF sector by major (sub-) category.

<sup>41</sup> Forest management accounts for total net emissions related to IPCC (2006) land use category “Forest land remaining forest land” and IPCC (1996) category “Changes in forest and other woody biomass,” when those categories are a net sink at national level.

FIGURE 12.

## EMISSIONS AND REMOVALS IN THE LULUCF SECTOR IN THE CARIBBEAN, BY MAJOR (SUB) CATEGORY



At the national level, emission sources and sinks vary by land use. For example, forest degradation is the main source of emissions in Haiti, while deforestation is the main source in Bahamas, Barbados, Cuba, Dominica, Jamaica, land converted to forest land in Saint Vincent and the Grenadines, biomass burning in forest land in Dominican Republic, and cropland in Antigua and Barbuda. On the other hand, forest management contributes to the majority of removals in all countries, except Barbados, where afforestation/reforestation constitutes the majority of removals.





# CHAPTER 3



# SYNTHESIS OF MITIGATION AND ADAPTATION CONTRIBUTIONS IN THE AGRICULTURE AND LAND USE SECTORS

This chapter provides a systematic review and synthesis of the role of the agriculture and land use sectors in the NDCs of 13 countries in the Caribbean at the regional level. It reflects the heterogeneous nature of country commitments and illustrates regional trends. It aims to identify the structural characteristics of the NDCs and to assess the scope, specificity, measurability and timeline of the mitigation contribution in the agriculture and land use sectors and adaptation component related to agriculture, food security and nutrition. This stocktaking exercise can lay the groundwork for an integrated plan-implementation-review cycle at the country level. The data informs the gap and opportunity analysis in Chapter 4, which seeks to support countries to enhance their NDCs, as early as 2020, as well as guide the prioritization of international support options.

## 3.1 MITIGATION CONTRIBUTION

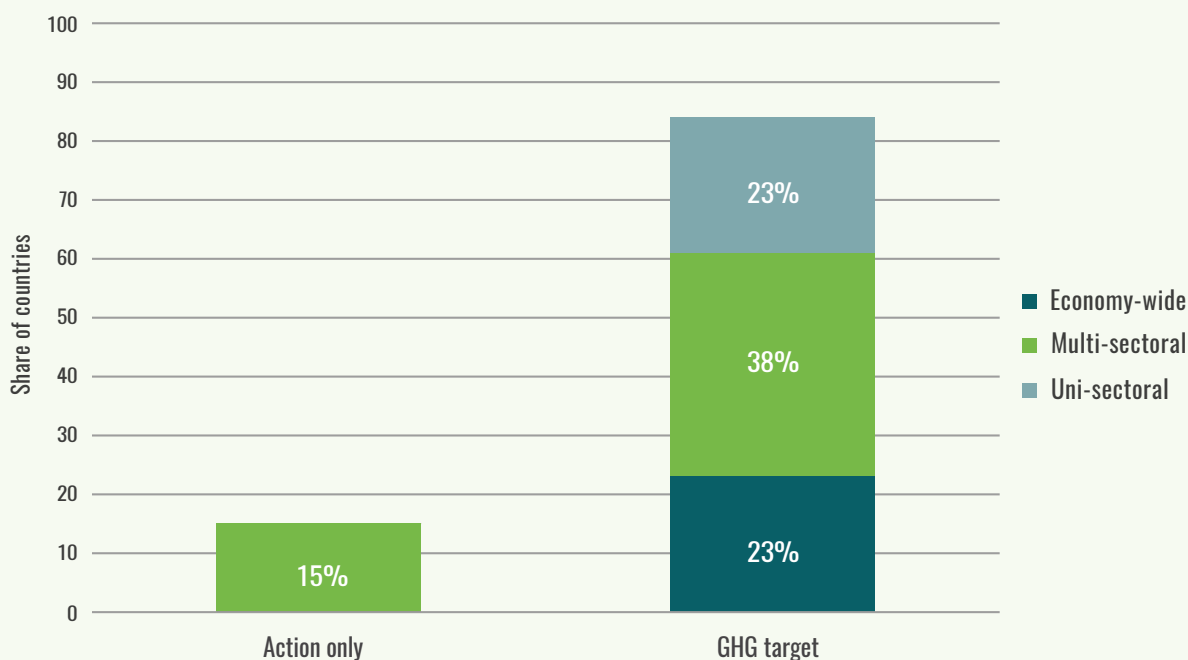
This section synthesizes the mitigation contributions in the agriculture and land use sectors communicated in the NDCs of 13 countries in the Caribbean at the regional level. The data from the NDCs were supplemented with information reported in NCs to the UNFCCC.

### 3.1.1 General mitigation contribution

All 13 countries in the Caribbean communicated a general mitigation contribution in their NDC, 11 of which (85 percent) set a GHG target and two<sup>42</sup> (15 percent) qualify their contribution in terms of “Action-only.” Figure 13 illustrates the type and scope of general mitigation contributions in the region by share of countries.

FIGURE 13.

#### TYPE AND SCOPE OF GENERAL MITIGATION CONTRIBUTIONS EXPRESSED IN THE NDCs OF CARIBBEAN COUNTRIES



All GHG targets are expressed as an absolute reduction of net emissions, with the exception of one,<sup>43</sup> which is expressed as a reduction in terms of emission intensity per capita. Around half are set in comparison to the level of emissions under a business as usual (BAU) scenario, and the other half of GHG targets are set against emission levels from a specific base year.

The period of NDC implementation varies between 2016 or 2020 and 2030, with only one country setting an end date of 2025.<sup>44</sup> Annex 1 contains detailed information on each country’s general mitigation contribution.

Around one-fourth of all general mitigation contributions are economy-wide in scope, covering emissions from all IPCC sectors – Energy, Industrial Products and Processing (IPPU), AFOLU and Waste, while another one-fourth are uni-sectoral and the remaining half multi-sectoral. All countries include the energy sector in their mitigation contribution.

Around 40 percent of countries in the Caribbean include the agriculture sector and over half include the LULUCF sector in their general mitigation contributions. Taken together, around one-third of countries in the region include both agriculture and the LULUCF sectors (e.g. AFOLU) and around 60 percent include either one or the other. Figure 14 illustrates the IPCC sector included in general mitigation contributions by share of countries at the regional level.

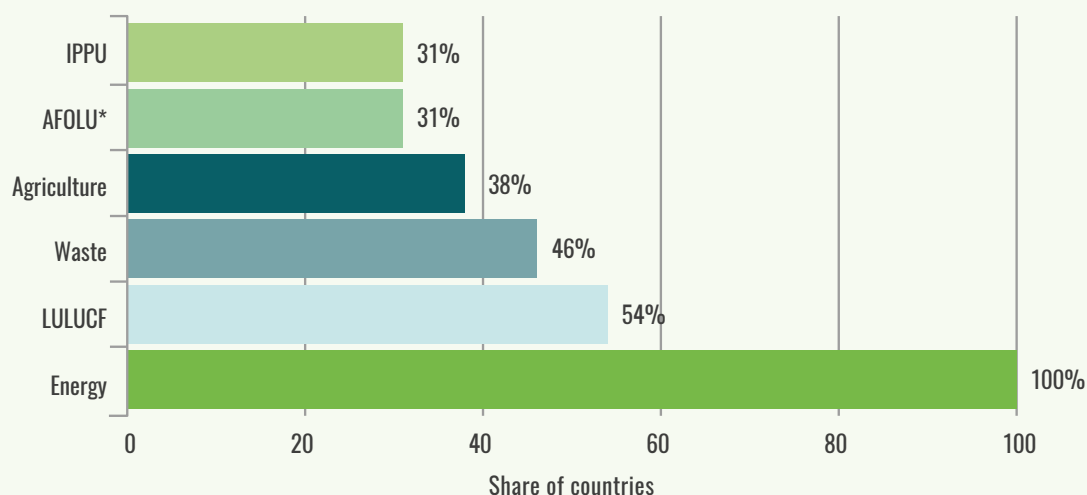
<sup>42</sup> Antigua and Barbuda and Cuba.

<sup>43</sup> Dominican Republic.

<sup>44</sup> St. Vincent and Grenadines.

FIGURE 14.

## SECTORS INCLUDED IN THE GENERAL MITIGATION CONTRIBUTIONS IN THE NDCs OF CARIBBEAN COUNTRIES



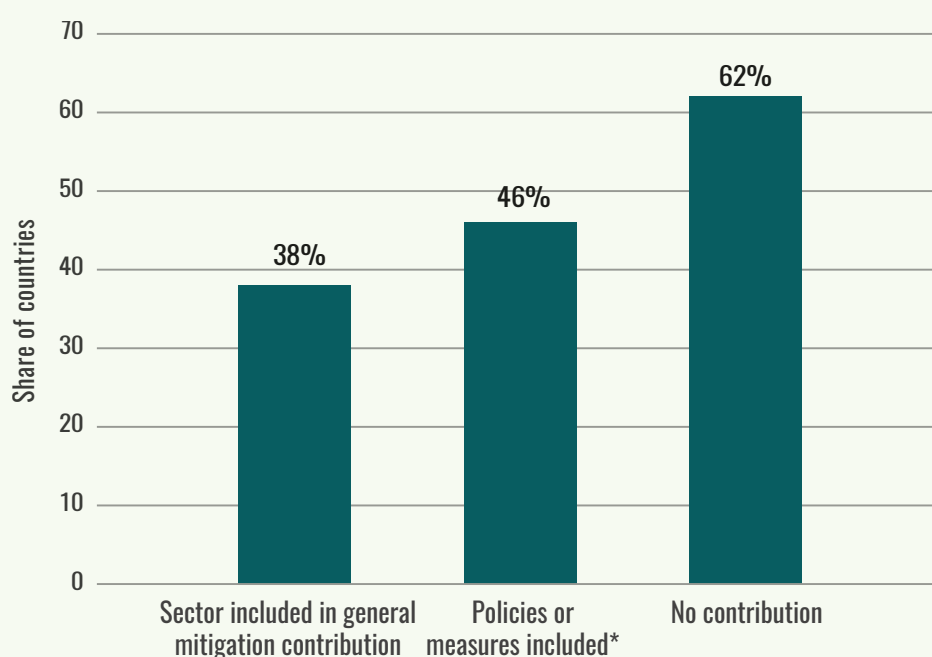
\* AFOLU refers to when both agriculture and LULUCF sectors are included in mitigation contribution.

### 3.1.2 Mitigation in the agriculture and land use sectors

Thirty-eight percent of countries in the region include agriculture in their general mitigation contribution, while the remaining (62 percent) do not include mitigation in the sector. When considering additional information from NCs, almost half (46 percent) of countries include mitigation policies or measures in agriculture. **Figure 15** illustrates the share of countries with a mitigation contributions in the agriculture sector by type. **Annex 2** contains detailed information on each country's agricultural mitigation contribution.

FIGURE 15.

## TYPE OF MITIGATION CONTRIBUTIONS IN THE AGRICULTURE SECTOR EXPRESSED IN THE NDCs OF CARIBBEAN COUNTRIES

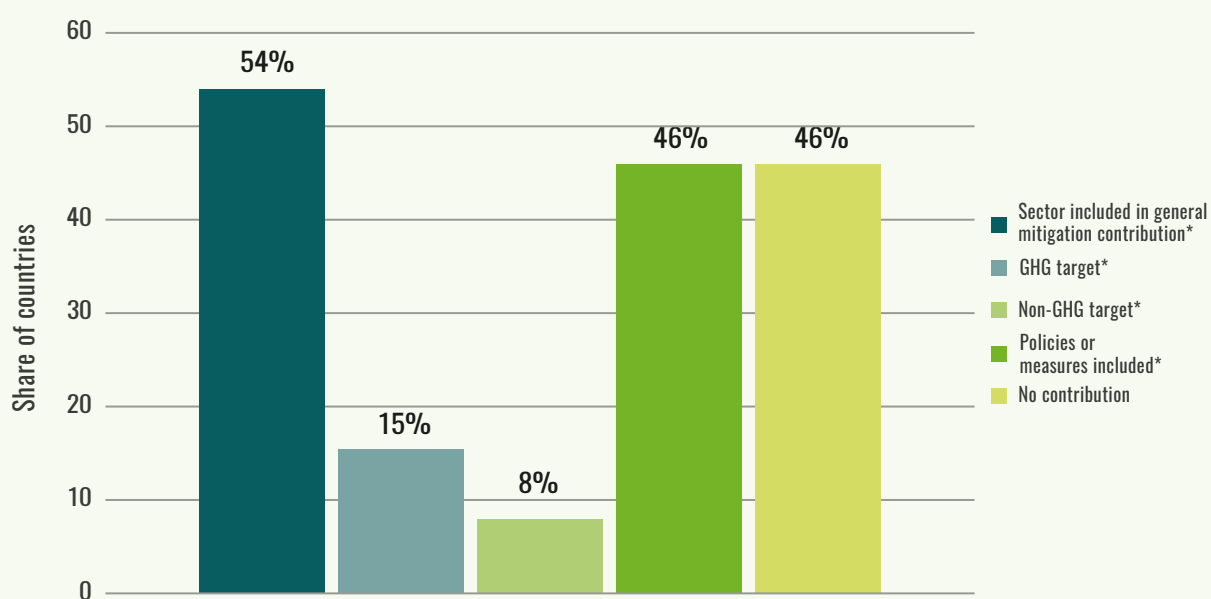


\* Barbados, Haiti, Jamaica and St Lucia include policies or measures in NCs.

Fifty-four percent of countries in the region include LULUCF in their mitigation contribution, expressed as either a set of mitigation policies or measures (46 percent of countries), a GHG target compared to a BAU scenario (Bahamas and Dominica) and/or a non-GHG target (Antigua and Barbuda). Around half of the countries (46 percent) do not include mitigation in the sector. **Figure 16** illustrates the share of countries with a mitigation contributions in the LULUCF sector by type. **Annex 2** contains detailed information on each country's LULUCF mitigation contribution.

FIGURE 16.

## TYPE OF MITIGATION CONTRIBUTIONS IN THE LULUCF SECTOR EXPRESSED IN THE NDCs OF CARIBBEAN COUNTRIES



\* Legend categories are not mutually exclusive. Note: Antigua and Barbuda, Bahamas, St Vincent and the Grenadines and St Lucia include additional policies or measures in the NCS

## Policies and measures in the agriculture and land use sectors

Countries often include mitigation in their contribution as policies or measures that aim to reduce net emissions or emission intensity, or enhance carbon sinks, from a particular agriculture activity and/or land use. The methodological notes (FAO, 2019b) contains the methodological matrix for how policies and measures in the agriculture and land use sectors are categorized in relation to corresponding GHG source and sink categories in line with IPCC Guidelines (IPCC, 2006).

The policies and measures in the agriculture and land use sectors were categorized by management activity, agriculture sub-sector and IPCC land use category, and aggregated into ten main sub-sector/land use categories: 1) all land;<sup>45</sup> 2) agricultural land;<sup>46</sup> 3) cropland; 4) integrated systems; 5) livestock; 6) grassland; 7) forest land; 8) wetlands and organic soils; 9) bioenergy from agriculture; and 10) bioenergy from forests.

**Overall, 62 percent of countries in the Caribbean include at least one mitigation policy or measure in the agriculture and/or land use sectors.** The majority of those countries promote mitigation on forest land (63 percent of countries with mitigation in agriculture and/or land use), followed by bioenergy production from agriculture (38 percent), in livestock (38 percent), on cropland and in integrated systems

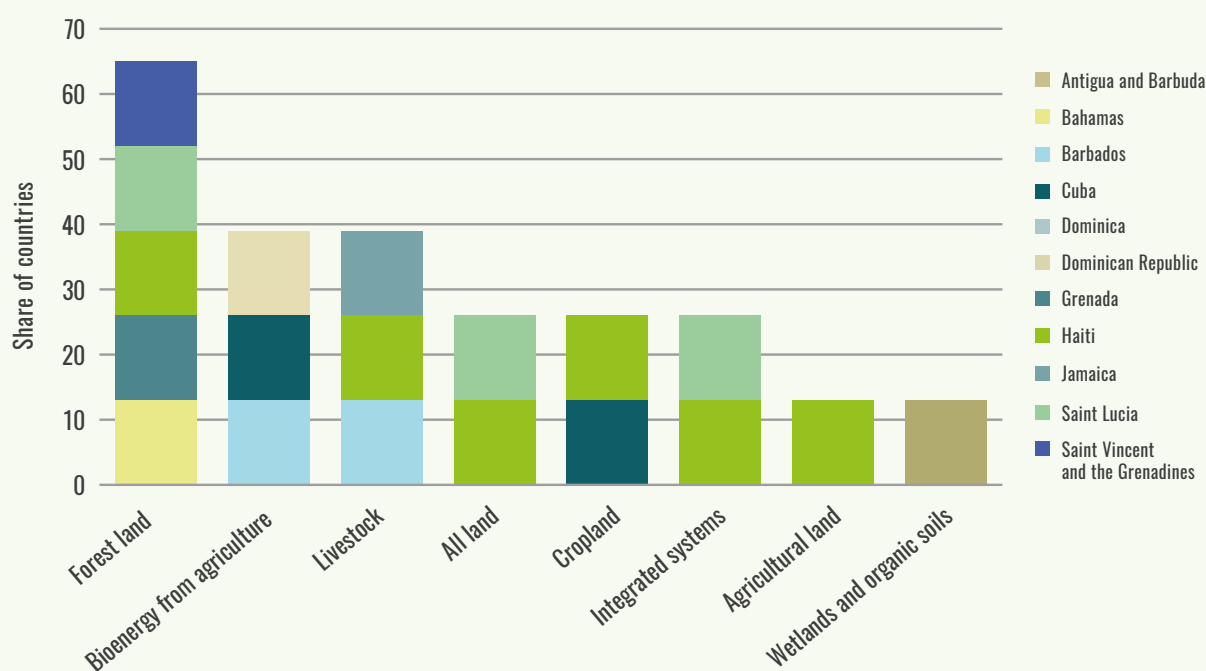
<sup>45</sup> For the purpose of this document, "all land" refers to agriculture, forestry and other land uses.

<sup>46</sup> For the purpose of this document, "agricultural land" refers to a combination of cropland and grassland.

(25 percent each), and on agricultural land and on wetlands and organic soils (13 percent each). **Figure 17** illustrates the share of countries with one or more (to avoid bias of representation) policies or measures, by land use category/sub-sector, out of countries with mitigation in the agriculture and/or land use sectors.

**FIGURE 17.**

**MITIGATION POLICIES OR MEASURES IN THE AGRICULTURE AND LAND USE SECTORS INCLUDED IN THE NDCs OF CARIBBEAN COUNTRIES, BY SECTOR/LAND USE**

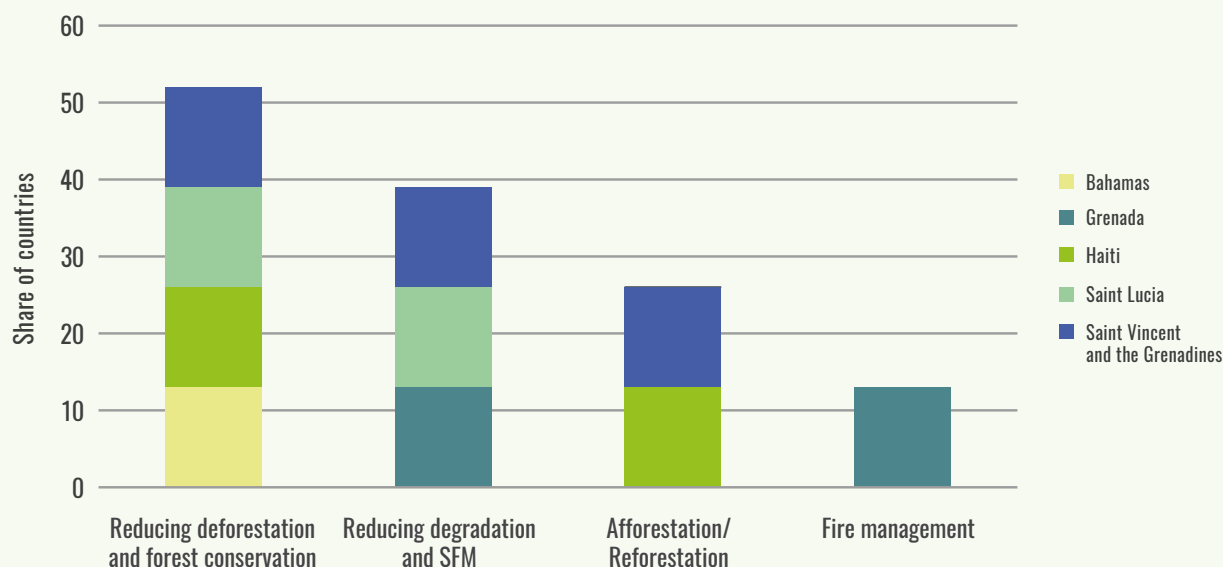


The coverage of policies and measures in the agriculture and land use sectors are presented by prevalence amongst countries in the region, in descending order:

## FOREST LAND

**Sixty-three percent of countries in the region with mitigation in the agriculture and/or land use sectors include at least one policy or measure on forest land.** The majority of those countries aim to reduce land use emissions and/or enhance removals on forest land by reducing deforestation and forest conservation (50 percent of countries with mitigation in the agriculture and/or land use), followed by reducing degradation and promoting sustainable forest management (SFM) (38 percent), afforestation/reforestation (25 percent) and fire management (13 percent). **Figure 18** illustrates the share of countries with one or more (to avoid bias of representation) policy or measure on forest land, by management activity, out of countries with mitigation on in the agriculture and/or land use sectors.



**FIGURE 18.**
**MITIGATION POLICIES OR MEASURES ON FOREST LAND IN THE NDCs OF CARIBBEAN COUNTRIES**

**TABLE 2.**
**EXAMPLES OF MITIGATION POLICIES AND MEASURES ON FOREST LAND**

COUNTRY	MANAGEMENT ACTIVITY	METRIC	2030 TARGET
BAHAMAS	FOREST CONSERVATION (20% WITHIN FOREST RESERVES, PROTECTED FOREST AND CONSERVATION FOREST)	GHG QUANTIFIED	-5 661 KT CO <sub>2</sub> EQ
GRENADA	REPLACEMENT OF THE INVASIVE BAMBOO WITH FAST GROWING INDIGENOUS SPECIES THAT ARE ECOLOGICALLY ADAPTED TO THE PARTICULAR PROTECTED AREAS	NON-QUANTIFIED	
HAITI	PROTECT, CONSERVE AND EXPAND EXISTING MANGROVE FORESTS	NON-GHG QUANTIFIED	19 500 HA (CONDITIONAL) PLUS 1 000 HA (UNCONDITIONAL)

## BIOENERGY FROM AGRICULTURE

Thirty-eight percent of countries in the region with mitigation in the agriculture and/or land use sectors include at least one mitigation policy or measure targeting bioenergy production from agricultural biomass. The majority of those countries aim to reduce net emissions across all sectors by substituting fossil fuel as a source of energy through the production of biogas (38 percent of countries with mitigation in agriculture and/or land use), followed by liquid biofuel production (25 percent) and bioenergy production from non-specified biomass feedstock (13 percent). **Figure 19** illustrates the share of countries with one or more (to avoid bias of representation) bioenergy-related policy or measure, by management activity, out of countries with mitigation on in the agriculture and/or land use sectors.

FIGURE 19.

## BIOENERGY-RELATED MITIGATION POLICIES OR MEASURES IN THE NDCs OF CARIBBEAN COUNTRIES

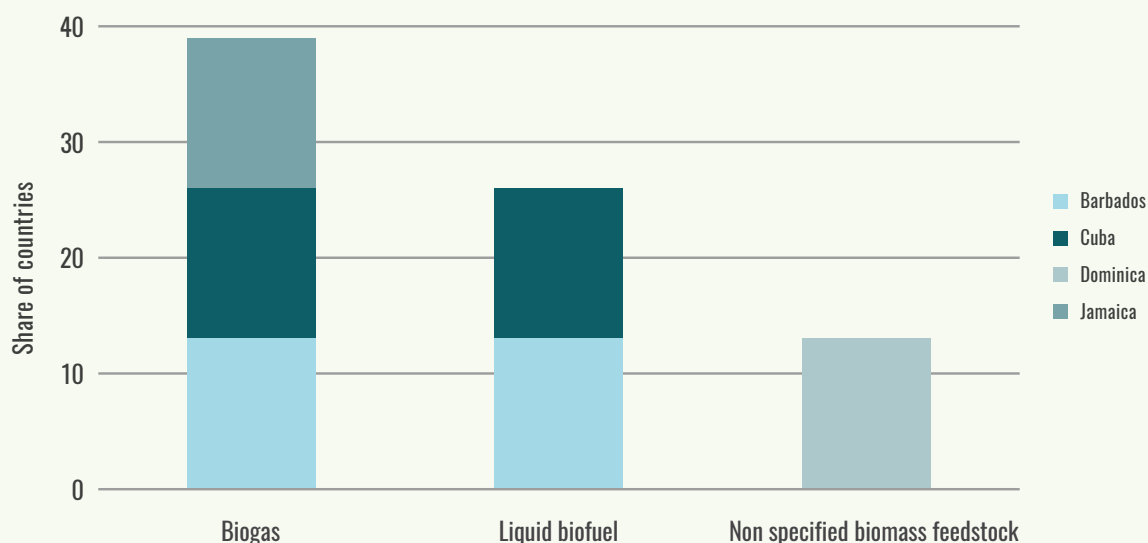


TABLE 3.

## EXAMPLES OF BIOENERGY-RELATED MITIGATION POLICIES AND MEASURES

COUNTRY	MANAGEMENT ACTIVITY	METRIC	2030 TARGET
CUBA	BUILD BIOELECTRICAL POWER STATIONS CONNECTED TO SUGAR PRODUCING PLANTS AND USING BIOMASS FROM FORESTS AND SUGAR CANE	NON-GHG QUANTIFIED	19 STATIONS
BARBADOS	BIOMASS COGENERATION TO POWER SUGARCANE INDUSTRY	NON-GHG QUANTIFIED	25 MW
JAMAICA	A PORTION OF THE MANURE FROM JAMAICA'S FOUR MOST POPULOUS LIVESTOCK ANIMALS IS REDIRECTED TO ANAEROBIC DIGESTERS TO PRODUCE BIOGAS FOR POWER GENERATION	GHG QUANTIFIED	-1 140.2 KT CO <sub>2</sub> EQ PER YEAR

## LIVESTOCK

Three countries include at least one mitigation policy or measure in livestock (38 percent of countries with mitigation in agriculture and/or land use), either as improved manure management<sup>47</sup> or improved feeding practices.<sup>48</sup> For instance, Haiti calls for “improved quality of pasture, in particular of cattle with leguminous plant.”

## CROPLAND

Two countries include at least one mitigation policy or measure on cropland (25 percent of countries with mitigation in agriculture and/or land use), either as nutrient,<sup>49</sup> plant<sup>50</sup> or rice management.<sup>51</sup> For instance, Cuba calls for the “use of organic residues for the production of biogas and biofertilizer which replacing chemical fertilizer will contribute to the reduction of emissions and diminutions of watersheds contamination.”

<sup>47</sup> Barbados (NC) and Jamaica (NC).

<sup>48</sup> Haiti

<sup>49</sup> Cuba.

<sup>50</sup> Haiti (NC).

<sup>51</sup> Haiti (NC).

## INTEGRATED SYSTEMS

Two countries<sup>52</sup> include at least one mitigation policy or measure in integrated systems (25 percent of countries with mitigation in agriculture and/or land use), both promoting agroforestry.

## WETLANDS AND ORGANIC SOILS

Only one country<sup>53</sup> includes at least one mitigation policy or measure on wetlands and organic soils (10 percent of countries with mitigation in agriculture and/or land use).

# 3.2 ADAPTATION CONTRIBUTION

**Climate change directly affects the natural resources and ecosystems upon which agricultural production, food systems and rural livelihoods rely.** Climate change impacts are transmitted to food security and nutrition through different pathways, and the severity of the impact is determined by climate drivers and risks, and by the underlying vulnerability of ecosystems, agro-ecosystems, rural economies and households (FAO, 2016c).

**A key way to moderate, reduce and/or avoid climate-related impacts is to reduce a system's underlying vulnerabilities, strengthen its adaptive capacity and increase its resilience** (FAO, 2016d). Adaptation to climate change refers to changes in processes, practices and structures to moderate potential damages from climate change, or to benefit from opportunities associated with such changes. Adaptation in the agriculture and land use sectors signifies modifying agricultural production and socio-economic institutional systems in response to and in preparation for actual or expected climate variability and change and their impacts, to moderate harmful effects and exploit beneficial opportunities. Resilience is generally understood as the capacity of individuals, groups, communities and institutions to anticipate, absorb (cope), adapt and transform in the face of climate variability and extremes that undermine food security and nutrition (FAO, 2018). Adaptive capacity encompasses two dimensions: the capacity to manage or moderate climate risks (including extreme climatic events), and the capacity to gradually respond to longer-term climate changes (FAO, 2017c).

**This section synthesizes the adaptation components in the agriculture and land use sectors communicated in the NDCs of 13 countries in the Caribbean.** It also contains a summary of the major climate-related hazards, impacts and vulnerabilities reported in ecosystems and social systems. The data from the NDCs were supplemented with information reported in NCs.

### 3.2.1 Climate-related hazards, impacts, and vulnerabilities

In order to contextualize the fairness and ambition of the NDCs, all countries in the Caribbean include a description of observed and/or expected climate variability and extremes, as well as cite the climate-related hazards, impacts and vulnerabilities in ecosystems and/or social systems that are already being observed or are expected in the future.

#### Climate-related hazards

All countries in the region report observed and/or projected climate-related hazards, including hydro-meteorological, climatological and biological processes or phenomenon that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems, and environmental resources.<sup>54</sup>

<sup>52</sup> St Lucia (NC) and Haiti.

<sup>53</sup> Antigua and Barbuda.

<sup>54</sup> Definition of climate-related hazard adapted from IPCC (2014) and EM-DAT.

At the regional level, the majority of countries report the occurrence of floods and storms (92 percent of countries each), amongst observed and/or projected climate-related hazards,<sup>55</sup> followed by drought (77 percent), landslides (31 percent), invasion by pests and non-native species in agriculture (31 percent), extreme heat (23 percent) and wildfire (15 percent). Figure 20 illustrates the share of countries with observed and/or projected climate-related hazards reported, by type of hazard.

FIGURE 20.

## OBSERVED AND/OR PROJECTED CLIMATE-RELATED HAZARDS REPORTED IN THE NDCs OF CARIBBEAN COUNTRIES

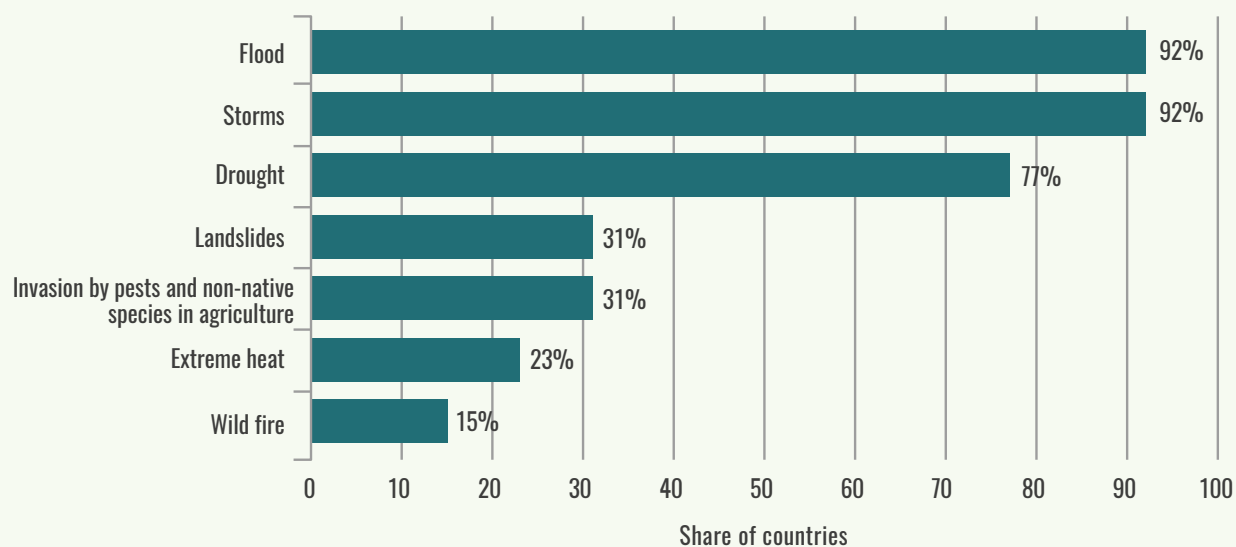


TABLE 4.

## EXAMPLES OF OBSERVED AND/OR CLIMATE-RELATED HAZARDS REPORTED

COUNTRY	CLIMATE-RELATED RISK	DESCRIPTION
ST LUCIA	DROUGHT	LOW RAINFALL AND INCREASING DROUGHT IMPACT NEGATIVELY ON BIOMASS GROWTH IN MOST, IF NOT ALL, PLANTS AND THAT INCLUDES GRASSLANDS UPON WHICH ANIMALS AND RUMINANTS FEED
TRINIDAD AND TOBAGO	FLOOD	INCREASED FLOODING, ALTERED HYDROLOGICAL CYCLES AND PRECIPITATION VARIANCE HAVE IMPLICATIONS FOR THE LOCAL AGRICULTURE INDUSTRY
GRENADA	INVASION BY PESTS AND NON-NATIVE SPECIES	INCREASE OF PEST AND DISEASE IN AGRICULTURE

### Climate-related slow onset events

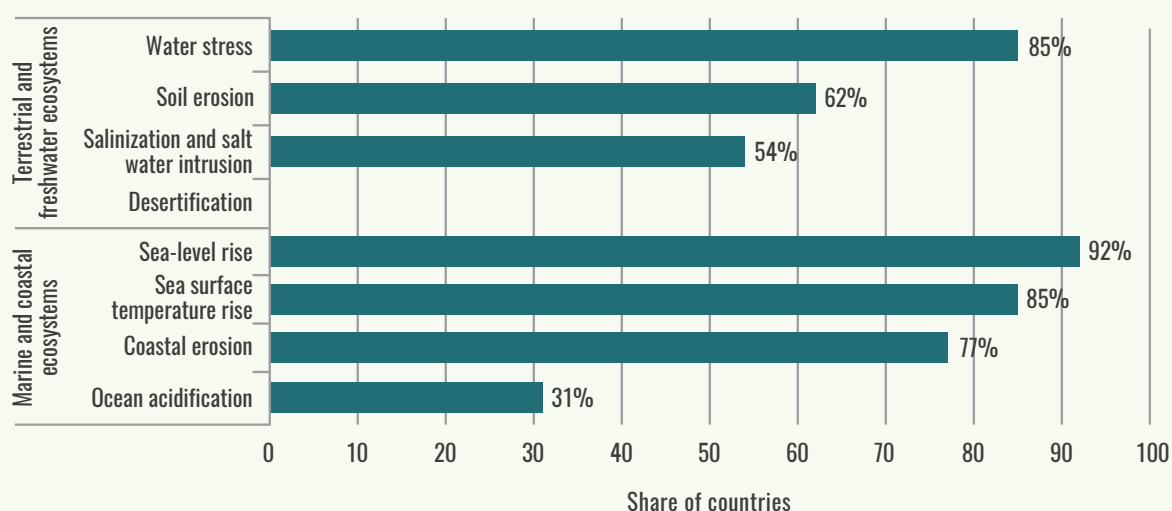
All countries in the region report observed and/or projected climate-related chemical, biological, and physical changes, leading to slow onset events.<sup>56</sup>

<sup>55</sup> Definition of climate-related hazard adapted from IPCC (2014) and EM-DAT.

<sup>56</sup> Definition of climate-related slow onset events adopted from IPCC (2014).

In terrestrial and freshwater ecosystems, water stress, soil erosion and salinization are reported most frequently amongst observed and/or projected climate-related slow onset events (85, 62 and 54 percent of countries, respectively).

In marine and coastal ecosystems, sea level rise, sea surface temperature rise and coastal erosion are reported most frequently amongst observed and/or projected climate-related slow onset events (92, 85 and 77 percent, respectively), followed by ocean acidification (31 percent). **Figure 21** illustrates the share of countries with observed and/or projected climate-related slow onset events reported, by type of event.

**FIGURE 21.**
**OBSERVED AND/OR PROJECTED CLIMATE-RELATED SLOW ONSET EVENTS IN MARINE AND TERRESTRIAL ECOSYSTEMS REPORTED IN THE NDCs OF CARIBBEAN COUNTRIES**

**TABLE 5.**
**EXAMPLES OF OBSERVED AND/OR CLIMATE-RELATED SLOW ONSET EVENTS REPORTED**

COUNTRY	CLIMATE-RELATED HAZARD	DESCRIPTION
ANTIGUA AND BARBUDA	TERRESTRIAL ECOSYSTEMS AND FRESHWATER RESOURCES	SALT WATER INTRUSION DROUGHTS AND CONTAMINATION FROM SALTWATER INTRUSION THAT THREATENS GROUNDWATER SUPPLIES
BARBADOS		DESERTIFICATION INCREASED LAND DEGRADATION
ST KITTS AND NEVIS		SOIL EROSION MEASURABLE EROSION HAS BEEN RECORDED AT MOST SITES, PARTICULARLY FOLLOWING THE PASSAGE OF TROPICAL STORMS AND HURRICANES
CUBA		WATER STRESS CHANGES IN WATER AVAILABILITY AND ESTIMATED DIMINUTION OF HYDROLOGICAL POTENTIAL
ST LUCIA	MARINE AND COASTAL ECOSYSTEMS	SEA LEVEL RISE SEA LEVEL RISE WILL CAUSE THE SHORELINE TO RECEDE
JAMAICA		OCEAN ACIDIFICATION OCEAN ACIDIFICATION, SEA SURFACE TEMPERATURE AND CORAL BLEACHING CONTRIBUTE TO DECREASED CATCH
SAINT KITTS AND NEVIS		SEA SURFACE TEMPERATURE RISE SEA SURFACE TEMPERATURE RISE, AMONGST OTHER STRESSORS, WILL LEAD TO TREE MORTALITY. RHIZOHOPRA MANGLE IS NOW VIRTUALLY EXTINCT ON THE ISLAND OF NEVIS, AS ONLY A FEW INDIVIDUAL TREES ON PINNEY'S BEACH ARE KNOWN TO EXIST
TRINIDAD AND TOBAGO		COASTAL EROSION COASTAL EROSION

## Climate-related vulnerabilities

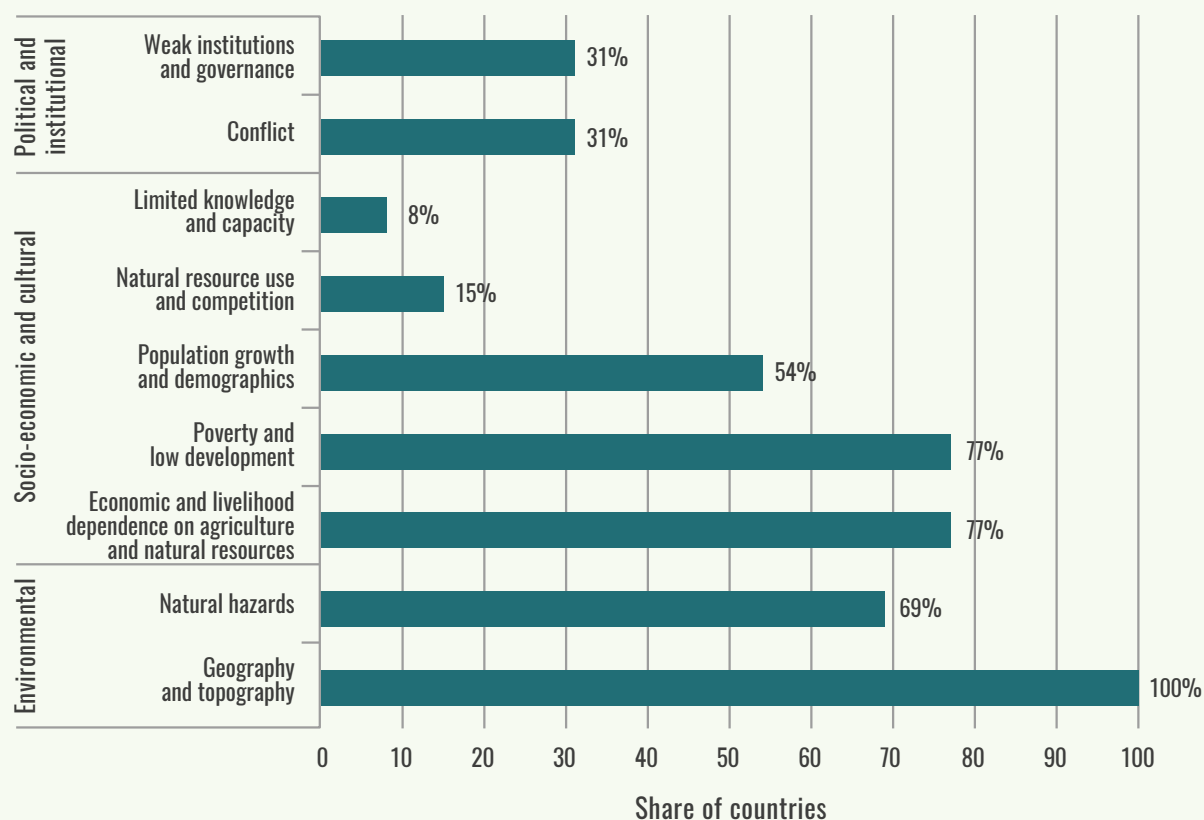
### NON-CLIMATIC DRIVERS OF VULNERABILITY

All countries in the region report on the intersecting environmental, social, economic, cultural, political and institutional variables, or stressors, that can affect individual adaptive capacity to respond, as well as the level of exposure to climate change, creating new or exacerbating existing vulnerabilities to climate change.<sup>57</sup>

Geography and topography is reported by all countries as a non-climatic driver of vulnerability, followed by economic dependence on agriculture and natural resources (77 percent), natural resource use and competition (77 percent), natural hazards (69 percent) poverty and low levels of development (54 percent), weak institutions and governance (31 percent) and conflict (31 percent), amongst others. **Figure 22** illustrates the share of countries with non-climatic drivers of vulnerability reported, by type of stressor.

**FIGURE 22.**

#### NON-CLIMATIC DRIVERS OF VULNERABILITY REPORTED IN THE NDCs OF CARIBBEAN COUNTRIES



<sup>57</sup> Definition of non-climatic stressors adapted from IPCC (2014).

TABLE 6.

## EXAMPLES OF NON-CLIMATIC DRIVERS OF VULNERABILITY REPORTED

COUNTRY	CLIMATE-RELATED HAZARD	DESCRIPTION
BAHAMAS	ENVIRONMENTAL	GEOGRAPHY AND TOPOGRAPHY
DOMINICAN REPUBLIC		NATURAL HAZARDS
JAMAICA	SOCIO-ECONOMIC AND CULTURAL	ECONOMIC AND LIVELIHOOD DEPENDENCE ON AGRICULTURE AND NATURAL RESOURCES
DOMINICA		POVERTY AND LOW ECONOMIC DEVELOPMENT
BARBADOS		NATURAL RESOURCE USE AND COMPETITION
GRENADA		LIMITED KNOWLEDGE AND CAPACITY
HAITI	POLITICAL AND INSTITUTIONAL	WEAK INSTITUTIONS AND GOVERNANCE

### Climate-driven impacts, vulnerabilities and risks in ecosystems

All countries in the region report observed and/or projected climate-driven impacts, vulnerabilities and risks in ecosystems.<sup>58</sup> The impacts of climate change refer generally to the effects of extreme weather and climate events and of climate change on the lives, livelihoods, health, ecosystems, economies, societies, cultures, services, and infrastructure, due to the interaction of climate changes or hazardous climate events occurring within a specific time period and the vulnerability of an exposed society or system. The vulnerability of an exposed system depends on sensitivity and lack of capacity to cope and adapt. The probability of occurrence compounded by the impact, or risk, results from the interaction of vulnerability, exposure, and hazard.<sup>59</sup>

**At the regional level, ocean and coastal zones<sup>60</sup> are most frequently referenced as vulnerable to climate-related impacts** (77 percent of countries), followed by agro-ecosystems (69 percent)<sup>61</sup> and ecosystems in general (69 percent) and inland water ecosystems<sup>62</sup> (23 percent). **Figure 23** illustrates the share of countries with one or more observed and/or expected climate-related impact, vulnerability and risk in ecosystems reported, by type of ecosystem.

<sup>58</sup> Definition of ecosystems elaborated from (Millennium Ecosystem Assessment, 2005).

<sup>59</sup> Definition of impact, vulnerability and risk in ecosystems adapted from IPCC (2014).

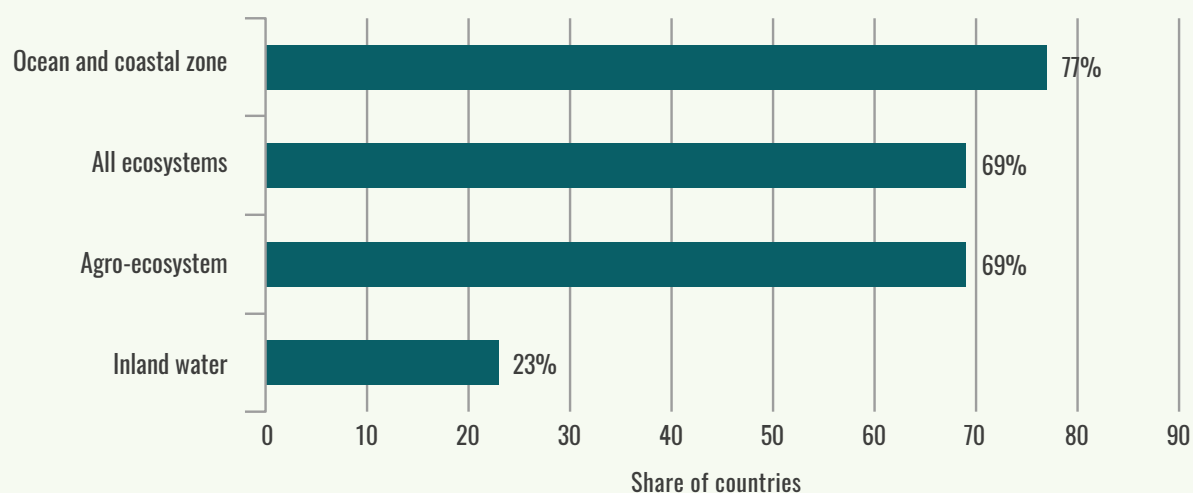
<sup>60</sup> Dominica, Barbados, St Kitts and Nevis, Bahamas, Grenada, Antigua and Barbuda, Jamaica, St Lucia, St Vincent and the Grenadines and Trinidad and Tobago.

<sup>61</sup> Barbados, Dominica, St Kitts and Nevis, Antigua and Barbuda, Grenada, Jamaica, St Lucia, St Vincent and the Grenadines and Trinidad and Tobago.

<sup>62</sup> Antigua and Barbuda, Haiti and St Vincent and the Grenadines and Trinidad.

FIGURE 23.

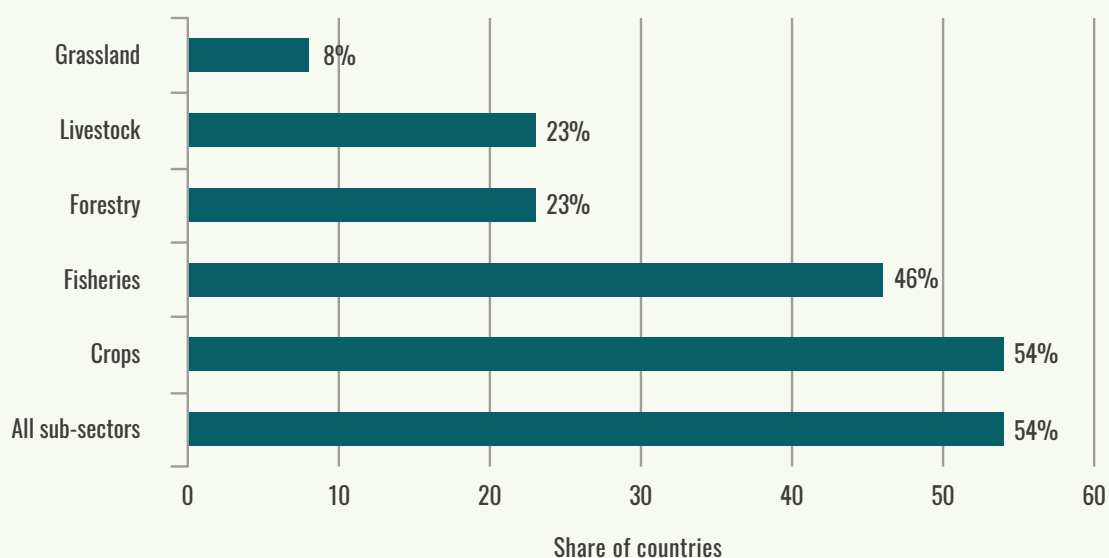
## OBSERVED AND/OR PROJECTED CLIMATE-RELATED IMPACTS REPORTED IN ECOSYSTEMS, BY ECOSYSTEM TYPE



In agro-ecosystems, the majority of countries indicate the agriculture sector in general and crops sub-sector as the most vulnerable to climate change (54 percent of countries each), followed by fisheries (46 percent), forestry (23 percent), livestock (23 percent) and grassland (8 percent). Figure 24 illustrates the share of countries with one or more observed and/or expected climate-related impact, vulnerability and risk in agro-ecosystems reported, by sub-sector.

FIGURE 24.

## OBSERVED AND/OR PROJECTED CLIMATE-RELATED IMPACTS REPORTED IN AGRO-ECOSYSTEMS, BY SUB-SECTOR IMPACTED



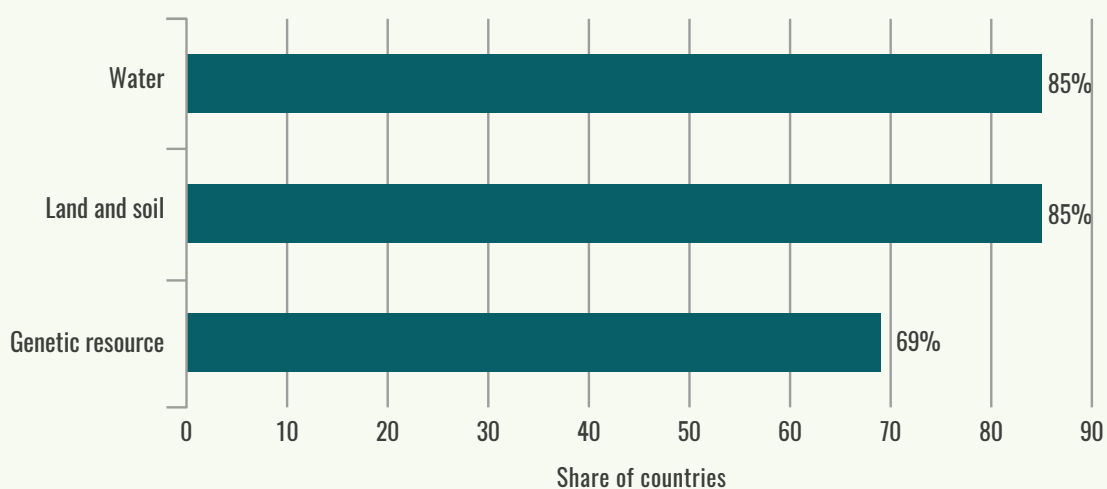


**Climate-driven impacts, vulnerabilities and risks in ecosystems vary by natural resource and ecosystem service affected.** Observed and/or projected climate-related impacts reported by countries were qualified by the type of natural resource and ecosystem service primarily affected.

**Climate-related impacts on water, land and soil resources are reported most frequently amongst natural resource-related impacts** (85 percent of countries, each) across all ecosystems, followed by genetic resources (69 percent). **Figure 25** illustrates share of countries with observed and/or projected climate-related impacts, vulnerabilities and risks in ecosystems reported, by natural resource impacted.

**FIGURE 25.**

**OBSERVED AND/OR PROJECTED CLIMATE-RELATED IMPACTS REPORTED IN ECOSYSTEMS, BY NATURAL RESOURCE TYPE**



**Amongst ecosystem service-related impacts, primary production and productivity loss is reported most frequently** (77 percent of countries) across all ecosystems, followed by coastal erosion and changes in water availability and quality (69 percent, respectively), pest and disease incidence and mangrove mortality and/or coastal reef degradation (38 percent, respectively) ecosystem, biodiversity and ecosystem services loss in general, changes in species range, abundance and extinction, and changes in hydrological flow and water cycling (31 percent, respectively) and soil erosion and sedimentation and biodiversity loss (23 percent, respectively), amongst others. **Figure 26** illustrates the share of countries with observed and/or projected climate-related impacts in ecosystems reported, by ecosystem service impact category.

FIGURE 26.

## OBSERVED AND/OR PROJECTED CLIMATE-RELATED IMPACTS REPORTED IN ECOSYSTEMS, BY ECOSYSTEM SERVICE TYPE

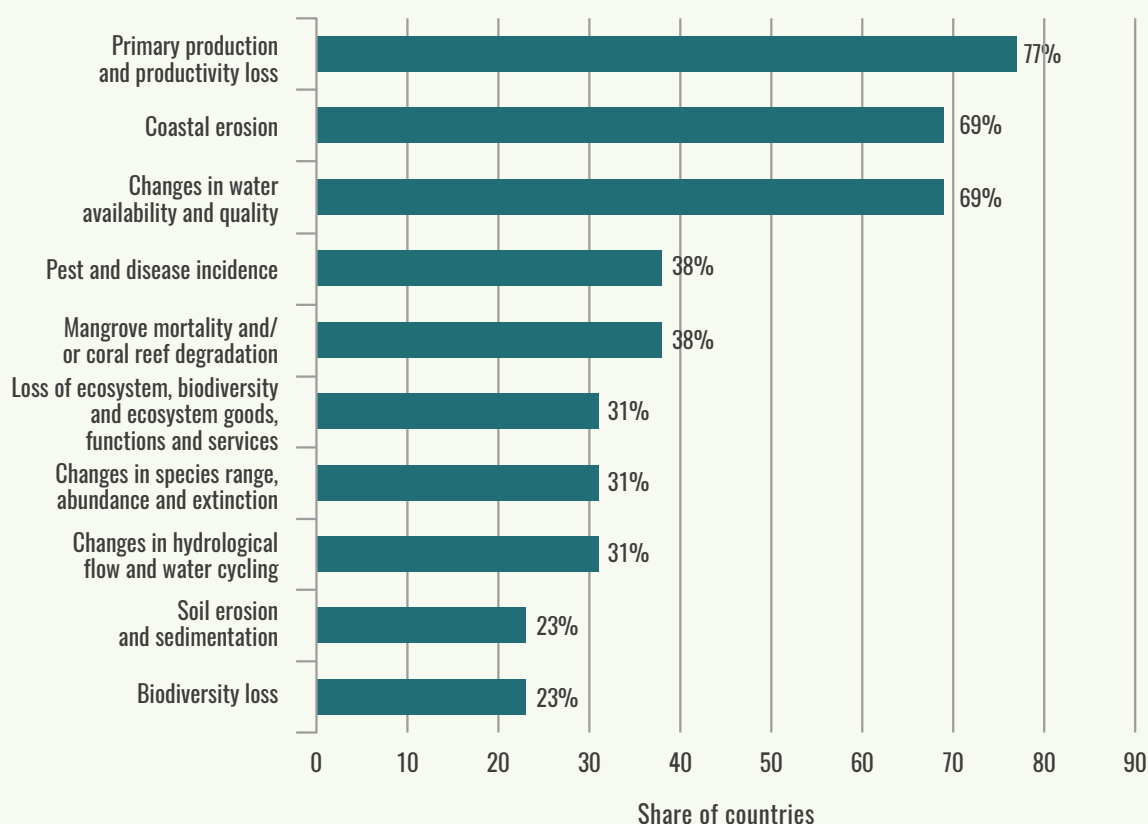


TABLE 7.

## EXAMPLES OF OBSERVED AND/OR PROJECTED CLIMATE-RELATED IMPACTS, VULNERABILITIES AND RISKS REPORTED IN ECOSYSTEMS

COUNTRY	ECOSYSTEM	SECTOR	CLIMATE-RELATED RISK
BARBADOS	AGRO-ECOSYSTEM	FISHERIES	REDUCED FISH STOCKS CAUSED BY THE MIGRATION OF FISH TO COOLER WATERS BEYOND THE CARIBBEAN REGION; DISTRIBUTION OF FISH SPAWNING SITES, REDUCING LARVAL DURATION, INCREASING FISH MORTALITY RATES AS WELL AS SHIFTING SEASONAL MIGRATION PATTERNS
ST KITTS AND NEVIS		FORESTRY	PROJECTED DECREASES IN RAINFALL, MORE PROTRACTED DRY SEASONS, A HIGHER NUMBER OF 'HOT' AND 'VERY HOT' DAYS AND A HIGHER INCIDENCE OF DROUGHT COULD LEAD TO A CONTRACTION OF THE RAINFOREST IN FAVOUR OF A GREATER SPATIAL EXTENT OF TROPICAL DRYLAND SPECIES
TRINIDAD AND TOBAGO		CROPS	INCREASES IN TEMPERATURE COUPLED WITH LOWER RAINFALL OR LESS EFFECTIVE RAINFALL COULD RESULT IN INCREASED SOIL ARIDITY AND CONSIDERABLE DECREASES IN AGRICULTURAL YIELDS
ST LUCIA		LIVESTOCK	HEAT STRESS REDUCES BOTH MEAT AND MILK PRODUCTION IN RUMINANTS. AS MOST OF THESE ANIMALS GRAZE IN THE SUN FOR MUCH OF THE DAY, LOCAL MEAT AND MILK PRODUCTION ARE EXPECTED TO DECREASE AS DAILY TEMPERATURES INCREASE
ST VINCENT AND GRENADINES	INLAND WATER		FURTHER REDUCED RAINFALL WOULD SEVERELY IMPACT THE WATER SUPPLY OF RIVERS AND STREAMS IN ST. VINCENT
DOMINICA	OCEAN AND COASTAL ZONE		MANGROVE RETREAT AND DIMINISHING BUFFERING CAPACITY EXPECTED

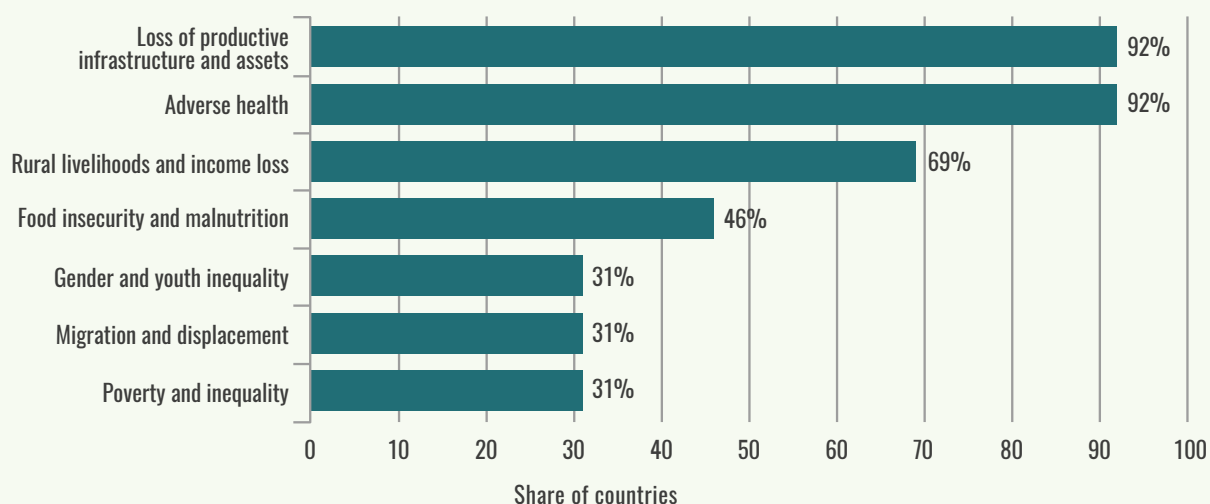
## CLIMATE-DRIVEN IMPACTS, VULNERABILITIES AND RISKS IN SOCIAL SYSTEMS

All countries in the region identify at least one observed and/or expected impact, vulnerability and risk induced by climate change in social systems.<sup>63</sup> For the sake of this analysis, the climate-related impacts are differentiated across three main pillars: socio-economics and well-being; knowledge and capacity; and institutions and governance.

At the regional level, the majority of those countries report the loss of productive infrastructure and assets and adverse health as climate-related risks in social systems (92 percent of countries, respectively), followed by loss of rural livelihoods and incomes (69 percent), food insecurity and malnutrition (46 percent), gender and youth inequality (31 percent), migration and displacement (31 percent) and poverty and inequality (31 percent). **Figure 27** illustrates the share of countries with one or more observed and/or expected climate-related impact, vulnerability and risk in social systems reported out of countries with impacts reported, by risk type.

**FIGURE 27.**

### OBSERVED AND/OR PROJECTED CLIMATE-RELATED RISKS IN SOCIAL SYSTEMS REPORTED IN THE NDCs OF CARIBBEAN COUNTRIES



<sup>63</sup> Definition of impact, vulnerability and risk in social systems adapted from IPCC (2014).

TABLE 8.

## EXAMPLES OF OBSERVED AND/OR PROJECTED CLIMATE-RELATED IMPACTS, VULNERABILITIES AND RISKS REPORTED IN SOCIAL SYSTEMS

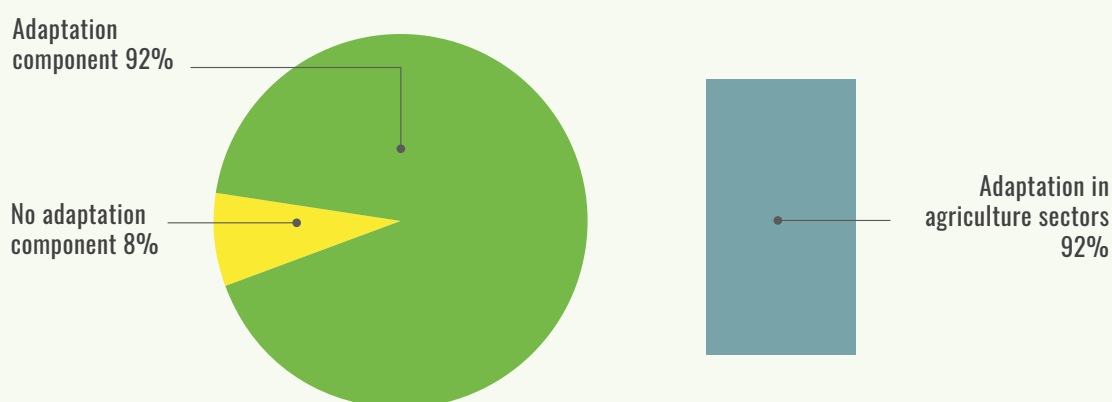
COUNTRY	CLIMATE-RELATED RISK	DESCRIPTION
ST VINCENT AND GRENADINES	LOSS OF PRODUCTIVE INFRASTRUCTURE AND ASSETS	MORE THAN 90% OF THE INFRASTRUCTURAL DEVELOPMENT OF ST. VINCENT AND THE GRENADINES LIES ON A NARROW COASTAL BELT LESS THAN EIGHT METERS ABOVE SEA-LEVEL. THESE INCLUDE THE ISLAND'S MAIN COMMUNICATION AND EMERGENCY RESPONSE STRUCTURES - ROADS, AIRPORTS, TELECOMMUNICATION, FINANCIAL, AND TECHNICAL SUPPORT CENTRES
ANTIGUA AND BARBUDA	ADVERSE HEALTH	THE HEALTH SECTOR IS EXPOSED TO CLIMATE IMPACTS THROUGH VECTOR BORNE DISEASES AND THE SPREAD OF WATER- BORNE ILLNESSES, WHERE TRENDS SUGGEST INCREASES IN THE COUNTRY
JAMAICA	FOOD INSECURITY AND MALNUTRITION	INCREASED TEMPERATURES, LOW RAINFALL, AND STRONG WINDS CAN LEAD TO LOW YIELDS AND FOOD SECURITY CONCERNS
ST VINCENT AND GRENADINES	RURAL LIVELIHOODS AND INCOME LOSS	AGRICULTURE IS ONE OF THE LARGEST ECONOMIC ACTIVITIES ON ST. VINCENT AND IT CONTRIBUTES SIGNIFICANTLY TO THE ECONOMIC AND SOCIAL DEVELOPMENT OF RURAL LIVELIHOODS IN PARTICULAR
DOMINICA	GENDER AND YOUTH INEQUALITY	VULNERABLE SEGMENTS OF SOCIETY INCLUDE WOMEN, YOUTH, ELDERLY, PEOPLE WITH DISABILITIES
DOMINICA	MIGRATION AND DISPLACEMENT	TOPOGRAPHIC CONDITIONS HAVE FORCED HUMAN SETTLEMENTS ONTO NARROW COASTAL AREAS PARTICULARLY IN THE SOUTH AND WEST WITH APPROXIMATELY 44,000 PERSONS (62%) LIVING ALONG THE COAST
DOMINICA	POVERTY AND INEQUALITY	27.0% OF THE DOMINICAN HOUSEHOLDS LIVE BELOW THE POVERTY LINE, WHICH MAY BE EXACERBATED BY CLIMATE CHANGE

### 3.2.2 Adaptation in the agriculture and land use sectors

All countries in the Caribbean, with the exception of one,<sup>64</sup> communicated an adaptation component in their NDCs (92 percent of all countries), all of which include the agriculture and land use sectors. The level of detail included in each country's adaptation component varies, as some countries detailed their adaptation visions, goals and measures, while other countries made reference to national adaptation and climate change plans. **Figure 28** illustrates the share of countries with an adaptation component and adaptation in the agriculture and land use sectors.

FIGURE 28.

## SHARE OF COUNTRIES WITH AN ADAPTATION COMPONENT AND ADAPTATION IN THE AGRICULTURE AND LAND USE SECTORS



<sup>64</sup> Trinidad and Tobago but agricultural adaptation measures are included in NC.

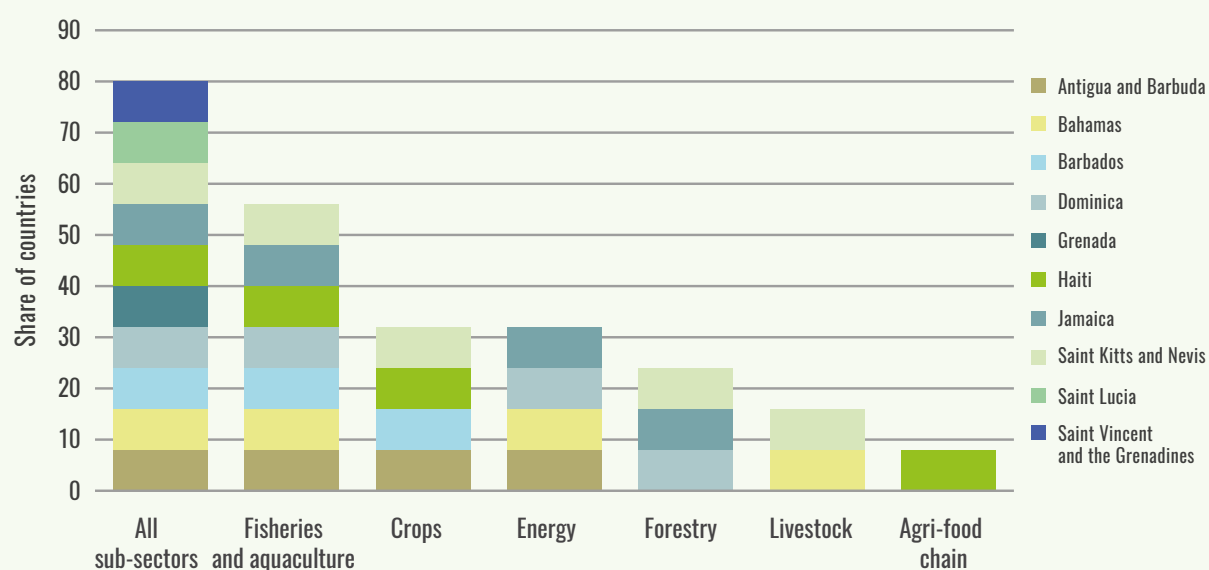
## Priority sectors and cross-sectoral priorities

Countries often identify a number of priority (sub-) sectors and cross-sectoral priorities in ecosystems and social systems as part of their adaptation strategy in the agriculture and land use sectors.

Amongst priority sectors for adaptation in the region, agriculture is prioritized most frequently (83 percent of countries with an adaptation component), followed by fisheries and aquaculture (58 percent), crops (33 percent), energy (33 percent), forestry (25 percent), livestock (17 percent) and the agri-food chain (8 percent). **Figure 29** illustrates the share of countries with an adaptation component with priority sectors in agriculture by sub-sector.

**FIGURE 29.**

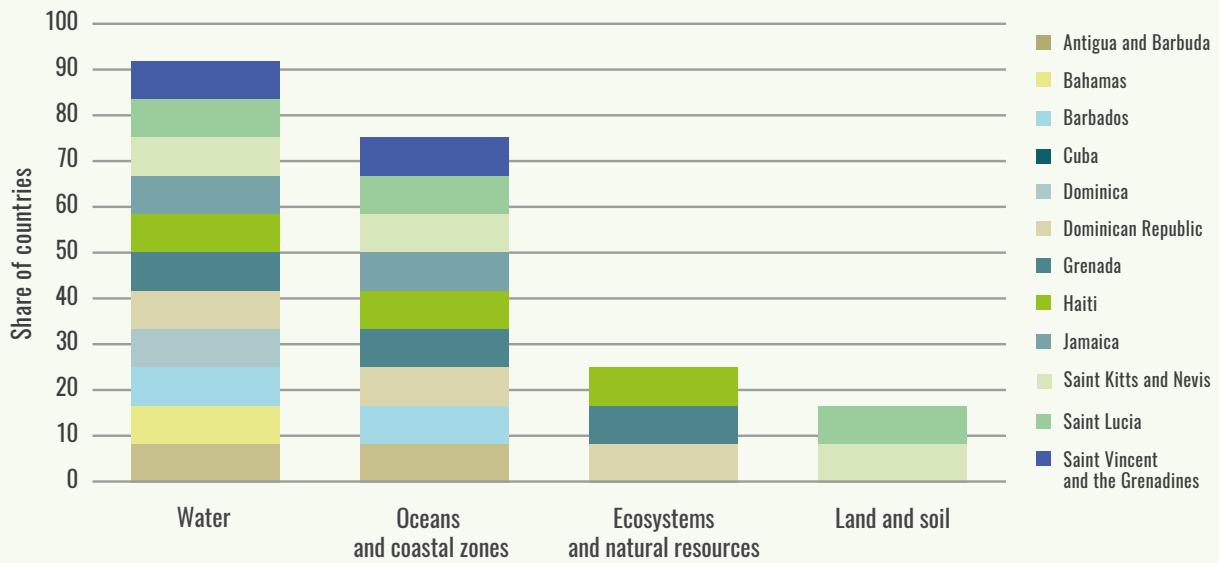
### PRIORITY SECTORS FOR ADAPTATION IN THE NDCs OF CARIBBEAN COUNTRIES, BY TYPE



Amongst cross-sectoral priorities for adaptation, water resources are promoted most frequently in the region (92 percent of countries with an adaptation component), followed by oceans and coastal zones (75 percent), ecosystems and natural resources (25 percent), and land and soil resources (17 percent). **Figure 30** illustrates the share of countries with an adaptation component with cross-sectoral priorities in ecosystems, by type.

FIGURE 30.

CROSS-SECTORAL PRIORITIES FOR ADAPTATION IN ECOSYSTEMS IN THE NDCS OF CARIBBEAN COUNTRIES, BY TYPE

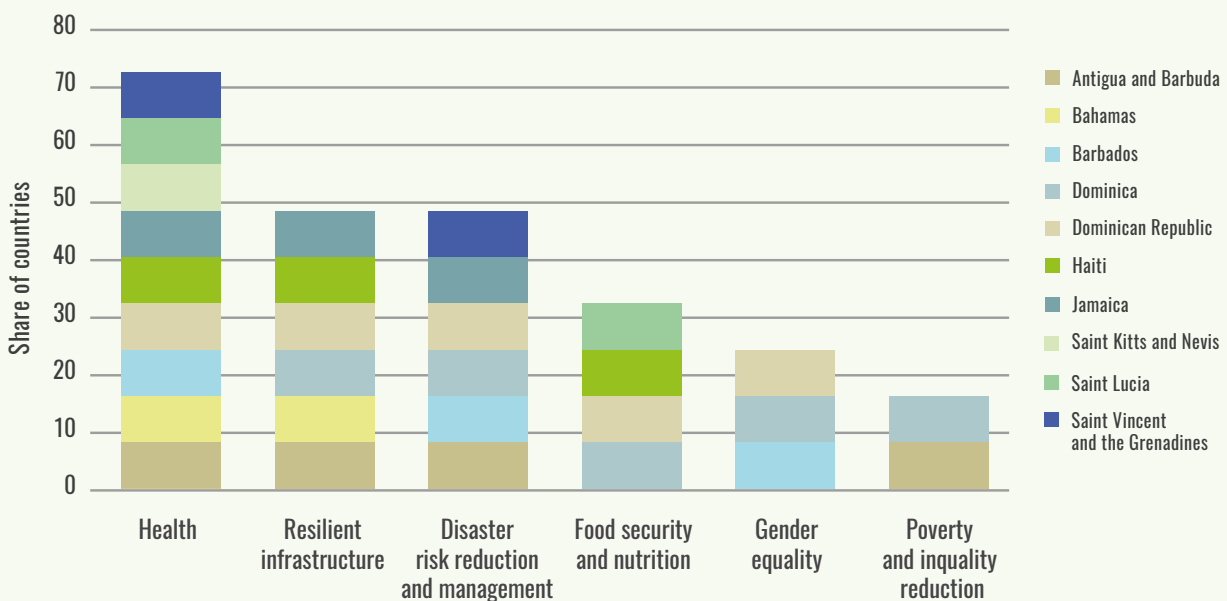


Countries often identify a number of cross-cutting priorities in social systems as part of their adaptation strategy.

Amongst cross-cutting adaptation measures in social systems, health is most frequently promoted in the region (75 percent of countries with an adaptation component), followed by resilient infrastructure and Disaster Risk Reduction (DRR) (50 percent each), food security and nutrition (33 percent), gender equality (25 percent) and poverty and inequality reduction (17 percent). Figure 31 illustrates the share of countries with an adaptation component with cross-cutting priorities in social systems by type.

FIGURE 31.

CROSS-SECTORAL PRIORITIES FOR ADAPTATION IN SOCIAL SYSTEMS IN THE NDCS OF CARIBBEAN COUNTRIES, BY TYPE



## Adaptation measures in ecosystems and social systems

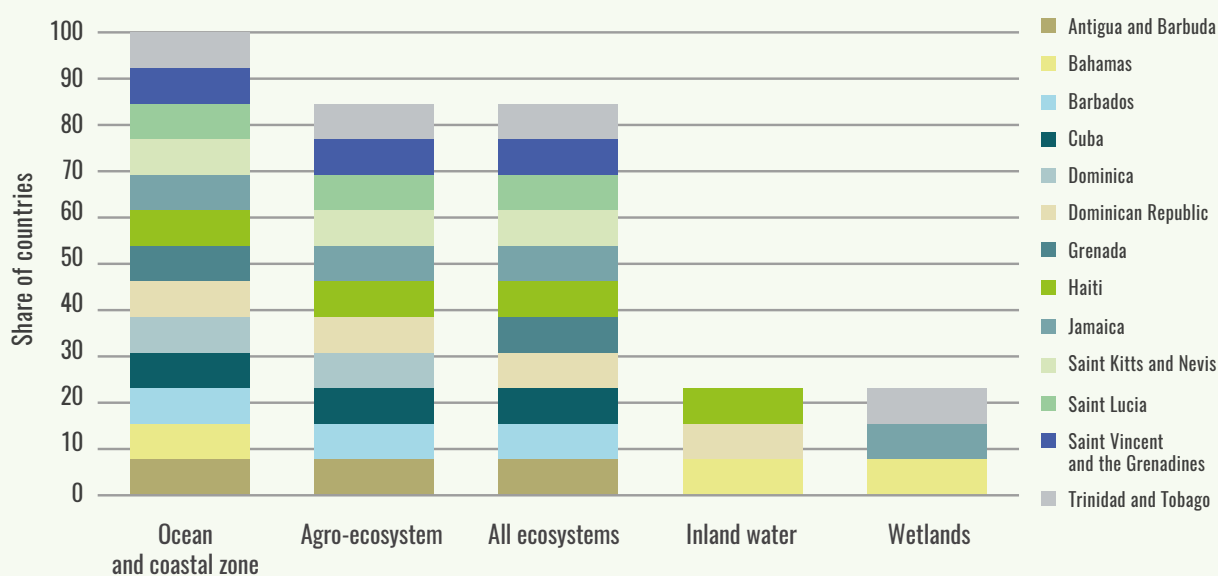
Adaptation measures in ecosystems are differentiated by type of ecosystem, natural resource and ecosystem service supported and management activity. Adaptation measures in social systems are differentiated by dimension and intervention option. It should be noted that the objective of adaptation measures and their entry-points are often multiple, as their impacts are often cross-cutting. For this reason, adaptation measures are categorized thematically, depending on the level of detail provided, and categories are not considered mutually exclusive.

### ADAPTATION MEASURES IN ECOSYSTEMS

All countries in the region with an adaptation component identify at least one policy or measure in ecosystems, particularly in ocean and coastal zones, followed by agro-ecosystems and ecosystems in general (85 percent of countries with adaptation, respectively), and inland water and wetland ecosystems (23 percent each). **Figure 32** illustrates the share of countries that include one or more (to avoid bias of representation) adaptation measure in ecosystems, by type of ecosystem, out of countries with an adaptation component.

**FIGURE 32.**

#### ADAPTATION POLICIES AND MEASURES IN ECOSYSTEMS IN THE NDCs OF CARIBBEAN COUNTRIES

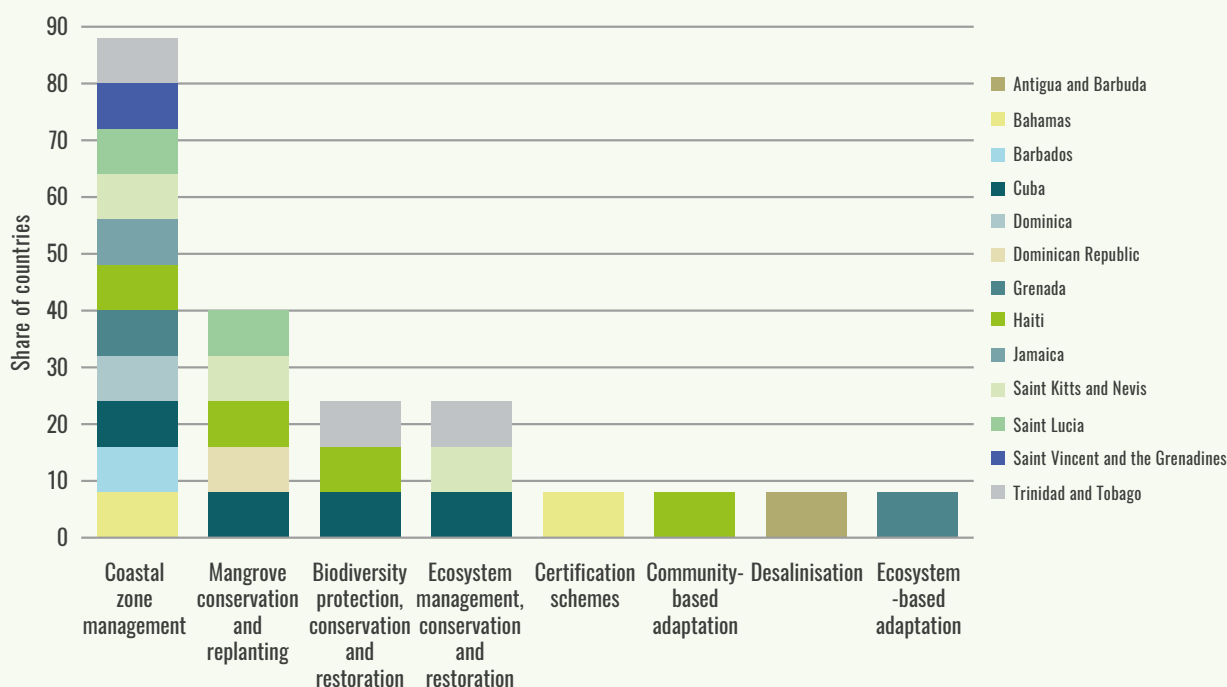


The adaptation measures in ecosystems are described by ecosystem type and management activity in order of regional priority:

#### Ocean and coastal zone ecosystems

All countries with an adaptation component include at least one policy or measure in ocean and coastal zone ecosystems. The majority of those countries promote coastal zone management (85 percent of countries with adaptation in ecosystems), followed by mangrove conservation and replanting (38 percent), biodiversity and ecosystem protection, conservation and restoration (23 percent each), amongst others.

**Figure 33** illustrates the share of countries with one or more (to avoid bias of representation) adaptation measure in ocean and coastal zone ecosystems, by management activity, out of countries with adaptation in ecosystems.

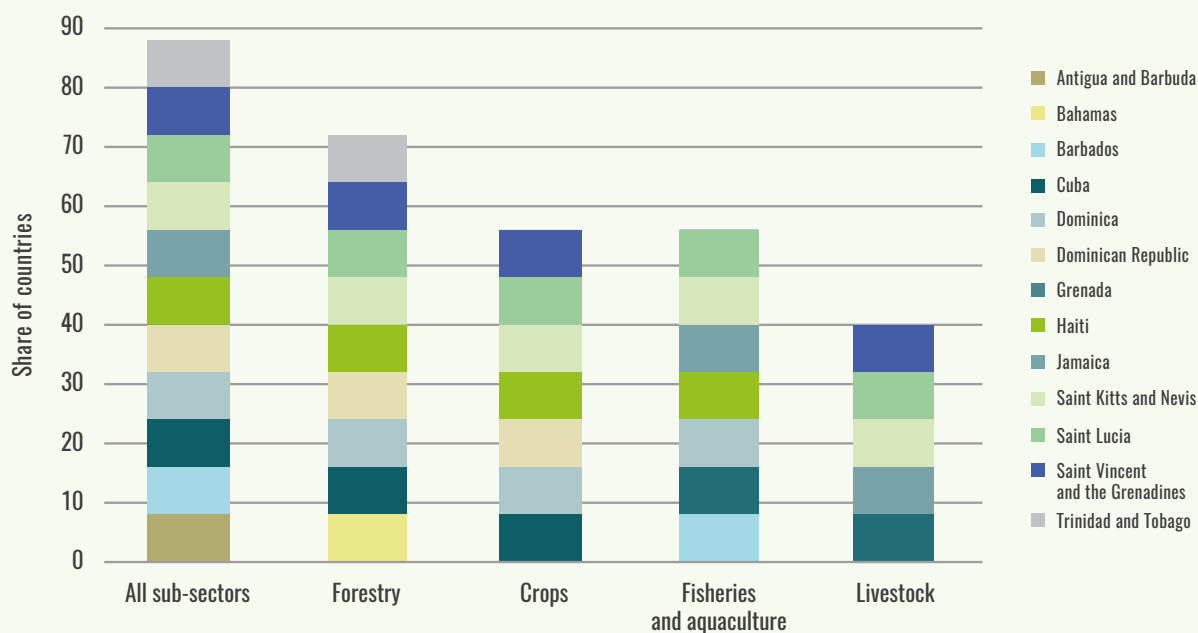
**FIGURE 33.**
**ADAPTATION POLICIES AND MEASURES IN OCEAN AND COASTAL ZONE ECOSYSTEMS IN THE NDCs OF CARIBBEAN COUNTRIES**

**TABLE 9.**
**EXAMPLES OF ADAPTATION MEASURES IN OCEAN AND COASTAL ZONE ECOSYSTEMS**

COUNTRY	MANAGEMENT ACTIVITY	METRIC	2030 TARGET
ANTIGUA AND BARBUDA	BY 2025, INCREASE SEAWATER DESALINATION CAPACITY BY 50% ABOVE 2015 LEVELS	QUANTIFIED	50%
HAITI	ADOPTION OF PROTECTION, CONSERVATION AND SUSTAINABLE MANAGEMENT MEASURES OF MANGROVES ECOSYSTEMS	NON-QUANTIFIED	
ST KITTS AND NEVIS	EFFECTIVE STRATEGIES, TECHNIQUES AND TOOLS ARE NOW AVAILABLE FOR APPLICATION IN HABITAT RESTORATION ACTIVITIES FOR CORALS, MANGROVES AND SEAGRASSES	NON-QUANTIFIED	

### Agro-ecosystems

**Eighty-five percent of countries with an adaptation component identify at least one policy or measure in agro-ecosystems.** The majority of those countries promote adaptation in agriculture in general (85 percent of countries with adaptation in agro-ecosystems), followed by in forestry (69 percent), fisheries and aquaculture and the crops sub-sectors (54 percent each), livestock (38 percent) and integrated systems (23 percent). **Figure 34** illustrates the share of countries with one or more (to avoid bias of representation) adaptation measure, by sub-sector, out of countries with adaptation in agro-ecosystems.



**FIGURE 34.**
**ADAPTATION POLICIES AND MEASURES IN AGROECOSYSTEMS IN THE NDCs OF CARIBBEAN COUNTRIES**


### Forestry

**Sixty-nine percent of countries with adaptation in agro-ecosystems include at least one policy or measure in the forestry sub-sector.** The majority of those countries promote reducing degradation and SFM (46 percent of countries with adaptation in agro-ecosystems), followed by afforestation/reforestation (31 percent) and reducing deforestation and forest conservation (23 percent), and mangrove conservation and replanting and biodiversity protection, conservation and restoration (15 percent each), amongst others. **Figure 35** illustrates the share of countries with one or more (to avoid bias of representation) adaptation measure in the forestry sub-sector, by management activity, out of countries with an adaptation in agro-ecosystems.

FIGURE 35.

## ADAPTATION POLICIES AND MEASURES IN THE FORESTRY SUB-SECTOR IN THE NDCs OF CARIBBEAN COUNTRIES

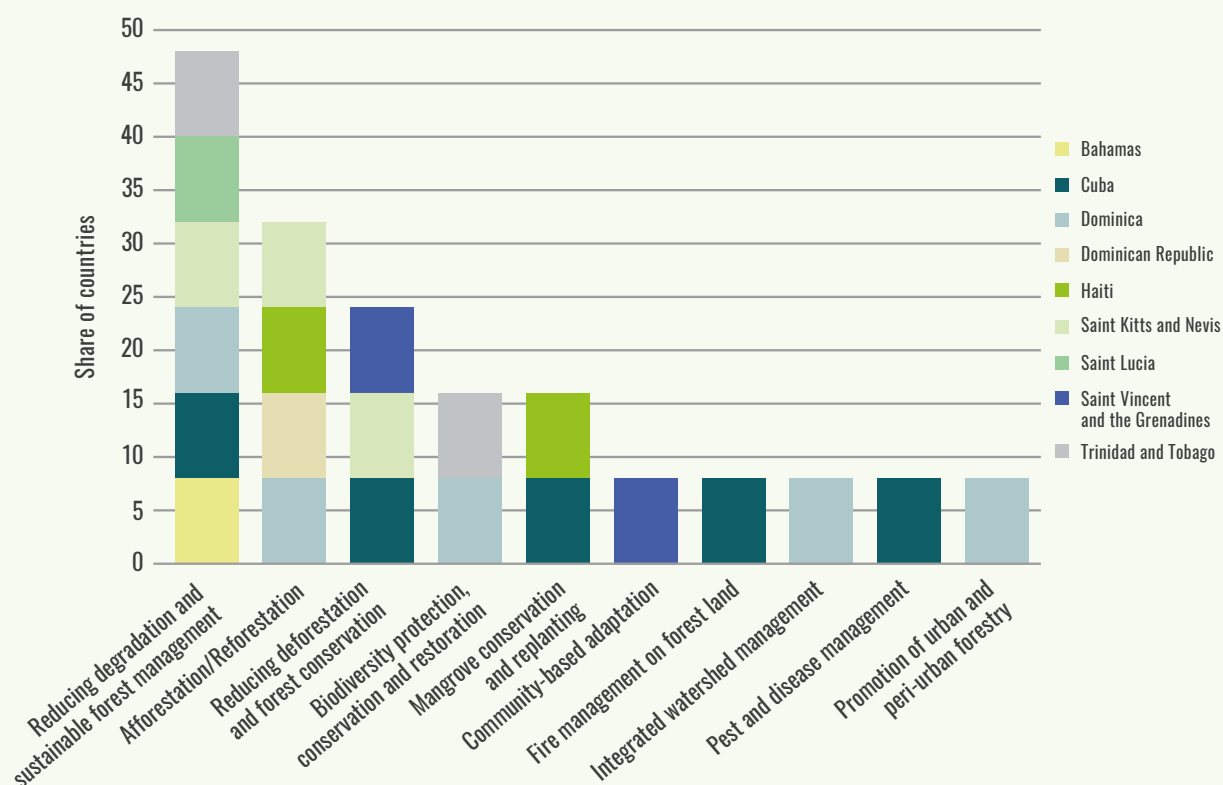


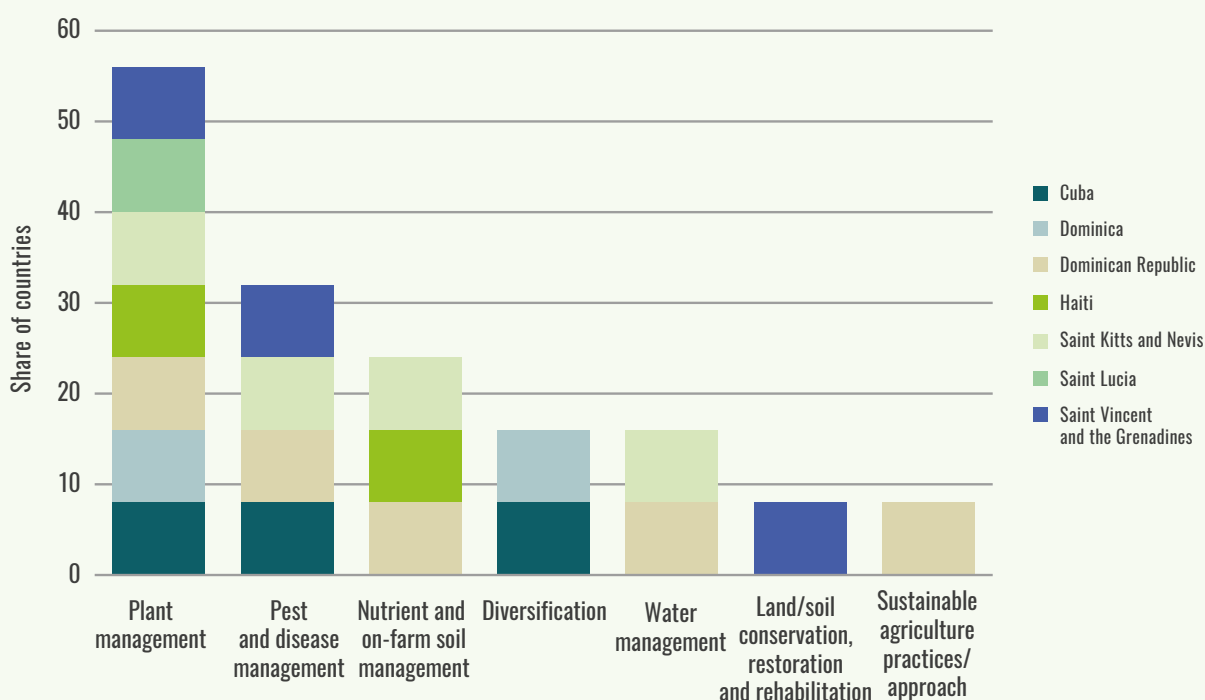
TABLE 10.

## EXAMPLES OF ADAPTATION MEASURES IN THE FORESTRY SUB-SECTOR

COUNTRY	MANAGEMENT ACTIVITY	METRIC	2030 TARGET
ST VINCENT AND GRENADINES	ADDRESS ISSUES OF LIMITED INVOLVEMENT OF COMMUNITIES IN FOREST RESOURCE MANAGEMENT	NON-QUANTIFIED	
HAITI	REFORESTATION OF UPSTREAM AREAS	NON-QUANTIFIED	

### Crops

Fifty-four percent of countries with adaptation in agro-ecosystems include at least one policy or measure in the crops sub-sector. The majority of those countries target plant management (54 percent of countries with adaptation in agro-ecosystems), followed by pest and disease management (31 percent) and nutrient and on-farm soil management (23 percent), amongst others. Figure 36 illustrates the share of countries with one or more (to avoid bias of representation) adaptation measure in the crops sub-sector, by management activity, out of countries with an adaptation in agro-ecosystems.

**FIGURE 36.**
**ADAPTATION POLICIES AND MEASURES IN THE CROPS SUB-SECTOR IN THE NDCS OF CARIBBEAN COUNTRIES**

**TABLE 11.**
**EXAMPLES OF ADAPTATION MEASURES IN THE CROPS SUB-SECTOR**

COUNTRY	MANAGEMENT ACTIVITY	METRIC	2030 TARGET
HAITI	DEVELOPMENT OF SALT-RESISTANT CROPS	NON-QUANTIFIED	
ST KITTS AND NEVIS	OTHER SOURCES OF FEEDING THE RAINWATER PALM FOR IRRIGATION PURPOSES	NON QUANTIFIED	
CUBA	ASSESS THE LEVELS OF TOLERANCE AND RESISTANCE OF EXISTING VARIETIES OF TOBACCO TO THE EFFECTS OF PESTS		

### Fisheries and aquaculture

**Fifty-four percent of countries with adaptation in agro-ecosystems include at least one policy or measure in the fisheries and aquaculture sub-sector.** The majority of those countries promote improved fisheries practices (46 percent of countries with adaptation in agro-ecosystems), followed by improved aquaculture practices (31 percent) and ecosystem management, conservation and restoration (15 percent). **Figure 37** illustrates the share of countries with one or more (to avoid bias of representation) adaptation measure in marine fisheries and aquaculture, by management activity, out of countries with an adaptation in agro-ecosystems.

FIGURE 37.

## ADAPTATION POLICIES AND MEASURES IN THE FISHERIES AND AQUACULTURE SUB-SECTOR IN THE NDCs OF CARIBBEAN COUNTRIES

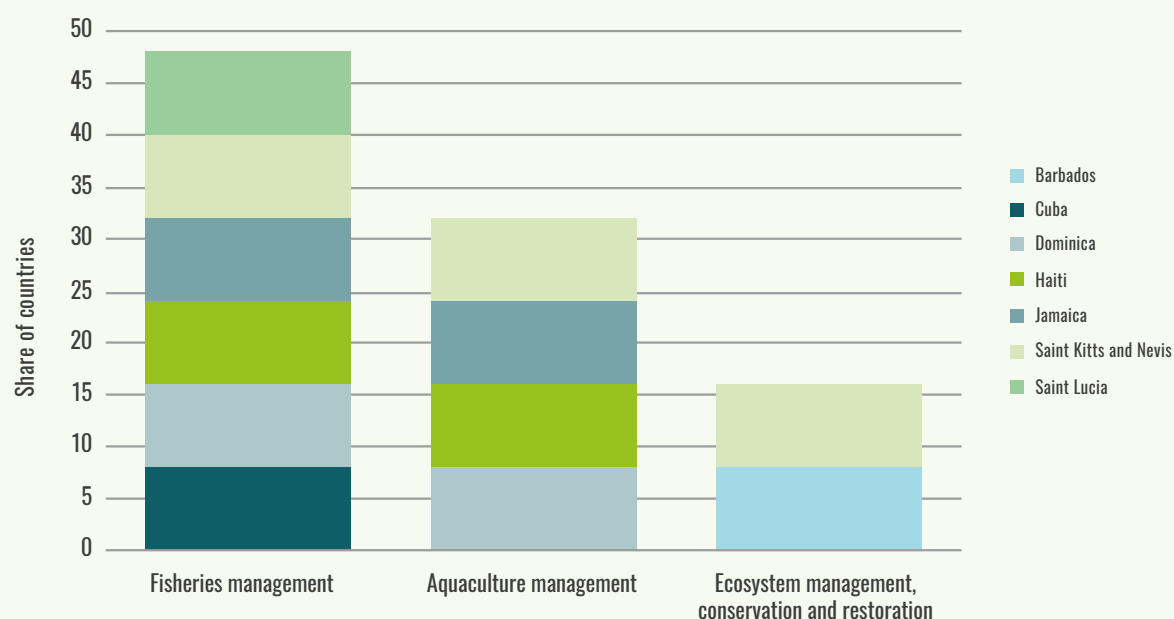


TABLE 12.

## EXAMPLES OF ADAPTATION MEASURES IN FISHERIES AND AQUACULTURE

COUNTRY	MANAGEMENT ACTIVITY	METRIC
DOMINICA	PROMOTION OF CLIMATE RESILIENT AGRICULTURE/FISHERIES	NON-QUANTIFIED
HAITI	IMPROVEMENT OF THE AUTONOMY AND SECURITY OF SMALL FISHERIES BOATS	NON-QUANTIFIED
JAMAICA	CONDUCTING AND UPDATING STOCK ASSESSMENTS AS IMPORTANT TOOLS FOR MANAGING FISHERIES RESOURCES UNDER CHANGING CONDITIONS (DUE TO CLIMATE CHANGE IMPACTS). CONDUCTING THESE ASSESSMENTS WILL PROVIDE A GOOD INVENTORY OF AVAILABLE SPECIES THAT CAN BE USED AS A TOOL FOR IDENTIFICATION OF OVER- AND UNDER-EXPLOITED STOCKS	NON-QUANTIFIED

## Livestock

**Thirty-eight percent of countries with adaptation in agro-ecosystems include at least one policy or measure in the livestock sub-sector.** The majority of those countries promote general livestock management and improved feeding practices (23 percent of countries with adaptation in agro-ecosystems, respectively), followed by animal breeding and husbandry (15 percent) and intensification (8 percent). **Figure 38** illustrates the share of countries with one or more (to avoid bias of representation) adaptation measure in the livestock sub-sector, by management activity, out of countries with an adaptation in agro-ecosystems.

FIGURE 38.

## ADAPTATION POLICIES AND MEASURES IN THE LIVESTOCK SUB-SECTOR IN THE NDCs OF CARIBBEAN COUNTRIES

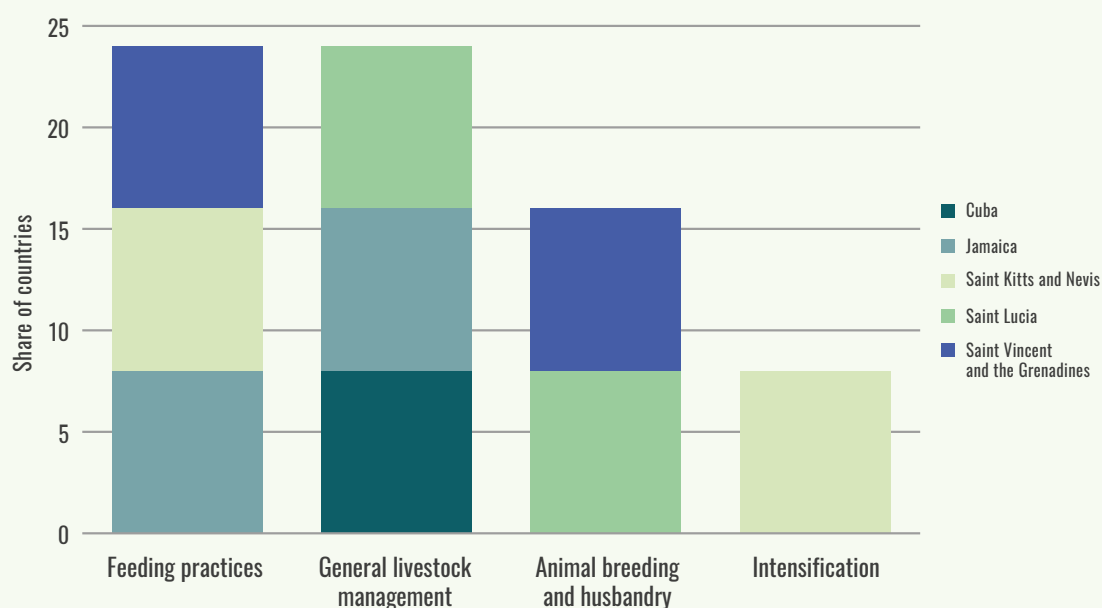


TABLE 13.

## EXAMPLES OF ADAPTATION MEASURES IN INTEGRATED SYSTEMS

COUNTRY	MANAGEMENT ACTIVITY	METRIC	2030 TARGET
ST KITTS AND NEVIS	EXPLORING OTHER FEEDSTOCK TO WARRANT FEEDING IN DRY SEASON	NON-QUANTIFIED	
JAMAICA	PLENTY OF CLEAN, COOL, AND FRESH WATER IS PARAMOUNT TO PREVENTING HEAT STRESS IN LIVESTOCK	NON-QUANTIFIED	
ST VINCENT AND GRENADINES	EDUCATION OF HEAT PRODUCTION THROUGH RUMINATION BY ENHANCED NUTRITION AND FEEDING PROGRAMME	NON-QUANTIFIED	

## Integrated systems

Three countries<sup>65</sup> (23 percent of countries with adaptation in agro-ecosystems) include at least one adaptation policy or measure in integrated systems, all promoting agroforestry.

TABLE 14.

## EXAMPLES OF ADAPTATION MEASURES IN INTEGRATED SYSTEMS

COUNTRY	MANAGEMENT ACTIVITY	METRIC	2030 TARGET
DOMINICAN REPUBLIC	PERENNIAL CROPS: COFFEE AND CACAO UNDER TREE SHADOW	NON-QUANTIFIED	
DOMINICA	THE IMPLEMENTATION AND PROMOTION OF AGROFORESTRY SYSTEMS	NON-QUANTIFIED	
ST VINCENT AND GRENADINES	MIX FARMING USING A COMBINATION OF TREE CROPS AND VEGETABLE OR ROOT CROPS	NON-QUANTIFIED	

<sup>65</sup> Dominica, Dominican Republic and Saint Vincent and the Grenadines.

## INLAND WATER ECOSYSTEMS

Three countries<sup>66</sup> (23 percent of countries with adaptation in ecosystems) include at least one adaptation policy or measure in inland water ecosystems, particularly integrated watershed management, payment for ecosystem services and water-related ecosystem protection and restoration.

**TABLE 15.**

### EXAMPLES OF ADAPTATION MEASURES IN INLAND WATER ECOSYSTEMS

COUNTRY	MANAGEMENT ACTIVITY	METRIC
BAHAMAS	DISCOURAGEMENT OF THE EXCAVATION OF CANALS AND WATERWAYS AND ANY EXCAVATIONS BELOW THE WATER TABLE WHERE THESE ARE UNNECESSARY	NON-QUANTIFIED
DOMINICAN REPUBLIC	CONSERVATION AND MANAGEMENT OF WATER BASINS	NON-QUANTIFIED

## WETLAND ECOSYSTEMS

Three countries<sup>67</sup> (23 percent of countries with adaptation in ecosystems) include at least one adaptation policy or measure in wetland ecosystems.

**TABLE 16.**

### EXAMPLES OF ADAPTATION MEASURES IN WETLAND ECOSYSTEMS

COUNTRY	MANAGEMENT ACTIVITY	METRIC
JAMAICA	IMPROVE ABILITY OF ECOSYSTEMS SUCH AS WETLANDS TO ACT AS CARBON SINK (BLUE CARBON)	NON-QUANTIFIED
TRINIDAD AND TOBAGO	REDUCE THE RISKS OF FLOODS AND DROUGHTS BY, INTER ALIA, PROMOTING WETLAND AND WATERSHED PROTECTION AND RESTORATION, IMPROVED LAND-USE PLANNING, IMPROVING AND APPLY MORE WIDELY TECHNIQUES AND METHODOLOGIES FOR ASSESSING THE POTENTIAL ADVERSE EFFECTS OF CLIMATE CHANGE ON WETLANDS	NON-QUANTIFIED

## NATURAL RESOURCES

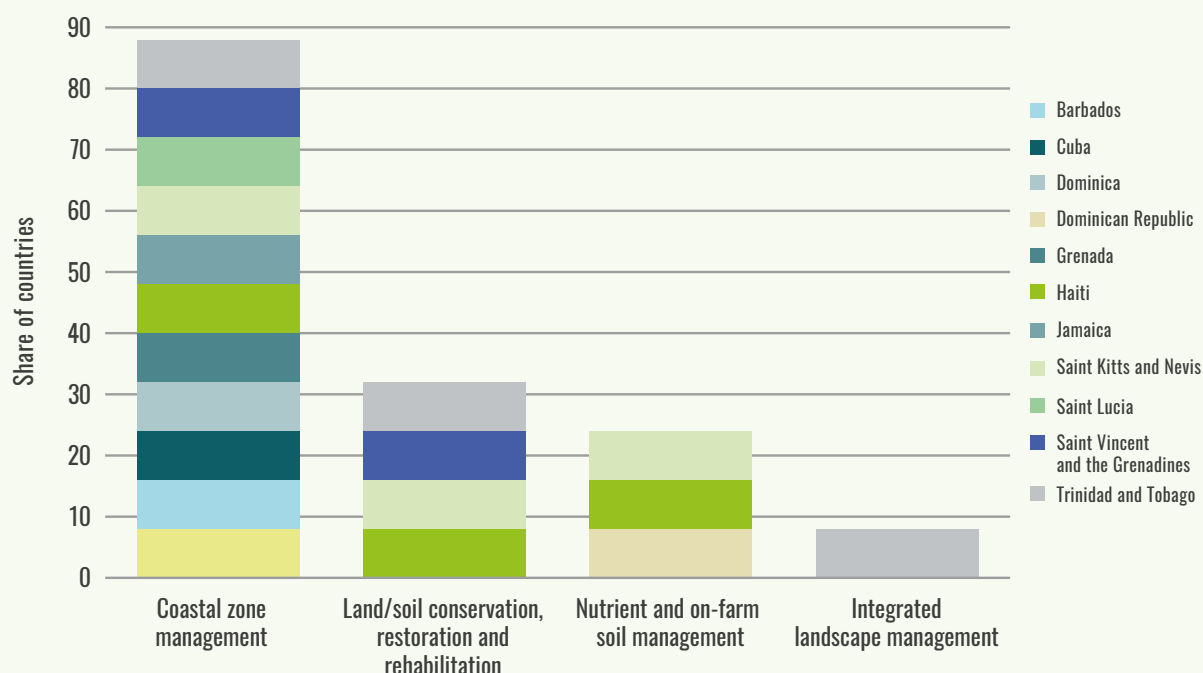
Natural resource use and management options are integrated within each of the ecosystem-based approaches to adaptation identified above due to their cross-cutting nature. The distribution of those management options are presented from a natural resource lens below:

### Land and soil resources

**Ninety-two percent of countries with an adaptation component include at least one policy or measure targeting land and soil resource use and management.** The majority of those countries promote coastal zone management (85 percent of countries with adaptation in ecosystems), followed by land/soil conservation, restoration and rehabilitation (31 percent) and nutrient and on-farm management (23 percent), amongst others. **Figure 39** illustrates the share of countries with one or more (to avoid bias of representation) land and soil-related adaptation measure, by resource use and management option, out of countries with adaptation in ecosystems.

<sup>66</sup> Haiti, Bahamas and Dominican Republic.

<sup>67</sup> Bahamas, Jamaica and Trinidad and Tobago.

**FIGURE 39.**
**LAND AND SOIL-RELATED ADAPTATION MEASURES IN THE NDCs OF CARIBBEAN COUNTRIES**

**TABLE 17.**
**EXAMPLES OF LAND-RELATED ADAPTATION MEASURES**

COUNTRY	MANAGEMENT ACTIVITY	METRIC
ST VINCENT AND GRENADINES	SOIL CONSERVATION MEASURES TO DEAL WITH RUN-OFFS, ESPECIALLY ON HILLSIDE FARMING	NON-QUANTIFIED
HAITI	CONSERVATION AND REGENERATION OF SOILS	NON-QUANTIFIED
TRINIDAD AND TOBAGO	DEVELOP AND IMPLEMENT INTEGRATED LAND MANAGEMENT AND WATER-USE PLANS THAT ARE BASED ON SUITABLE USE OF RENEWABLE RESOURCES AND ON INTEGRATED ASSESSMENTS OF SOCIO-ECONOMIC AND ENVIRONMENTAL POTENTIALS	NON-QUANTIFIED

### Ecosystems and biodiversity

**Ninety-two percent of countries with an adaptation component include at least one policy or measure targeting ecosystems and biodiversity conservation.** The majority of those countries promote ecosystem management, conservation and restoration (62 percent of countries with adaptation in ecosystems), followed by crop breeding and diversification (54 percent), pest and disease management (31 percent), ecosystem-based adaptation (15 percent) and animal breeding, (15 percent), amongst others. **Figure 40** illustrates the share of countries with one or more (to avoid bias of representation) ecosystem and biodiversity-related adaptation measure, by resource use and management option, out of countries with adaptation in ecosystems.

FIGURE 40.

## ECOSYSTEM AND BIODIVERSITY-RELATED ADAPTATION MEASURES IN THE NDCs OF CARIBBEAN COUNTRIES

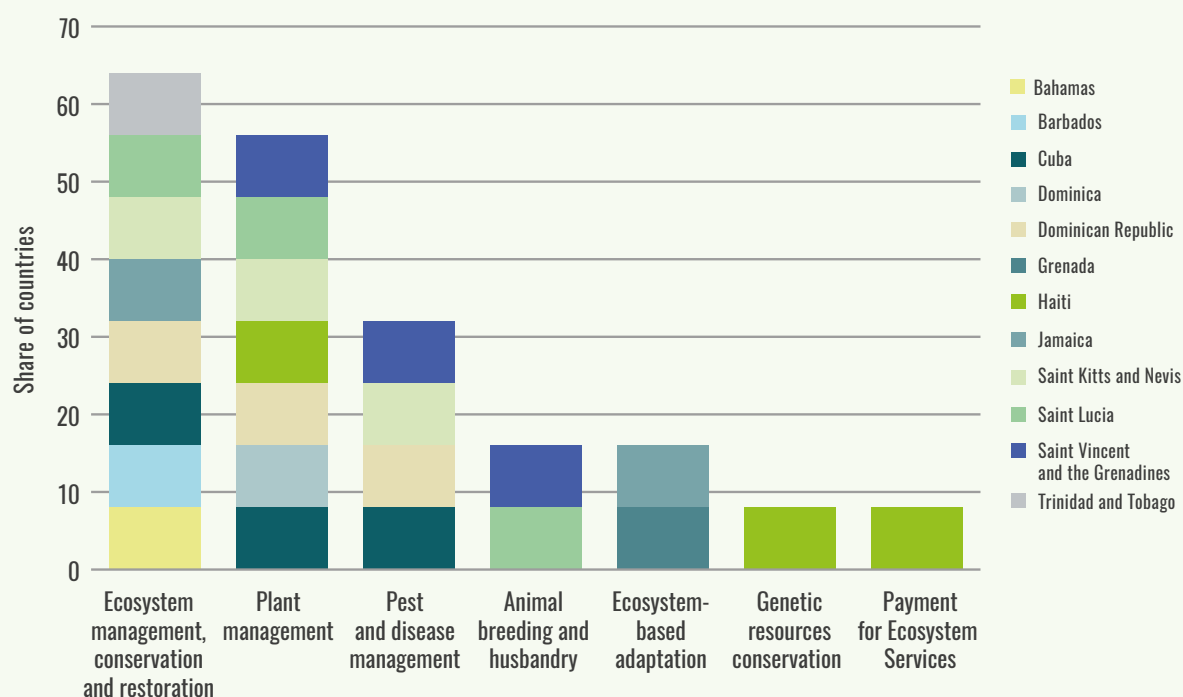


TABLE 18.

## EXAMPLES OF ECOSYSTEM AND BIODIVERSITY-RELATED ADAPTATION MEASURES

COUNTRY	MANAGEMENT ACTIVITY	METRIC
HAITI	CONSERVATION OF GENETIC AGRICULTURAL RESOURCES	QUANTIFIED NON-QUANTIFIED
CUBA	CREATE PROTECTED AREAS WITH RESTRICTIVE CATEGORIES TO EFFECTIVELY PROTECT MARINE ECOSYSTEMS	NON-QUANTIFIED
HAITI	DEVELOPMENT OF INITIATIVES CONNECTED TO ECOSYSTEM SERVICE PAYMENTS IN CATCHMENT BASINS	NON-QUANTIFIED

### Water resources

**Eighty-five percent of countries with an adaptation component include at least one policy or measure targeting water resource use and management.** The majority of those countries promote irrigation and drainage (46 percent of countries with adaptation in ecosystems), followed by water storage and harvesting and sustainable (38 percent), sustainable water use and management (38 percent), water availability and access (23 percent) and water quality and pollution management (23 percent), amongst others. **Figure 41** illustrates the share of countries with one or more (to avoid bias of representation) water-related adaptation measure, by resource use and management option, out of countries with adaptation in ecosystems.



FIGURE 41.

## WATER-RELATED ADAPTATION MEASURES IN THE NDCs OF CARIBBEAN COUNTRIES

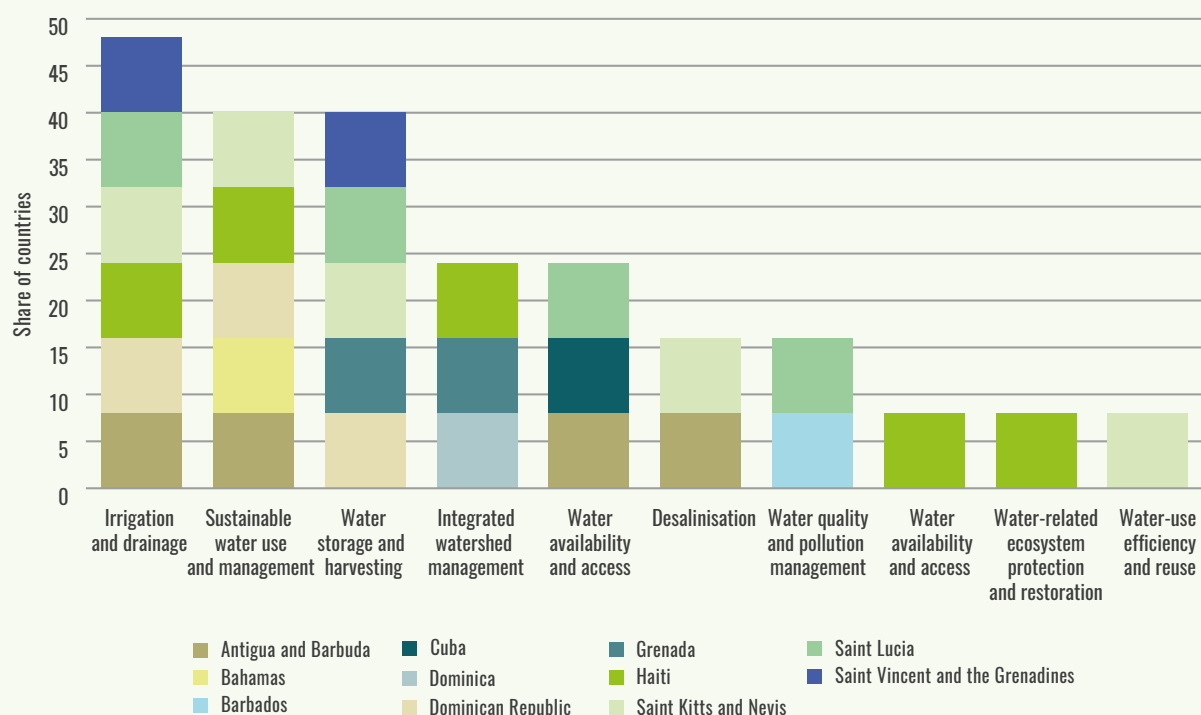


TABLE 19.

## EXAMPLES OF WATER-RELATED ADAPTATION MEASURES

COUNTRY	MANAGEMENT ACTIVITY	METRIC
ST KITTS AND NEVIS	RAINWATER HARVESTING FROM ROOF CATCHMENTS, AND STORAGE IN CISTERNS	NON-QUANTIFIED
DOMINICAN REPUBLIC	CANALS OF FLOW DEVIATION FOR VULNERABLE AREAS	NON-QUANTIFIED
ST LUCIA	DEVELOP DRIP AND SPRINKLE IRRIGATION PRACTICES TO INCREASE WATER EFFICIENCY	NON-QUANTIFIED

## ADAPTATION MEASURES IN SOCIAL SYSTEMS

For the sake of this analysis, adaptation measures in social systems are differentiated along three main pillars: socio-economics and well-being; knowledge and capacity; and institutions and governance. Social systems refer to the interaction between agricultural and food systems and rural livelihoods, and the institutions, governments and economies influencing individual adaptive capacity and exposure to climate change. The measures contained, therefore, in this section are not exclusive to agriculture.

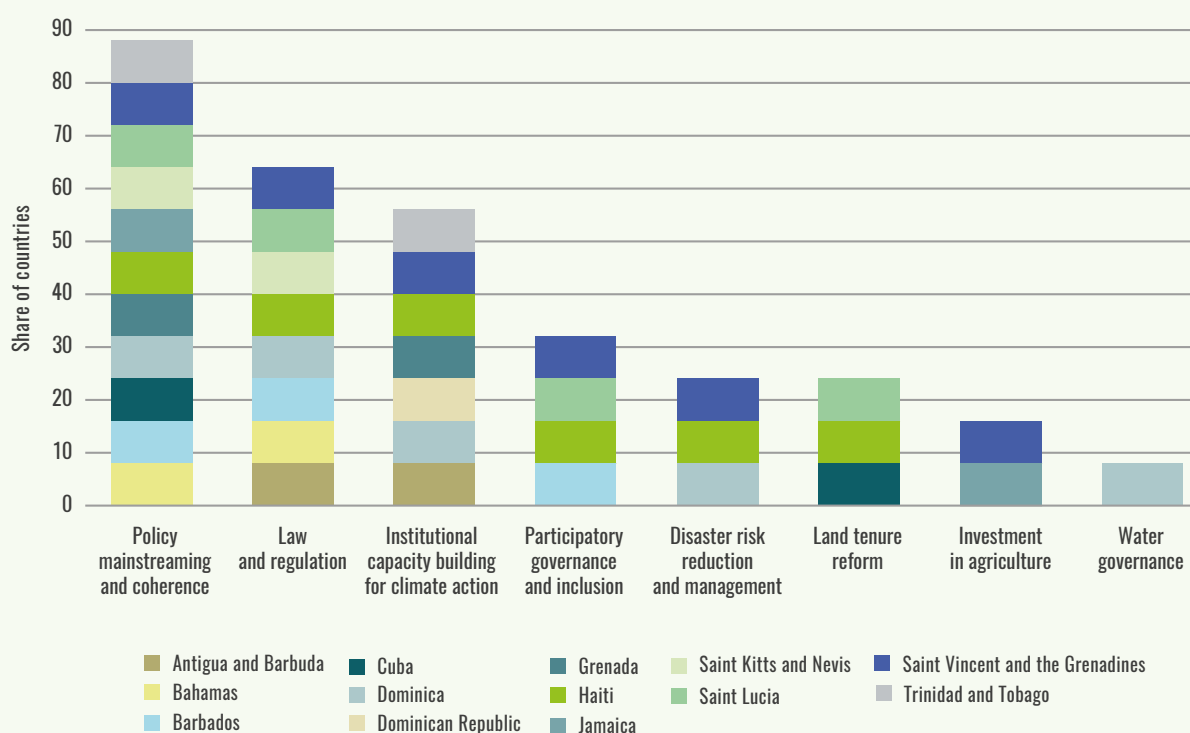
All countries with an adaptation component in the Caribbean identify at least one adaptation policy or measure in social systems, primarily around the institutions and governance pillar (100 percent of countries with adaptation), followed by the socio-economics and well-being (92 percent) and knowledge and capacity pillars (85 percent).

## Institutions and governance

All countries with an adaptation component include at least one policy or measure related to institutions and governance. The majority of those countries promote policy mainstreaming and coherence (85 percent of countries with adaptation in social systems), followed by law and regulation (62 percent), institutional capacity building (54 percent), participatory governance and inclusion (31 percent) and land tenure reform and DRR (23 percent each), amongst others **Figure 42** illustrates the share of countries with one or more (to avoid bias of representation) institutions and governance-related adaptation measure, by intervention option, out of countries with adaptation in social systems.

**FIGURE 42.**

### INSTITUTIONS AND GOVERNANCE-RELATED ADAPTATION MEASURES IN THE NDCs OF CARIBBEAN COUNTRIES



**TABLE 20.**

### EXAMPLES OF INSTITUTIONS AND GOVERNANCE-RELATED ADAPTATION MEASURES

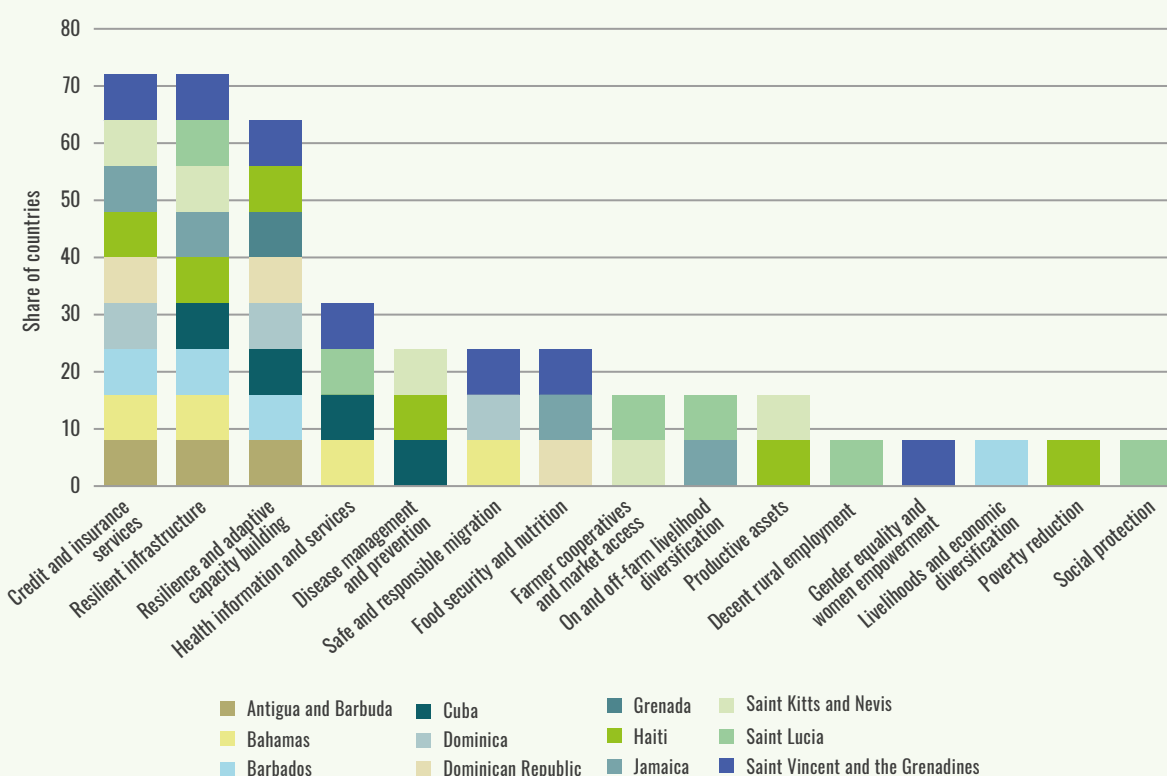
COUNTRY	MANAGEMENT ACTIVITY	METRIC
ST KITTS AND NEVIS	INCLUDE CLIMATE-RELATED ISSUES IN THE NEXT UPDATE OF NATIONAL PHYSICAL DEVELOPMENT PLAN	NON-QUANTIFIED
DOMINICA	LEGAL ESTABLISHMENT OF THE DEPARTMENT OF CLIMATE CHANGE, ENVIRONMENT AND DEVELOPMENT	NON-QUANTIFIED
ST VINCENT AND GRENADINES	INCREASE INSTITUTIONAL CAPACITY TO UNDERTAKE CLIMATE RISK MANAGEMENT	NON-QUANTIFIED
HAITI	DISASTER RISK REDUCTION IN THE AREAS MOST VULNERABLE TO FLOODS	NON-QUANTIFIED

## Socio-economics and well-being

Ninety-two percent of countries with an adaptation component in the region include at least one policy or measure related to socio-economics and well-being. The majority of those countries promote resilient infrastructure and credit and insurance services (69 percent of countries with adaptation in social systems, respectively), followed by resilience and adaptive capacity building (62 percent), health information and services (31 percent) and food security and nutrition, safe and responsible migration, and disease management and prevention (23 percent each), amongst others. **Figure 43** illustrates the share of countries with one or more (to avoid bias of representation) socio-economics and well-being-related adaptation measure, by intervention option, out of countries with adaptation in social systems.

**FIGURE 43.**

### SOCIO-ECONOMICS AND WELL-BEING RELATED ADAPTATION MEASURES IN THE NDCs OF CARIBBEAN COUNTRIES



**TABLE 21.**

### EXAMPLES OF SOCIO-ECONOMICS AND WELL-BEING RELATED ADAPTATION MEASURES

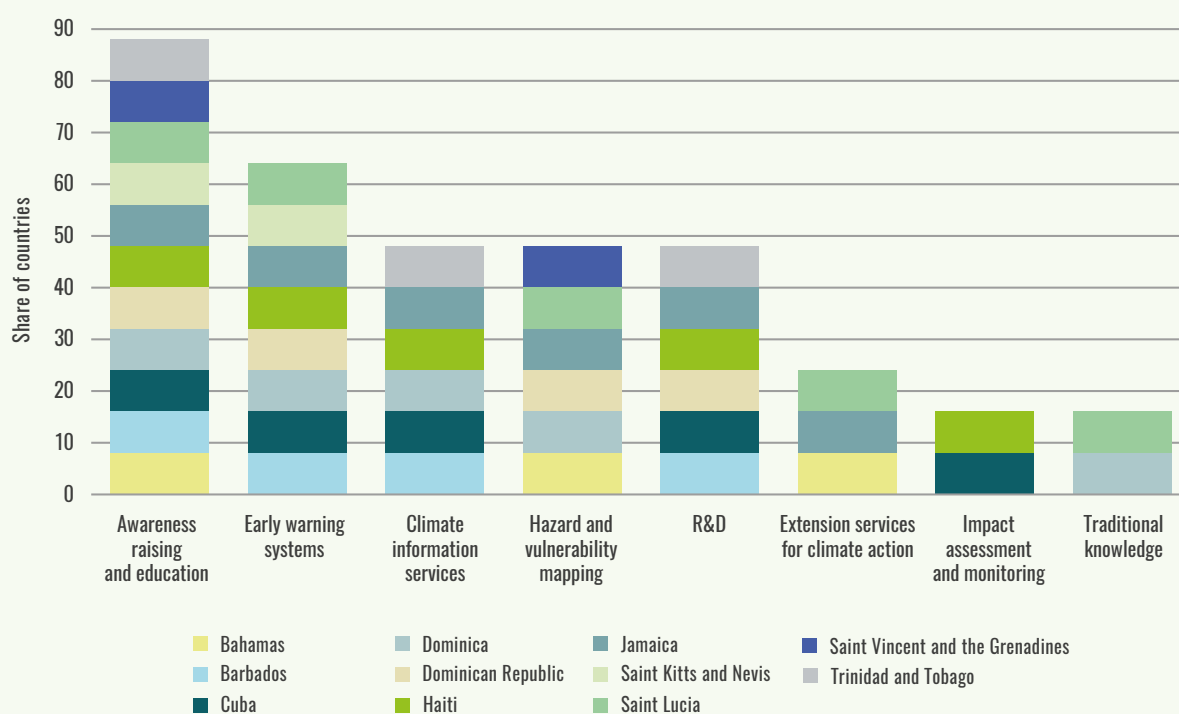
COUNTRY	MANAGEMENT ACTIVITY	METRIC
ANTIGUA AND BARBUDA	BY 2030, AN AFFORDABLE INSURANCE SCHEME IS AVAILABLE FOR FARMERS, FISHERS, AND RESIDENTIAL AND BUSINESS OWNERS TO COPE WITH LOSSES RESULTING FROM CLIMATE VARIABILITY	NON-QUANTIFIED
CUBA	BUILD CAPACITY FOR HEALTH SERVICES WITH REGARD TO CLIMATE CHANGE	NON-QUANTIFIED
ST KITTS AND NEVIS	RELOCATION OF CRITICAL SETTLEMENTS, ECONOMIC AND SOCIAL ACTIVITIES AND THEIR SUPPORTING INFRASTRUCTURE FROM HIGHLY VULNERABLE LOCATIONS (E.G. UTILITIES, SCHOOLS, SEGMENTS OF MAIN ROAD ARTERIES WHERE FEASIBLE) TO AREAS OF LOWER VULNERABILITY	NON-QUANTIFIED
ST LUCIA	THE DEVELOPMENT OF A SAFETY NET OF INCOME IN TIMES OF NEED WITH A VIEW TO PROTECT THE GROUPS AT RISK	NON-QUANTIFIED
DOMINICAN REPUBLIC	INCENTIVES FOR THE CREATION OF COOPERATIVES	NON-QUANTIFIED

## Knowledge and capacity

**Eighty-five percent of countries with an adaptation component include at least one policy or measure related to knowledge and capacity.** The majority of those countries promote the awareness raising (85 percent of countries with adaptation in social systems), followed by early warning systems (62 percent), climate information services, hazard and vulnerability mapping and research and development (R&D) (46 percent each) (23 percent each), amongst others. **Figure 44** illustrates the share of countries with one or more (to avoid bias of representation) knowledge and capacity-related adaptation measure, by intervention option, out of countries with adaptation in social systems.

**FIGURE 44.**

### KNOWLEDGE AND CAPACITY-RELATED ADAPTATION MEASURES IN THE NDCs OF CARIBBEAN COUNTRIES



**TABLE 22.**

### EXAMPLES OF KNOWLEDGE AND CAPACITY RELATED ADAPTATION MEASURES

COUNTRY	MANAGEMENT ACTIVITY	METRIC	2030 TARGET
DOMINICA	ESTABLISH EMERGENCY PREPAREDNESS TRAINING PROGRAMS IN VULNERABLE COMMUNITIES	NON-QUANTIFIED	
JAMAICA	ADAPTATION MEASURES IN VULNERABLE PRIORITY AREAS SUPPORTED BY EXISTING DATA SETS AND TRADITIONAL KNOWLEDGE, OR NEW DATA DEVELOPED AS NECESSARY	NON-QUANTIFIED	
ST VINCENT AND GRENADINES	PREPARE COMPREHENSIVE HAZARD MAPS FOR PUBLIC INSTITUTIONS AND COMMUNITIES	NON-QUANTIFIED	
BARBADOS	ESTABLISH FIELD SCHOOLS FOR FARMERS WHERE THEY CAN LEARN NEW 'CLIMATE-SMART' FARMING METHODS AND TECHNOLOGIES IN A HANDS-ON MANNER	NON-QUANTIFIED	

## 3.3 BARRIERS AND SUPPORT NEEDS

Article 9, 10 and 11 of the Paris Agreement reiterate the obligations of developed countries to support developing country efforts to build clean, climate-resilient futures through the provision of finance, technology and capacity-building support for climate change mitigation and adaptation. This section discusses the different types of support needs communicated by 8 countries in the Caribbean,<sup>68</sup> as well as the barriers facing these nations to effectively put in place technologies and policies to achieve their climate goals and targets. Information from the NDCs was supplemented by a comprehensive review of country NCs and the TNAs to understand all support needs and potential barriers to implementation.

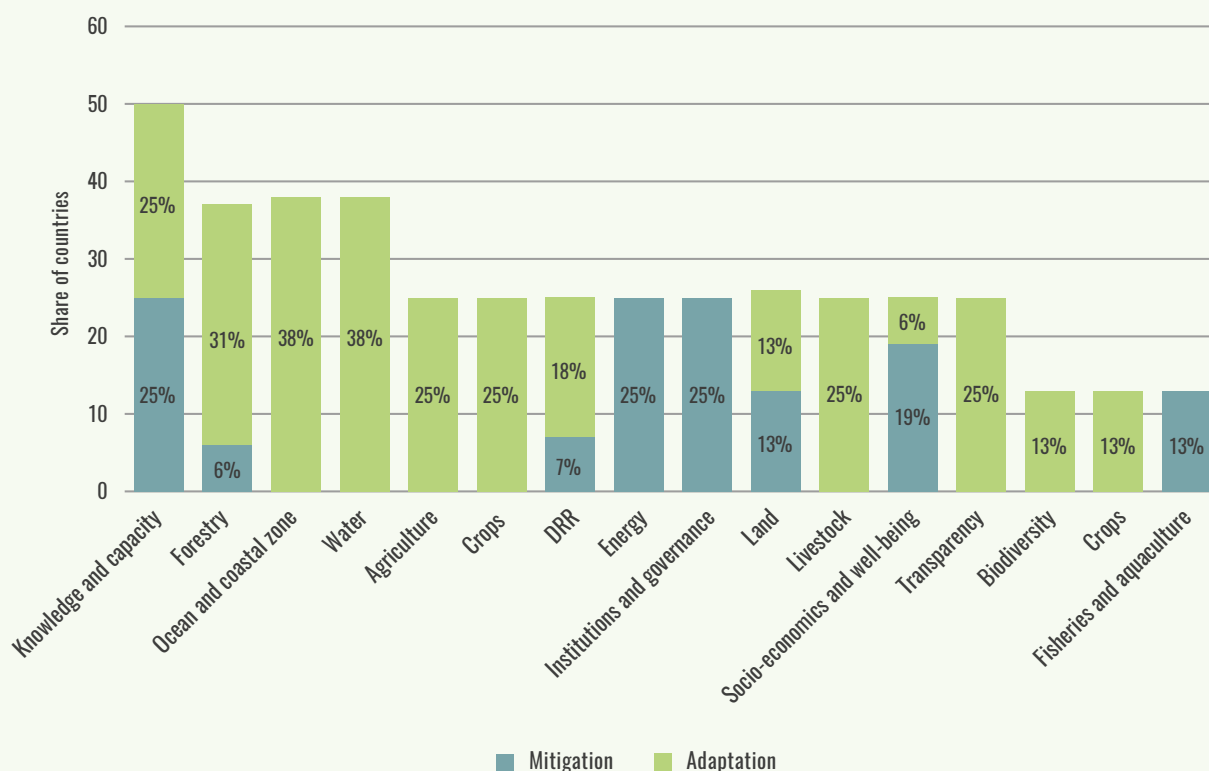
### 3.3.1 Priority needs

Sixty-two percent of all countries in the Caribbean report at least one priority need for implementing climate action in the agriculture and land use sectors, primarily for adaptation (80 percent of needs) as opposed to mitigation (20 percent).

In particular, the majority of those countries report support needs related to knowledge and capacity in the agriculture and land use sectors (50 percent of countries with needs reported), followed by forestry, ocean and coastal zones and water (38 percent each), amongst others. Figure 45 illustrates the share of countries with priority support needs for climate change adaptation and mitigation, by sector, out of countries with needs reported.

FIGURE 45.

SUPPORT NEEDS REPORTED IN THE CARIBBEAN FOR NDC IMPLEMENTATION IN THE AGRICULTURE AND LAND USE SECTORS, BY PRIORITY AREA



<sup>68</sup> Barbados, Dominica, Saint Kitts and Nevis, Antigua and Barbuda, Bahamas, Cuba, Saint Lucia, Saint Vincent and the Grenadines.

Data collection and management is the most frequently reported technology need in the agriculture and land use sectors (15 percent of total technologies), followed by climate information and early warning systems and mapping and monitoring (15 percent each) and irrigation and drainage (12 percent), amongst others.

### 3.3.2 Barriers to implementation

The majority of countries in the Caribbean report economic and financial, human skills and institutional and organizational-related barriers (63 percent of countries with barriers reported) impeding the implementation of climate change adaptation and mitigation measures in the agriculture and land use sectors. Technical, informational and awareness and legal and regulatory-related barriers are also prominent (50, 50 and 38 percent, respectively). However, when compared against the types of mitigating measures to address those barriers, gaps emerge around almost all categories. This comparison, however, does not assess the quality (i.e. effectiveness and status of implementation) of the mitigating measure identified. **Figure 46** illustrates the share of countries with barriers reported, by type, against the share of countries with relevant mitigating measures.

**FIGURE 46.**

**BARRIERS TO NDC IMPLEMENTATION IN THE AGRICULTURE AND LAND USE SECTORS REPOORTED IN THE CARIBBEAN, BY TYPE**

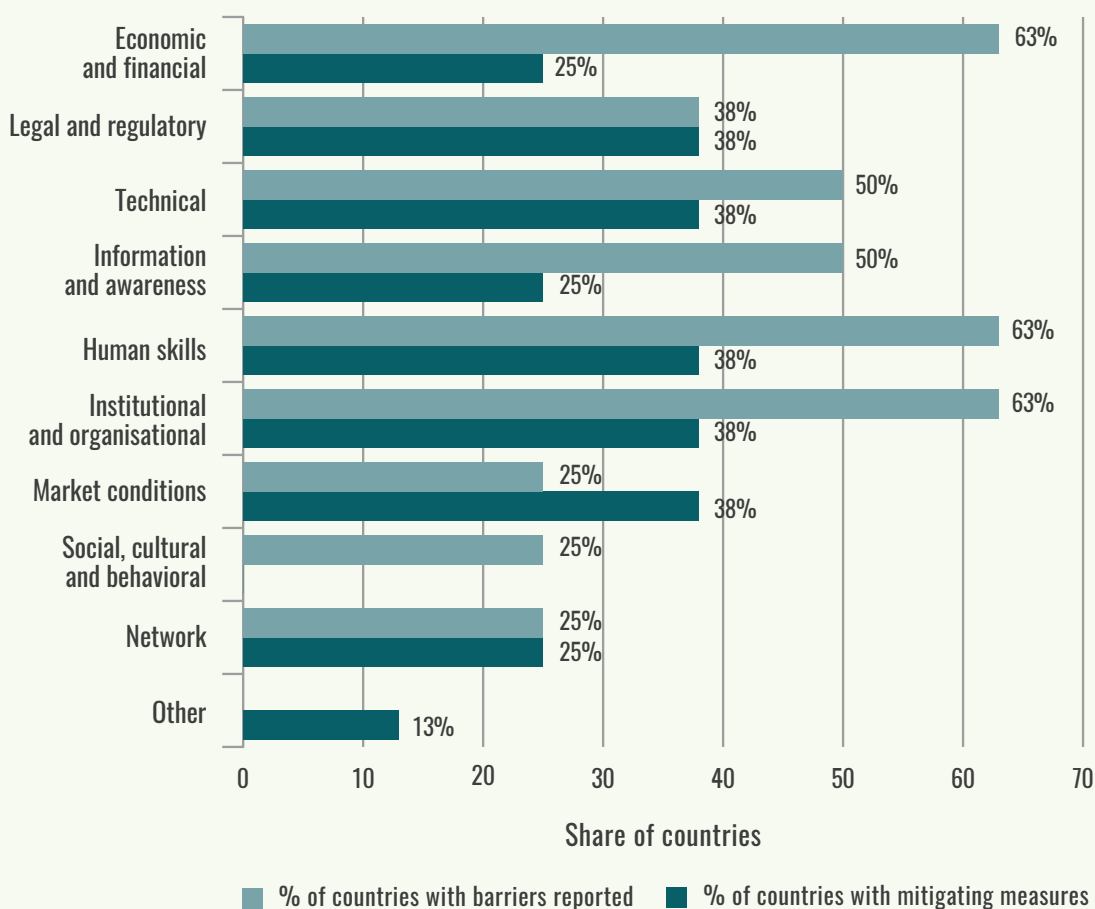


Table 23 illustrates some examples of reported barriers to climate action in the region.

**TABLE 23.**

**EXAMPLES OF REPORTED BARRIERS IN THE CARIBBEAN**

COUNTRY	TYPE OF BARRIER	DESCRIPTION OF BARRIER
SAINT LUCIA	FINANCIAL AND ECONOMIC	COSTS OF PURCHASE AND MAINTENANCE
DOMINICA	INSTITUTIONAL AND ORGANIZATIONAL	LACK OF FORMAL INSTITUTIONAL MECHANISMS FOR COORDINATED ACTION
CUBA	HUMAN SKILLS	LOW PERFORMANCE OF THE PERSONNEL OF THE NATIONAL INSPECTION SYSTEM OF HYDROLOGICAL RESOURCES
CUBA	TECHNICAL	LACK OF FACILITIES FOR EXPERIMENTS AND CERTIFICATION
BARBADOS	INFORMATION AND AWARENESS	LACK OF APPROPRIATE METHODS TO DISSEMINATE TIMELY AND RELEVANT INFORMATION TO FISHER FOLK
BARBADOS	LEGAL AND REGULATORY	WEAK ENFORCEMENT OF EXISTING REGULATIONS TO MANAGE COASTAL AREAS

### 3.3.3 Capacity-building, technology transfer and finance

All countries in the region express financial support needs and 92 percent of countries include capacity-building and technology transfer support needs, respectively.

# CHAPTER 4





# GAPS AND OPPORTUNITIES FOR ENHANCING AMBITION IN THE AGRICULTURE AND LAND USE SECTORS

This section aims to assess the degree to which the mitigation policies and measures in the agriculture and land use sectors address the major sources of sectoral GHG emissions, and the extent to which adaptation measures in ecosystems and social systems respond to the major observed and/or projected climate-related hazards, slow onset risks, impacts and vulnerabilities reported. The results of the “gap” analysis can inform the review and revision of NDCs in 2020 and future revision cycles by highlighting the “opportunities” to realign mitigation and adaptation priorities in the agriculture and land use sectors.

## 4.1 MITIGATION ANALYSIS

**This section first projects the counterfactual scenario – or net emissions in the absence of mitigation – and compares it to the mitigation scenario set out in country NDCs.** Information from the NDCs is supplemented by information from the NCs. The “GHG hotspots” in the agriculture and land use sectors are also identified and serve as the reference against which the mitigation policies or measures presented in the NDCs are assessed in order to identify gaps and opportunities for enhancing mitigation ambition.

### 4.1.1 Counterfactual and mitigation scenarios

Based on national data reported to the UNFCCC by all 13 countries in the region between 1994 and 2012, the counterfactual and mitigation scenarios are estimated at the country level and then aggregated to the regional level. The counterfactual scenario, at the country-level, is based on the projected level of net emissions in 2030 that is either reported by the country, or projected by using the average change in regional net emissions estimated by other countries in the region as a proxy. The counterfactual scenarios for each country are then aggregated to the regional level. The mitigation scenario, at the country level, is based on the estimated level of net emissions in 2030 that would result from the GHG reduction target reported in either their NDC or NC. The mitigation scenarios for each country are then aggregated to the regional level. Once the counterfactual and mitigation scenarios are established, they are compared to quantify the impact of NDC implementation in terms of the percent reduction in regional net emissions compared to either a scenario without NDC implementation (i.e. the counterfactual level of emissions in 2030) or the historical level of emissions (in 2015).

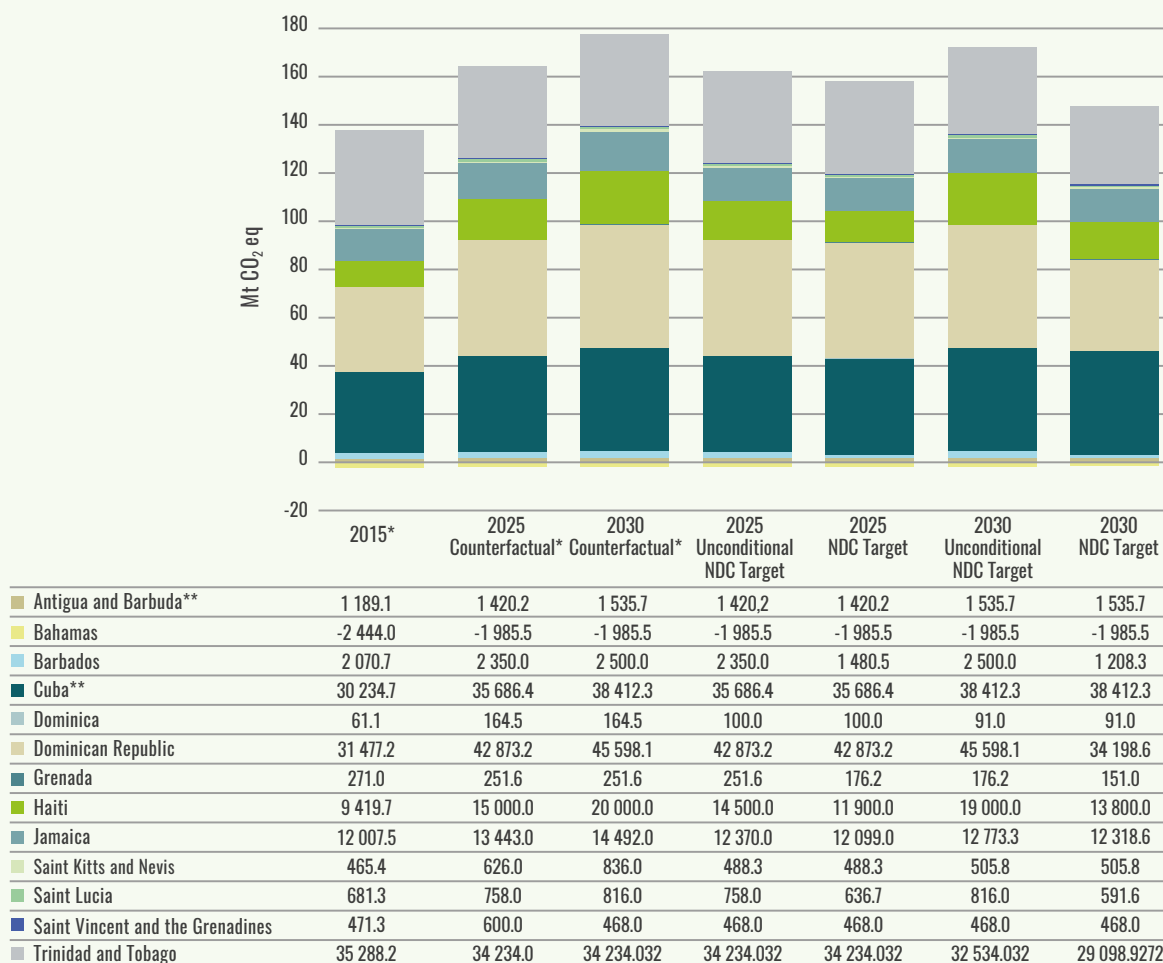
**Without implementation of the NDCs, total economy-wide net emissions in 2030 are expected to increase by around 30 percent compared to those reported in 2015**, rising from 121.2 Mt CO<sub>2</sub> eq. in 2015 to 157.3 Mt CO<sub>2</sub> eq. in 2030. Eleven out of the 13 countries in the region,<sup>69</sup> representing 74 percent of economy-wide net emissions in the region, set a general GHG target, covering the 2016–2030 period.

**Under the mitigation scenario, total net emissions in the region are expected to decrease by roughly 17 percent compared to the 2030 counterfactual scenario**, or from 157.3 Mt CO<sub>2</sub> eq. to 131 Mt CO<sub>2</sub> eq. in 2030, which equates to a cumulated net reduction of -245.1 Mt CO<sub>2</sub> eq. over the implementation period, of which 78 percent is explicitly referenced as conditional to international support.

<sup>69</sup> Antigua and Barbuda and Cuba do not communicate a GHG target.

FIGURE 47.

## AGGREGATED HISTORICAL (2015), COUNTERFACTUAL (2030) AND UNCONDITIONAL AND COMBINED MITIGATION SCENARIOS (2030) IN THE CARIBBEAN



\* Estimated based on national data, when available, and linearly interpolated, extrapolated or projected data.

\*\* Country without a GHG target where the 2030 counterfactual scenario is projected based on sub-regional emission trends and used under the 2030 mitigation scenarios, assuming the absence of mitigation.

Note: If a country does not set an unconditional and/or combined target, the counterfactual scenario emission level is used, assuming the absence of mitigation.

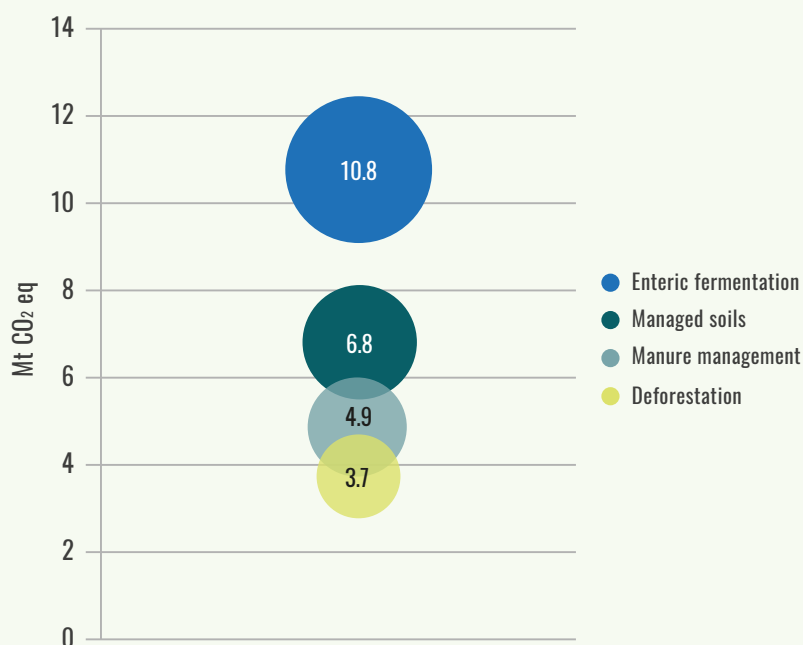
None of the countries in the region project counterfactual emission scenarios nor communicate GHG targets in the agriculture or LULUCF sector, with the exception of the two countries whom provide GHG targets in the forestry sector. The Bahamas communicates to potential to increase carbon sequestration of forest management with a cumulated net reduction of 5.6 Mt CO<sub>2</sub> eq by 2030, while Dominica states that its forests will continue to sequester 100 kt CO<sub>2</sub> eq annually between period 2020 to 2030.

#### 4.1.2 Greenhouse gas hotspots

This section identifies the major emission sources, against which the policies or measures set forth in the NDCs are compared, to inform the gap and opportunity analysis in the section that follows. For each country, the first and second<sup>70</sup> largest sources of sectoral emissions, or “GHG hotspots,” were identified based on data reported in the NGHGI. The country-level GHG hotspots are then aggregated at sub-regional and regional levels to identify trends amongst emissions sources, and account for differences, across sub-regional economies and land covers.

<sup>70</sup> Above a 10 percent share.

When emissions from the agriculture and LULUCF sector are combined, the largest GHG hotspots in the region are emissions from enteric fermentation (35 percent of total AFOLU emissions), followed by managed soils (23 percent), manure management (16 percent) and deforestation (12 percent). **Figure 4.8** illustrates the GHG hotspots in the AFOLU sector, at sub-regional level, where the size of the bubble corresponds to the amount of Mt CO<sub>2</sub> eq.

**FIGURE 4.8.****GHG HOTSPOTS IN THE AFOLU SECTOR IN THE CARIBBEAN, PER GHG CATEGORY**

### 4.1.3 Gaps and opportunities for enhancing mitigation

A gap analysis was run to assess the degree to which the mitigation policies and measures in the agriculture and land use sectors set forth in the NDCs address the main sources of sectoral GHG emissions, or GHG hotspots, to illustrate not only current “gaps” but potential “opportunities” for enhancing future NDCs. The analysis is based on the mitigation matrices for the agriculture and LULUCF sectors contained in the methodological framework (FAO, 2019b). “Policy coverage” refers to when at least one mitigation policy or measure in a country’s NDC aims to reduce emissions or enhance sinks from the GHG hotspot identified in its NGHGI. Policy coverage is quantified at the sub-regional level as the share of countries with at least one mitigation policy or measure that is in line with the GHG hotspot identified. A “policy coverage gap” refers to when there is absence of at least one policy or measure in a country’s NDC that targets the GHG hotspot identified. The gap is quantified at the sub-regional level as the share of countries with a policy coverage gap per GHG hotspot identified (**Table 24**). **Annex 4** contain a summary of the country-level gap analysis results per GHG hotspot.

It should be noted that the analysis serves as a broad review of the coverage of mitigation policies or measures mentioned in the NDC and not an assessment of their strength, which should be further assessed in terms of type (e.g. action, policy, project, programme or framework), scale, comprehensiveness and timeframe. The analysis, therefore, serves as an initial stocktaking of policy coverage and does not necessarily indicate policy effectiveness.

TABLE 24.

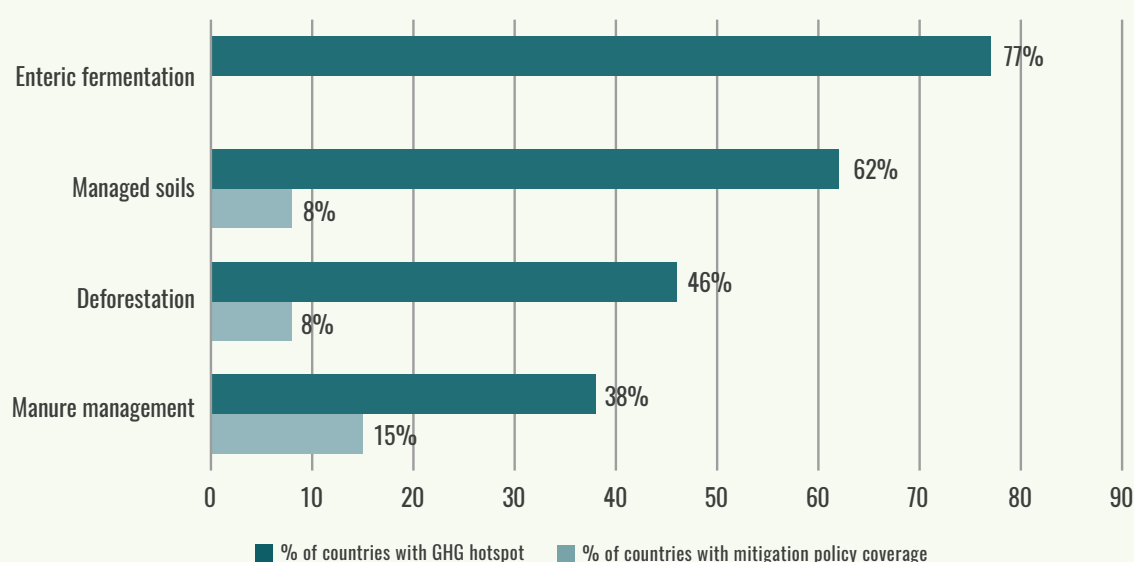
## RANGE OF POLICY COVERAGE GAPS IN THE NDC

SCORE	RANGE OF POLICY COVERAGE GAP
VERY HIGH	61 TO 100 PERCENT
HIGH	31 TO 60 PERCENT
MODERATE	10 TO 30 PERCENT
LOW	0 TO 9 PERCENT

In the Caribbean, high to very high mitigation policy coverage gaps<sup>71</sup> are observed in relation to emissions from enteric fermentation, managed soils, deforestation and manure management. Figure 49 presents the results of the mitigation policy gap and opportunity analysis by which the percent of countries with each type of GHG hotspot is compared against the share of countries with mitigation policy coverage in the NDCs, ordered from highest to lowest policy coverage gap.

FIGURE 49.

## MITIGATION GAP AND OPPORTUNITY ANALYSIS RESULTS FOR THE CARIBBEAN, PER GHG HOTSPOT



## 4.2 ADAPTATION ANALYSIS

This section presents the results of a gap analysis that compares the observed and/or projected climate-related hazards, impacts, vulnerabilities and risks in ecosystems and social systems reported, or “vulnerability hotspots”, against the relevant adaptation measures set forth in the NDCs in order to identify gaps and opportunities for strengthening next round NDCs. Information from the NDCs are supplemented with information from NCs. The analysis is based on the adaptation matrices for ecosystems and social systems contained in the methodological framework (FAO, 2019b).

<sup>71</sup> Only GHG hotspots identified for over a 10 percent share of countries are presented.

### 4.2.1 Gaps and opportunities for enhancing adaptation

For each country, the observed and/or projected climate-related hazards, risks and vulnerabilities reported in ecosystems or social systems, or “vulnerability hotspots,” are compared against the set of adaptation priorities or measures set forth in the NDCs at either the ecosystem service level (for ecosystems) or social dimension (for social systems). “Policy coverage” refers to when at least one adaptation measure in a country’s NDC aims to reduce vulnerability and/or increase adaptive capacity in relation to a given vulnerability hotspot. Policy coverage is quantified at the sub-regional level as the share of countries with at least one adaptation measure that addresses a given hotspot. A “policy coverage gap” refers to when there is misalignment between the adaptation priorities or measures presented in a country’s NDCs and a given vulnerability hotspot. A policy coverage gap is the difference between the share of countries with a vulnerability hotspot and the share of countries with policy coverage. The gap is quantified at the sub-regional level as the share of countries with a policy coverage gap out of the share of countries with a vulnerability hotspot (**Table 25**). **Annex 5-6** contains the country-level gap analysis results per vulnerability hotspot for each country.

It should be noted that the analysis serves as a broad review of the coverage of adaptation priority sectors and measures mentioned in the NDC and not an assessment of their strength, which should be further assessed in terms of type (e.g. action, policy, project, programme or framework), scale, comprehensiveness and timeframe. The analysis, therefore, serves as an initial stocktaking of policy coverage and does not necessarily indicate policy effectiveness.

**TABLE 25.**

#### RANGE OF POLICY COVERAGE GAPS IN THE NDC

SCORE	POLICY COVERAGE GAP RANGE
VERY HIGH	61 TO 100 PERCENT
HIGH	31 TO 60 PERCENT
MODERATE	10 TO 30 PERCENT
LOW	0 TO 9 PERCENT

### Gaps and opportunities in ecosystems

All countries in the Caribbean reported climate-related hazards, impacts and vulnerabilities in ecosystems. For this reason, the gap and opportunity analysis is relevant to all reporting countries.

In terms of climate-hazard hotspots, moderate to high adaptation policy coverage gaps are found in relation to storms and wildfires, while lower policy coverage gaps are observed in relation to climate-related drought, floods, water stress and invasion by pests and non-native species.

In terms of ecosystem vulnerability hotspots, a moderate adaptation policy coverage gaps is found in relation to climate-related impacts observed or projected in inland water ecosystems, and a lower policy coverage gap is found in relation to climate-related impacts in mountain ecosystems.

In terms of vulnerable agricultural sector hotspots, a moderate adaptation policy coverage gap is found in relation to climate-related impacts observed or projected in the crops sub-sector, and lower policy coverage gaps are identified in relation to climate-related impacts in livestock and grasslands.

Very high policy coverage is observed in relation to adaptation priorities or measures addressing climate-related impacts on natural resources, particularly vulnerable land and soil and water resources.

In terms of ecosystem service vulnerability hotspots, moderate adaptation policy coverage gaps are found in relation to climate-related impacts observed or projected on the provision of crops and freshwater, as well as the control of pests and diseases. Lower policy coverage gaps are found in relation to climate-related impacts on nutrient cycling and soil formation services, livestock provision and erosion control.

## Gaps and opportunities in social systems

All countries in the Caribbean reported climate-related hazards, impacts and vulnerabilities in social systems. For this reason, the gap and opportunity analysis is relevant to all reporting countries.

In terms of risk hotspots, a high policy adaptation coverage gap is found in relation to climate-related migration and displacement. Low to moderate policy coverage gaps are observed in relation to climate-related adverse health, rural livelihoods and income loss and gender and youth inequality.





# CHAPTER 5



# OPPORTUNITIES FOR LEVERAGING SYNERGIES WITH SUSTAINABLE DEVELOPMENT

**The world faces a double challenge of eradicating hunger by 2030 and addressing global climate change at the same time.** In 2015, with the adoption of the 2030 Agenda for Sustainable Development and the Paris Agreement, developed and developing countries alike pledged to take ambitious action to end all forms of poverty, fight inequalities, and tackle climate change, ensuring that no one is left behind.

**The Paris Agreement rests upon 167 (I)NDCs that reflect the national climate targets, policies and measures of 194 countries,<sup>72</sup> while the SDGs are defined by 17 goals and 169 targets,** which need to be translated into national and subnational plans.

**The SDGs and NDCs are interlinked** (GIZ and WRI, 2018). Both the 2030 Agenda and the preamble of the Paris Agreement acknowledge the intrinsic relationship between climate change, sustainable development and food security. The 2030 Agenda integrates addressing climate change in its 17 goals and refers to the UNFCCC as the primary international forum for negotiating the global response to climate change. Similarly, the Paris Agreement requires parties to embed climate action “in the context of sustainable development” and acknowledges the “fundamental priority of safeguarding food security and ending hunger, and the particular vulnerabilities of food production systems to the adverse impacts of climate change.”<sup>73</sup>

**The challenge is to strike a balance between emission reductions, adaptation and development and poverty reduction priorities, and find policies that co-deliver.** Climate change response pathways in developing countries should address the dual need for mitigation and adaptation together, leveraging synergies and reconciling tradeoffs amongst varying objectives. Capturing the co-benefits of mitigation and adaptation in the agriculture sector can also support progress in achieving the objectives of other international agreements, including the Sendai Framework for Disaster Risk Reduction, the United Nations Convention to Combat Desertification and the Convention on Biological Diversity.

<sup>72</sup> As of March 1, 2019.

<sup>73</sup> Article 2.1 of Paris Agreement.

Transforming the approach to NDC and SDG implementation from silos to synergies presents an unprecedented opportunity for national governments to leverage progress across both agendas and optimize resources in the path towards low-emissions and climate resilient development.

The Sendai Framework charts the global course over the next 15 years, with seven targets and four priorities for action, to reducing risk. It recognizes the opportunity to enhance coherence and mutual reinforcement across international agreements, to link mechanisms for monitoring and reporting and to promote cooperation in implementation.

This section aims to assess the opportunities for capturing mitigation and adaptation co-benefits within the NDCs, as well as leveraging synergies between climate actions and the sustainable development agenda. It first presents the types of co-benefits explicitly referenced by countries in their NDCs and then looks beyond to the potential co-benefits and synergies that may be generated from climate actions that are not explicitly recognized in the NDCs. It also assesses the links between climate actions in the agriculture and land use sectors and the 2030 Agenda and the Sendai Framework.

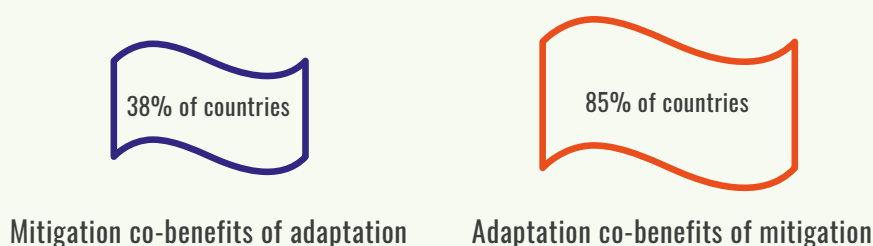
## 5.1 MITIGATION AND ADAPTION CO-BENEFITS

Mitigation and adaptation in agriculture are closely interlinked through a web of feedbacks, synergies, and tradeoffs. Sustainable food and agriculture systems carry the greatest potential for generating synergies across climate change mitigation and adaptation efforts, as well as significant socio-economic and environmental co-benefits (FAO, 2016d).

Overall, 85 percent of countries in the Caribbean explicitly recognize the co-benefits of either mitigation or adaptation in the agriculture and land use sectors within their NDCs –the majority from adaptation. Figure 50 illustrates the share of countries, at the regional and sub-regional level, with explicit reference to the co-benefits of mitigation and/or adaptation in the agriculture and land use sectors.

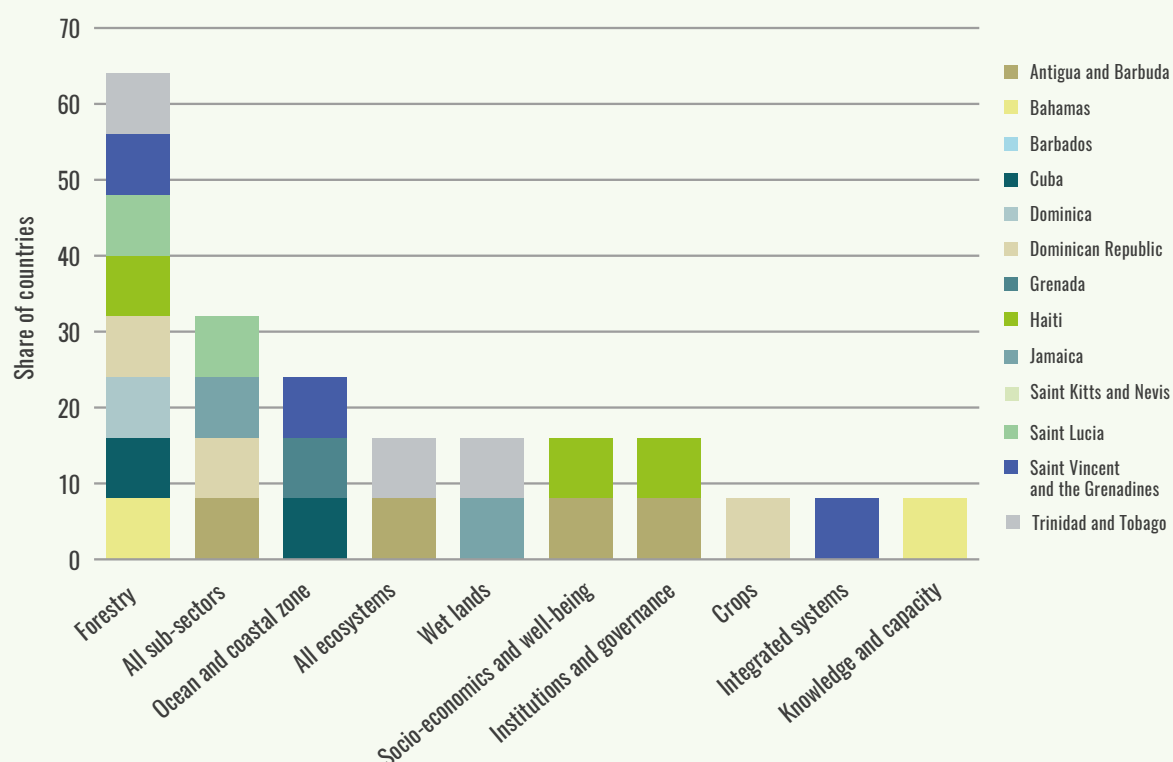
FIGURE 50.

SHARE OF COUNTRIES WITH REFERENCE TO CO-BENEFITS IN THE AGRICULTURE AND LAND USE SECTORS IN THE NDCs



### 5.1.1 Mitigation co-benefits of adaptation

At the regional level, 85 percent of countries in the region explicitly recognize the mitigation co-benefits of adaptation in the agriculture and land use sectors. In particular, adaptation in forestry represent the main areas in which co-benefits are most frequently reported (62 percent of countries with adaptation in agriculture and land use, respectively), followed by adaptation in agriculture in general (31 percent) and ocean and coastal zones (23 percent), as well as adaptation measures promoting institutions and governance (15 percent) and socio-economics and well-being (15 percent), amongst others. Figure 51 illustrates the share of countries, at the regional level, with at least one adaptation measure with mitigation co-benefits explicitly referenced out of countries with adaptation in agriculture and land use sectors, by land use/sub-sector.

**FIGURE 51.**
**MITIGATION CO-BENEFITS OF ADAPTATION IN AGRICULTURE AND LAND USE SECTORS REFERENCED IN THE NDCs OF CARIBBEAN COUNTRIES, BY LAND USE/SUB-SECTOR**

**TABLE 26.**
**EXAMPLE OF MITIGATION CO-BENEFITS OF ADAPTATION REPORTED**

COUNTRY	ADAPTATION MEASURE	MITIGATION CO-BENEFIT
DOMINICAN REPUBLIC	DEVELOPMENT OF CROPS RESISTANT TO DROUGHT AND EXCESS OF HUMIDITY	INCOME IMPROVEMENT
ST VINCENT AND GRENADINES	MIX FARMING USING A COMBINATION OF TREE CROPS AND VEGETABLE OR ROOT CROPS	GHG EMISSION REDUCTIONS
ANTIGUA AND BARBUDA	TO CONTINUE TO ENCOURAGE THE USE OF DRYLAND FARM-ING TECHNIQUES AROUND THE ISLAND, PARTICULARLY IN THE DRIER SECTIONS OF ANTIGUA	POVERTY REDUCTION

### 5.1.2 Adaptation co-benefits of mitigation

At the regional level, 35 percent of countries in the region explicitly recognize the adaptation and/or sustainable development co-benefits of mitigation in the agriculture and land use sectors. In particular, mitigation on forest land,<sup>74</sup> wetlands and organic soils,<sup>75</sup> blue carbon<sup>76</sup> and in integrated systems,<sup>77</sup> as well as bioenergy production from agricultural biomass<sup>78</sup> are recognized as areas capable of generating the majority of co-benefits.

<sup>74</sup> Bahamas.

<sup>75</sup> Antigua and Barbuda.

<sup>76</sup> Haiti.

<sup>77</sup> St Lucia.

<sup>78</sup> Dominica.

TABLE 27.

## EXAMPLE OF ADAPTATION AND SUSTAINABLE DEVELOPMENT CO-BENEFITS OF MITIGATION MEASURES REPORTED

COUNTRY	MITIGATION MEASURE	ADAPTATION AND SUSTAINABLE DEVELOPMENT CO-BENEFITS
BAHAMAS	FOREST CONSERVATION (20% WITHIN FOREST RESERVES, PROTECTED FOREST AND CONSERVATION FOREST)	ENHANCED MANAGEMENT WILL IMPROVE FOREST ECOSYSTEMS, THE RIDGE TO REEF LINKAGES TO PROTECT CORALS, SEA GRASSES IMPORTANT TO SUSTAINABLE LIVELIHOOD AND THE FUNCTIONALITY OF OUR MANGROVE ECOSYSTEMS INCREASING THEIR CARBON SINK ABILITY
DOMINICA	BIOENERGY PRODUCTION FROM BIOMASS	RESILIENCE, ECONOMIC DEVELOPMENT AND POLLUTION REDUCTION
ANTIGUA AND BARBUDA	BY 2030, ALL REMAINING WETLANDS AND WATERSHED AREAS WITH CARBON SEQUESTRATION POTENTIAL WILL BE PROTECTED AS CARBON SINKS	EXPANDING THE PROTECTION OF WETLANDS AND WATERSHEDS TO SINK GHG EMISSIONS ALSO SERVES AS AN ADAPTATION STRATEGY BY ENHANCING WATER RETENTION AND REDUCING THE RISKS OF CLIMATE IMPACTS, NAMELY FLOODING AND STORM SURGE

## 5.2 LINKS TO THE SUSTAINABLE DEVELOPMENT GOALS

The high degree of convergence between the climate and sustainable development agendas<sup>79</sup> suggests that aligning their implementation provides a great opportunity to national and sub-national governments to accelerate progress across both agendas. Aligning planning and budgetary processes would not only maximize scarce resources, enhance capacities and multiply information and technology sharing opportunities but, most importantly, deliver on countries' adaptation and mitigation commitments in a way that advances development and includes the most vulnerable.

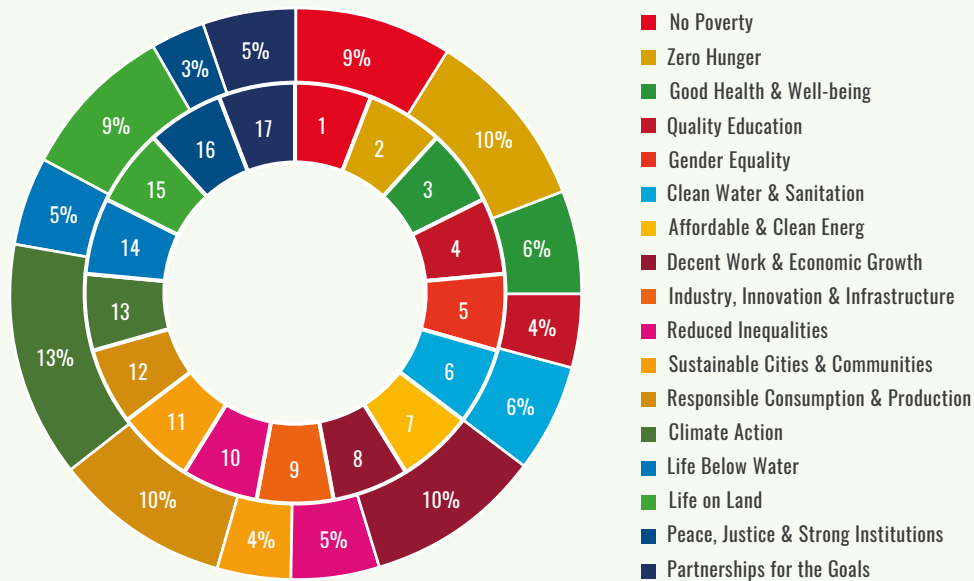
To understand the degree of convergence between “climate actions” in the agriculture and land use sectors communicated by countries in their NDCs and the 17 goals and 169 targets of the 2030 Agenda for Sustainable Development, the sectoral climate actions in the NDCs were mapped against the SDG targets. The variety of mitigation targets, policies or measures and adaptation priorities and measures in the agriculture and land use sectors (collectively referred to as “climate actions”) serve as the data points for the analysis. Overall, around 300 potential data points were derived.

A **NDC-SDG matrix was developed** to map the alignment between each climate action in the agriculture and land use sectors with one or more SDG targets (FAO, 2019c). A total of 1,500 potential climate action-sustainable development synergies were generated in the agriculture and land use sectors. The degree of convergence between NDC climate actions in the agriculture and land use sectors and SDG targets was assessed at the country level. The degree of convergence refers to the frequency of climate actions per SDG target (and does not reflect how much the climate action contributes in absolute terms to achieving a particular SDG target). The results were aggregated at sub-regional and regional levels. **Figure 50** illustrates the area of convergence between climate actions in the agriculture and land use sectors and the SDGs.

<sup>79</sup> Northrop *et al.* (2016) find that climate actions are aligned with 154 of the 169 SDG targets, particularly around energy, forest, land use and agriculture. Conversely, GIZ-WRI (2018) finds that 49 targets across 13 SDGs contribute to climate mitigation and adaptation, with greatest potential to generate climate action synergies in agriculture, water, food waste and marine and forest ecosystems, amongst others.

FIGURE 52.

DEGREE OF CONVERGENCE BETWEEN CLIMATE ACTIONS IN THE AGRICULTURE AND LAND USE SECTORS IN THE CARIBBEAN AND THE SDGs



In the Caribbean the greatest areas of convergence<sup>80</sup> between climate actions in the agriculture and land use sectors and the SDGs, after SDG 13, are found (in descending order) around:

- ▶ SDG 2 Zero Hunger, primarily targets 2.3 “Assure agricultural productivity for marginalized”;
- ▶ SDG 8 Decent Work and Economic Growth, primarily target 8.1 “Sustainable economic growth”;
- ▶ SDG 12 Responsible consumption and production, primarily target 12.2 “Efficient use of natural resources”;
- ▶ SDG 1 No Poverty, primarily target 1.5 “Resilience of poor to climate events”; and
- ▶ SDG 15 Life on Land, primarily targets 15.3 “Restore degraded land and combat desertification”.

## 5.3 LINKS TO THE SENDAI FRAMEWORK FOR DISASTER RISK REDUCTION

Climate change adaptation relies on the reduction and management of climate-related disaster risks, as countries are increasingly affected by both incremental climate change and more frequent and severe climate-related disasters. In agriculture, the two streams are strongly interrelated and mutually complementary. The overlaying nature of disaster and climate change impacts on agriculture calls for an integrated approach and working methods that enhance farmers’ resilience to shocks and climate change. Convergence between DRR and climate change adaptation action can bring significant benefits to adaptation, disaster risk reduction and sustainable development.

<sup>80</sup> Only convergence above or equal to a 3 percent share of climate action-sustainable development pathways are reported in list.



The Sendai Framework for Disaster Risk Reduction (SFDRR) presents an opportunity to enhance coherence across climate and development agendas and promote cooperation, as appropriate, for linked implementation, monitoring and reporting processes. The Sendai Framework is a 15-year long, country driven and non-binding agreement that recognizes the importance of integrating systematic efforts and strategies at different levels to prevent new and reduce existing disaster risk, by reducing hazard exposure and vulnerability to disaster, increasing preparedness for response and recovery and thus strengthening resilience. The framework is built upon four priorities for action, which are:

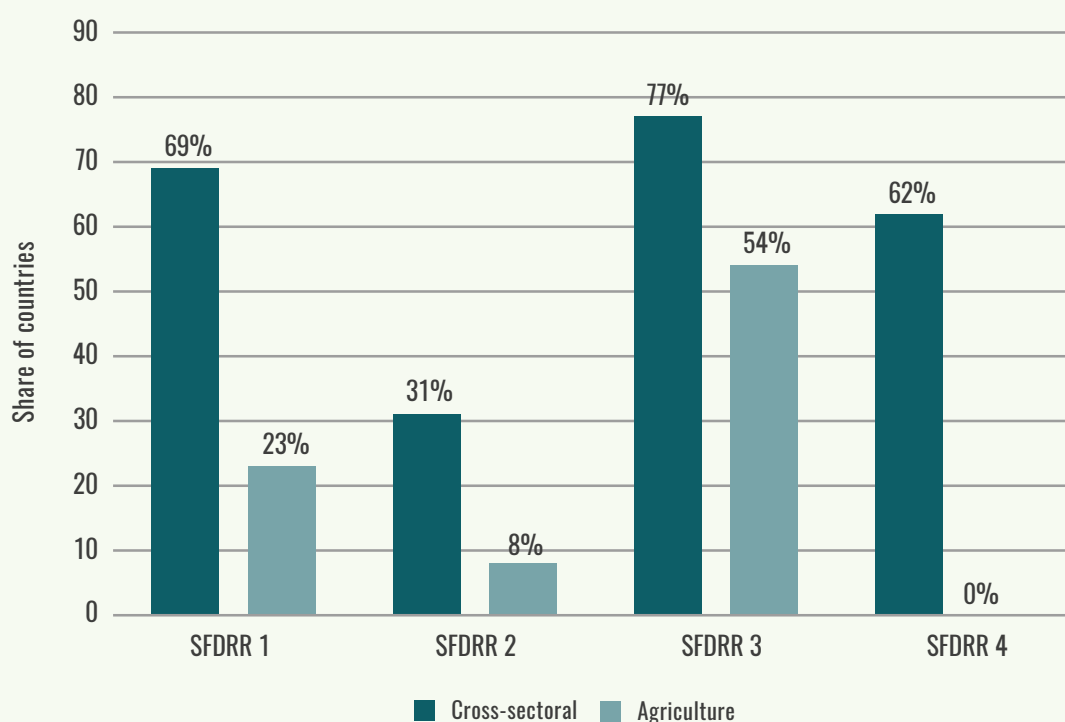
1. Priority for action I: Understanding disaster risk
2. Priority for action II: Strengthening disaster risk governance to manage disaster risk
3. Priority for action III: Investing in disaster risk reduction for resilience
4. Priority for action IV: Enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction.

This section analyzes the degree of alignment between adaptation measures set forth in country NDCs and the Sendai Framework, as per its four priorities for actions, to provide a better understanding of how climate change adaptation in the agriculture and land use sector and Disaster Risk Reduction/Management (DRR/M) are mutually reinforcing to promote policy coherence.

**Around two-thirds of countries in the region promote climate change adaptation measures that contribute to the Sendai Framework**, with the greatest areas of convergence found around priority for action III “Investing in disaster risk reduction” and I “Understanding disaster risk.” (77 and 69 percent of countries with adaptation, respectively). On the other hand, a gap is found in adaptation measures related to priority for action II “Strengthening disaster risk governance” (31 percent). **Figure 51** illustrates the share of countries with cross sectoral and/or agriculture-related adaptation priorities contributing to the SFDRR, per SFDRR priority for action, out of countries with an adaptation component.

**FIGURE 53.**

**ALIGNMENT BETWEEN ADAPTATION MEASURES IN THE NDCs OF CARIBBEAN COUNTRIES AND THE SENDAI FRAMEWORK, PER SFDRR PRIORITY FOR ACTION PILLAR**



### 5.3.1 SFDRR priority for action I: understanding disaster risk

#### Climate information

Improved climate information services are crucial for better understanding of disaster risks and are featured in many NDCs of the region. Some countries, including Jamaica, plan to install weather station. Jamaica, for example, intends to invest in the installation and maintenance of automatic weather stations at strategic locations across the island. This includes trainings to keep the stations operational. Increased research as a method to improve climate information is another way to get a better understanding of climate change and disaster risk, as outlined by countries such as Jamaica and Saint Lucia.

#### Risk and vulnerability assessment

Many countries, including Barbados, Dominica, Saint Lucia, Saint Vincent and the Grenadines refer to risk and vulnerability assessments, which can serve as a basis for risk-informed decision making. Saint Vincent and the Grenadines plans to enhance climate risk management through, amongst other, the preparation of comprehensive hazard maps for public institutions and communities.

Other countries have already conducted risk and vulnerability assessments to ensure risk-informed policies and actions. Dominica's Low-Carbon Resilient Development Strategy, presented in its NDC, was based on a stakeholder climate change risk assessment, which included a prioritization and ranking of climate change risks affecting the country and was based on climate change trend analysis and projections contained in Dominica's Initial National Communication (INC) and Second National Communication (SNC) to the UNFCCC. Belize refers to the Integrated Vulnerability and Adaptation Assessment of Belize, which made several cross-linkages between the impending impacts of climate change on six priority development sectors including agriculture, water, and fisheries further highlighting Belize's extreme vulnerability.

#### Education and awareness raising

Several countries in the region plan to develop and/or implement education and awareness raising programmes, although no country specifically refers to education and awareness raising in the agriculture and land use sectors. Dominica, for example plans to design and implement a Climate Change Adaptation (CCA) and Disaster Risk Management (DRM) education and awareness programme to be coordinated by the Department of Climate Change, Environment and Development. As part of the Pilot Programme for Climate resilience (PPCR), Saint Vincent and the Grenadines proposes a national 3-year public education programme to build community based climate risk and resilience and to provide a national curriculum for schools in climate change and disaster risk reduction.

### 5.3.2 SFDRR priority for action II: strengthening disaster risk governance to manage disaster risk

#### National plans, strategies and laws

National Adaptation Plan (NAP), National Adaptation Programmes of Action (NAPA) and other national climate plans, strategies or laws are mentioned by many countries in the sub-region. For instance, Haiti plans to update its National Risk and Disaster Management Plan (PNGRD) integrating risks related to climate change.

#### Mainstream DRR and management into the agriculture and land use sectors

The strategic integration of DRR into agriculture and land use sectors is an important factor for climate-resilient food systems and livelihoods. Some countries in the region, like Dominica mention their ambitions to mainstream DRR/M into sectoral policies in their NDCs. Dominica, as part of its Priorities for Building Climate Resilience, plans to create a supportive enabling framework whereby communities and vulnerable segments of societies can manage their own climate change risks, thereby addressing climate change impacts on vulnerable sectors, particularly agriculture, fisheries and water resources and threats to food security and sustainable livelihoods.

## Strengthen cooperation and capacities

Saint Vincent and the Grenadines, outline their plans to strengthen capacities in order to improve disaster risk management. As part of its Pilot Programme for Climate Resilience, it proposes to enhance climate risk managements through, amongst others, increased institutional capacity to undertake climate risk management and the collaboration with communities at all levels of climate and disaster risk management.

Cooperation with state and non-state actors on the national, as well as local level can help to better coordinate risk reduction activities. Accordingly, Dominica emphasizes the need for improved coordination amongst key state and non-state actors involved in climate change risk management.

To facilitate a multi-sectoral approach to climate change, the Government of Jamaica has established the Climate Change Focal Point Network (CCFPN), comprising representatives from key ministries, departments and agencies. The focal points are amongst others, responsible to facilitate climate resilience in policy and project development. Over time, representation on the Network will be expanded to the sub-national level, to include representation from local government, civil society groups, community organizations and the private sector, to increase the reach and participation. Similarly, Venezuela plans to coordinate actions with all national entities in charge of territorial planning and disaster management and to foster the development of municipal and local adaptation plans for risk management scenarios that directly involve “co-responsibility between the State and People's Power”.

### 5.3.3 SFDRR priority for action III: investing in disaster risk reduction for resilience

#### Investing in DRR and management and climate change adaptation measures for climate-resilient agriculture and land use sectors

While some countries only very generally mention the importance to reduce the negative impacts of climate risks in the agriculture and land use sectors, other countries outline specific agricultural good practices and technologies as part of their adaptation commitments. The most prominent sub-sector featured in the NDCs is the cropping sector, followed by the livestock and fisheries sector and lastly the forestry sector. Some countries plan for agricultural practices and technologies that are not only specific to one agricultural sub-sector, but can include several.

#### Crop production

The cropping sector is prominently featured in the sub-region. To reduce disaster risks and adapt to climate change, countries invest in water management practices and technologies. These include irrigation technologies and water harvesting measures (Saint Lucia).

A number of countries also plan to invest in seed varieties that are tolerant to extreme climate events and conditions, including to drought (Haiti). Other proposed cropping practices and technologies include conservation agriculture (e.g. Haiti), organic agriculture (Saint Vincent and the Grenadines).

#### Livestock

In some countries, investments in the livestock sector are an important part of the planned DRR and CCA measures. These include transition to semi-intensive systems of livestock management, the identification of other feedstock to warranty feeding in dry season and the usage of species resistant to climate extremes (Saint Kitts and Nevis).

#### Fisheries and aquaculture

Most countries in the region that refer to fisheries and aquaculture remain vague when it comes to specific practices and technologies that contribute to CCA and DRR. Some countries, however, outline specific planned activities. Haiti plans to develop aquaculture, improve the autonomy and safety of small fishing vessels, and implement coastal monitoring and sustainable fisheries management.

## Forestry

In the case of forestry, practices and technologies that contribute to DRR/M and CCA outlined in the NDCs mainly focus afforestation and reforestation and agroforestry. Bolivia, for example, plans to restore and recover degraded forests and to transition to integrated management of agroforestry and silviculture techniques. Belize aims to maintain and restore healthy forest ecosystems by sustainable forest management increasing afforestation and reforestation in order to increase the resilience of human communities.

By 2030, El Salvador will establish and manage one million hectares through "Sustainable Landscapes and Resilient to Climate Change", where forest areas will be rehabilitated and conserved, biological corridors will be established through, for example, the adoption of resilient agroforestry systems.

## Risk insurance

Several countries refer to insurance as a social safety net mechanism to reduce the impact of climate-related disasters on agricultural producers. Dominica emphasizes the need to establish micro-finance and micro-insurance mechanisms for vulnerable segments of society including farmers, fisher-folk and vulnerable communities in particular the Kalinago people.

### 5.3.4 SFDRR priority for action IV: enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction

#### Contingency planning

Some countries in the region point to planning mechanisms that they have established to better prepare for climate-related disasters. Saint Vincent and the Grenadines, for example, is a member of the Caribbean Disaster Emergency Management Agency (CDEMA), which is an inter-regional supportive network of independent emergency units that responds to disasters wherever they occur in the region.

#### Early warning systems

The most prominently featured preparedness mechanism in the NDCs of the region is early warning systems (EWS). Dominica specifically refers to community-based EWS.

#### Protection of infrastructure

In order to protect its infrastructure from the negative effects of climate-induced disasters, different measures are outlined by different countries. Some countries, including the Bahamas and Saint Lucia, emphasize the need for building codes to minimize the impact of disasters on its infrastructure. Other countries underline the need for structural measures. Haiti, for example, plan to relocate key infrastructure away from high-risk zones. Other structural measures planned by countries are the construction of dykes (Suriname) and natural defence systems, such as mangroves and wetlands (Saint Lucia).

#### Relocation of communities

The resettlement of the population living in high-risk areas can reduce people's exposure to hazards. Some countries in the region, such as the Bahamas and Haiti outline in their NDCs their plans to relocate communities to reduce climate-related disaster risk. The Bahamas emphasize that this measure has already proven effective.



# CHAPTER 6



# CONCLUSIONS

**While the Caribbean contributes to less than 0.5 percent of global GHG emissions** (WB-Open Data, undated), **and is disproportionately impacted by climate change and variability**, all but two countries<sup>81</sup> in the region set a general GHG target. Without implementation of the NDCs, net emissions are expected to increase by around 30 percent in 2030 compared to 2015 levels. Under the mitigation scenario, total net emissions in the region are expected to decrease by roughly 17 percent compared to the 2030 counterfactual scenario. Around 80 percent of that reduction is conditional to international financial support.

**After energy, the AFOLU sector represents the second largest share of emissions**, at 17 percent of total, primarily from enteric fermentation and managed soils. However, the LULUCF sector constitutes a net sink at the regional level, mainly from removals by forest management (99.8 percent of removals).

**Around 62 percent of countries in the region are committed to mitigation in the agriculture and/or LULUCF sector, primarily through mitigation on forest land**, such as reducing deforestation and forest conservation, while around one-third of countries promote bioenergy production from agriculture and mitigation in the livestock sector. Only two countries set a GHG target in the LULUCF sector (Bahamas and Dominica) and one country (Antigua and Barbuda) presents a non-GHG target. None of the countries communicate an agricultural GHG or non-GHG target.

**At the regional level, high to very high mitigation policy coverage gaps<sup>82</sup> are observed** in relation to emissions from enteric fermentation, managed soils, deforestation and manure management.

**Water stress, soil erosion and salinization are degrading terrestrial and freshwater ecosystems in the Caribbean**, while sea level rise and coastal erosion are threatening marine and coastal ecosystems. Climate-related floods, storms, droughts and landslides are amongst the most frequently reported observed and/or projected climate-related hazards in the region.

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<sup>81</sup> Antigua and Barbuda and Cuba.

<sup>82</sup> Only GHG hotspots identified for over a 10 percent share of countries are presented.



Ocean and coastal ecosystems are considered the most vulnerable, as are agro-ecosystems, particularly crops and fisheries. Land and soil resource degradation, changes in primary production and productivity, changes in water quality and quantity, pest and disease incidence and mangrove mortality and coastal reef degradation are amongst the most frequently reported climate-related impacts on natural resources and ecosystem services.

Climate-related losses of productive infrastructure and assets, adverse health and rural livelihoods and income losses constitute the most frequently reported climate-related risks in social systems, all exacerbated by the underlying economic dependence on agriculture and natural resources reported as a non-climatic driver of vulnerability and challenging geography and topography.

Indeed, all but one country<sup>83</sup> in the region include adaptation in the agriculture and land use sectors (92 percent), primarily in ocean and coastal zones, forestry and fisheries and aquaculture. Coastal zone management, mangrove conservation and planting, sustainable forest management, crop breeding and diversification, and irrigation and drainage appear most frequently amongst adaptation strategies in the region. Adaptation policy mainstreaming and coherence, resilient infrastructure, credit and insurance services, the use of traditional knowledge and impact assessment and monitoring are prominently promoted in the adaptation priorities in social systems of Caribbean countries.

At the regional level, moderate adaptation policy coverage gaps are found in relation to climate-related impacts observed or projected on the provision of crops and freshwater, as well as the control of pests and diseases and nutrient cycling. Moderate policy coverage gaps are also found in relation to climate-related impacts observed or projected in inland water ecosystems and around climate-related storms, floods and wildfires.

A high adaptation policy coverage gap is found in relation to climate-related migration and displacement. Low to moderate policy coverage gaps are also observed in relation to climate-related adverse health, rural livelihoods and income loss and gender and youth inequality.

Climate action in forestry, ocean and coastal zones, wetlands and integrated systems present the greatest potential for leveraging mitigation, adaptation and sustainable development co-benefits in the region. Only 15 percent of countries in the region promote food loss and waste reduction measures as part of their adaptation (Haiti) or mitigation (Cuba) contribution. And more can be done to strengthen disaster risk governance (priority II) and enhance disaster preparedness and “build back better” (priority IV) in the agriculture and land use sectors.

Climate action in the agriculture and land use sectors will require rapid mobilization of financial resources, enhanced capacities and the transfer of technology in the region. Over 90 percent of countries in the Caribbean reference capacity-building, financial and technology transfer support needs.

Addressing the financial, human, institutional and organizational barriers to the uptake and dissemination of technologies will be key to upscaling climate action in the agriculture and land use sectors. Investments in the sustainable management and use of forests, ocean and coastal zones and water resources, as well as in priority technologies, including data collection and management, climate information and early warning systems and mapping and monitoring and irrigation and drainage are needed for upscaling climate action in the agriculture and land use sectors.

By highlighting the gaps in the coverage of mitigation and adaptation in the agriculture and land use sectors, as well as illustrating opportunities for enhancing climate action ambitions in the next round of NDCs, this analysis can serve as an important roadmap for informing future policies and directing future investments in support of low-emission and climate-resilient agriculture and food systems in the region.

<sup>83</sup> Trinidad and Tobago includes adaptation measures in NC.

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# ANNEXES

## ANNEX 1.

### SOURCE OF NATIONAL DATA FOR ANALYSIS

COUNTRY	NDC	NC	TNA
ANTIGUA AND BARBUDA	2016	2016	
BAHAMAS	2016	2015	
BARBADOS	2016	2018	
CUBA	2016	2015	2013
DOMINICA	2016	2012	
DOMINICAN REPUBLIC	2017	2017	2012
GRENADA	2016	2000	2017/2018
HAITI	2017	2013	
JAMAICA	2017	2019	
SAINT KITTS AND NEVIS	2016	2016	
SAINT LUCIA	2016	2017	
SAINT VINCENT AND THE GRENADINES	2017	2016	
TRINIDAD AND TOBAGO	2018	2013	

## ANNEX 2.

## GENERAL MITIGATION CONTRIBUTIONS IN THE CARIBBEAN, BY SCOPE, TYPE AND TARGET

COUNTRY	SOURCE	SCOPE OF CONTRIBUTION	TYPE OF CONTRIBUTION	TYPE OF GHG TARGET	2030 UNCONDITIONAL REDUCTION (%)	2030 CONDITIONAL REDUCTION (%)	2030 COMBINED REDUCTION (%)
ANTIGUA AND BARBUDA	NDC	MULTI-SECTORAL	ACTION ONLY	NA	NA	NA	NA
BAHAMAS	NDC	MULTI-SECTORAL	GHG TARGET	BASE YEAR	NA	NA	30.00
BARBADOS	NDC	MULTI-SECTORAL	GHG TARGET	BAU	NA	NA	44.00
CUBA	NDC	MULTI-SECTORAL	ACTION ONLY	NA	NA	NA	NA
DOMINICA	NDC	ECONOMY-WIDE	GHG TARGET	BASE YEAR	44.70	0.00	44.70
DOMINICAN REPUBLIC	NDC	ECONOMY-WIDE	GHG TARGET	BASE YEAR	0.00	25.00	25.00
GRENADA	NDC	MULTI-SECTORAL	GHG TARGET	BASE YEAR	NA	NA	40.00
HAITI	NDC	MULTI-SECTORAL	GHG TARGET	BAU	5.00	26.00	31.00
JAMAICA	NDC	UNI-SECTORAL	GHG TARGET	BAU	7.76	2.24	10.00
SAINT KITTS AND NEVIS	NDC	ECONOMY-WIDE	GHG TARGET	BAU	35.00	0.00	35.00
SAINT LUCIA	NDC	UNI-SECTORAL	GHG TARGET	BAU	NA	NA	23.00
SAINT VINCENT AND THE GRENADINES*	NDC	UNI-SECTORAL	GHG TARGET	BAU	NA	NA	NA
TRINIDAD AND TOBAGO	NDC	MULTI-SECTORAL	GHG TARGET	BASE YEAR	4.97	10.03	15.00

\* NDC end date set for 2025. Calculated based on reported data.

## ANNEX 3.

## NATIONAL MITIGATION CONTRIBUTIONS IN THE AGRICULTURE SECTOR, BY TYPE AND TARGET

COUNTRY	SOURCE	TYPE OF CONTRIBUTION	TYPE OF GHG TARGET	2030 UNCONDITIONAL REDUCTION (%)	2030 CONDITIONAL REDUCTION (%)	2030 COMBINED REDUCTION (%)
ANTIGUA AND BARBUDA	NDC	NO CONTRIBUTION	NA	NA	NA	NA
BAHAMAS	NDC	NO CONTRIBUTION	NA	NA	NA	NA
BARBADOS	NDC	NO CONTRIBUTION	NA	NA	NA	NA
CUBA	NDC	POLICIES OR MEASURES ONLY	NA	NA	NA	NA
DOMINICA	NDC	SECTOR INCLUDED IN GENERAL CONTRIBUTION ONLY	NA	NA	NA	NA
DOMINICAN REPUBLIC	NDC	SECTOR INCLUDED IN GENERAL CONTRIBUTION ONLY	NA	NA	NA	NA
GRENADA	NDC	NO CONTRIBUTION	NA	NA	NA	NA
HAITI	NDC	POLICIES OR MEASURES ONLY	NA	NA	NA	NA
JAMAICA	NDC	NO CONTRIBUTION	NA	NA	NA	NA
SAINT KITTS AND NEVIS	NDC	SECTOR INCLUDED IN GENERAL CONTRIBUTION ONLY	NA	NA	NA	NA
SAINT LUCIA	NDC	NO CONTRIBUTION	NA	NA	NA	NA
SAINT VINCENT AND THE GRENADINES*	NDC	NO CONTRIBUTION	NA	NA	NA	NA
TRINIDAD AND TOBAGO	NDC	NO CONTRIBUTION	NA	NA	NA	NA

\* NDC end date set for 2025.



## ANNEX 4.

## NATIONAL MITIGATION CONTRIBUTIONS IN THE LAND USE, LAND USE CHANGE AND FORESTRY (LULUCF) SECTOR, BY TYPE AND TARGET

COUNTRY	SOURCE	TYPE OF CONTRIBUTION	TYPE OF GHG TARGET	2030 CUMULATED NET REDUCTION (MT CO <sub>2</sub> EQ)
ANTIGUA AND BARBUDA	NDC	NON-GHG TARGET	NA	NA
BAHAMAS	NDC	GHG TARGET	BAU	-5.66
BARBADOS	NDC	NO CONTRIBUTION	NA	NA
CUBA	NDC	NO CONTRIBUTION	NA	NA
DOMINICA	NDC	GHG TARGET	NA	NA
DOMINICAN REPUBLIC	NDC	SECTOR INCLUDED IN GENERAL CONTRIBUTION ONLY	NA	NA
GRENADA	NDC	POLICIES OR MEASURES ONLY	NA	NA
HAITI	NDC	SECTOR INCLUDED IN GENERAL CONTRIBUTION ONLY	NA	NA
JAMAICA	NDC	NO CONTRIBUTION	NA	NA
SAINT KITTS AND NEVIS	NDC	SECTOR INCLUDED IN GENERAL CONTRIBUTION ONLY	NA	NA
SAINT LUCIA	NDC	NO CONTRIBUTION	NA	NA
SAINT VINCENT AND THE GRENADINES*	NDC	POLICIES AND MEASURES ONLY (ADDITIONAL)	NA	NA
TRINIDAD AND TOBAGO	NDC	NO CONTRIBUTION	NA	NA

\* NDC end date set for 2025.

Annex 5-7 can be found online at <http://>

This report provides a unique, sector-specific synthesis of the Nationally Determined Contributions (NDCs) in the Caribbean. It summarizes the substantial contributions already put forward by countries, opportunities for further action and the gaps, barriers and needs that will need to be addressed if the agriculture and land use sector in the region are to raise mitigation and adaptation ambitions. The findings of this report will help member countries to reflect on their progress in advancing toward NDC priorities in the sector and associated national

climate goals, including nationally relevant Sustainable Development Goals (SDGs). The analysis also helps to clarify the links between the NDCs from the region and the Sendai Framework for Disaster Risk Reduction (SFDRR). Finally, the report serves as a guide to FAO, as well as other international actors, for the support that will be required to help countries in the region to move forward on implementing agricultural and land use priorities and ensuring that future commitments are transparent, comprehensive, measurable and sufficiently ambitious.

Climate and Environment Division (CBC)

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