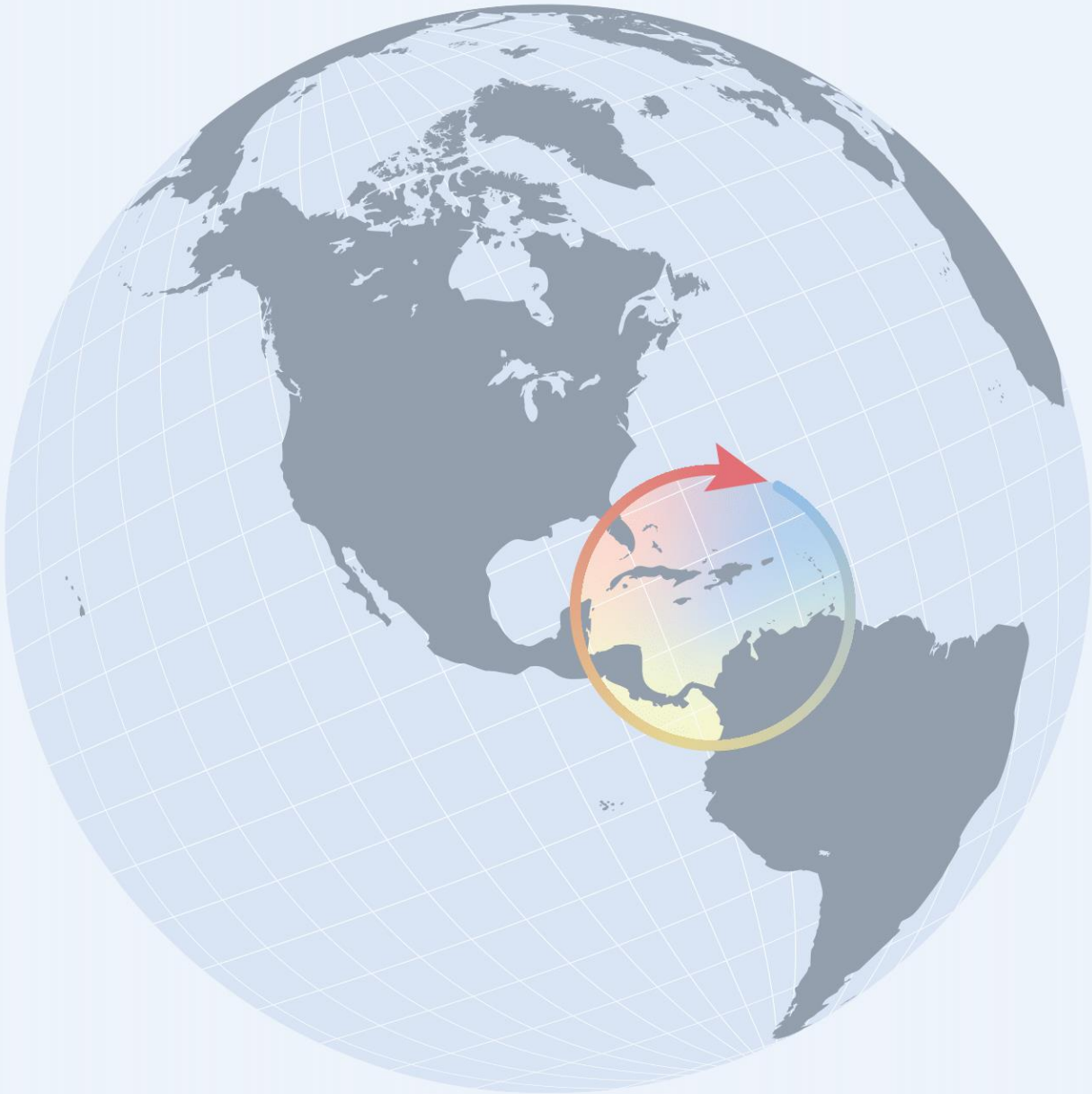


A BACKGROUND PAPER >> NATURE - BASED SOLUTIONS

360° Resilience

A Guide to Prepare the Caribbean
for a New Generation of Shocks



European Union



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NATURE-BASED SOLUTIONS FOR IMPROVING RESILIENCE IN THE CARIBBEAN

Environment, Natural Resources & Blue Economy (ENB) Global Practice

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This report is based on and summarizing findings from the 17 country profiles: St. Kitts and Nevis, St. Lucia, Grenada, Sint Maarten, Antigua and Barbuda, Turks and Caicos Islands, Suriname, Belize, Dominica, St. Vincent and the Grenadines, Trinidad and Tobago, Jamaica, Bahamas, Barbados, Haiti, Dominican Republic, and Guyana.

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1. EXECUTIVE SUMMARY

Sustainable management of environment and natural resources is essential for the long-term and sustainable growth of key economic sectors, such as fisheries, forestry or tourism, across the Caribbean. In addition to being important generators of GDP and beneficial to the human well-being overall, natural resources also provide a range of ecosystem services that play a critical role in the Caribbean countries' efforts to reduce disaster risks and adapt to mounting climate change risks.

The region is facing a number of challenges in this area, including the climate change impacts, limited access to financing, and narrow fiscal space, among others. Such challenges are being exacerbated by the unprecedented health, economic and social impacts of COVID-19 pandemic. However, with great challenges come great opportunities, including to grow and shift the development pathway into a green recovery, based on the richness of the natural resources and biodiversity that this region possesses.

Indeed, nature-based solutions (NBS) offer an opportunity to solve challenges at the local and national level in an integrated way given their high potential for producing co-benefits and significant multiplier effect. For example, restoring and replanting mangroves along the coast of a low lying country not only provides coastal protection from storm surge, sea level rise and extreme weather events, but it also serves as a sanctuary for marine flora and fauna, a carbon sink to mitigate climate change emissions, a habitat for terrestrial species and a livelihood for coastal communities.

However, their potential in the region has not been utilized despite the countries having overall favorable legal and institutional frameworks for mainstreaming resilience into the development agenda and ensuring the uptake of NBS in support of it. Similar challenges exist in the domain of data resources and availability with a pertaining challenge of bridging the gap between having the information and data available and translating it into such information that can be applied to policy making and tangible actions while also ensuring the data is maintained, improved, and updated regularly.

Recognizing unique national circumstances of the Caribbean countries, as well as varying levels of uptake of NBSs for resilience, there are still some common threads that would be needed in this regard – ranging from mangrove and reef restoration efforts to enhance policy and institutional coordination. At the same time, there is a need to adopt multi-sectoral and innovative approaches for improving resilience, including at the regional level.

Against this backdrop and in order to further examine this issue, this Background Note firsts examines the extent of challenges that the region is facing, with a particular emphasis on the coastal resilience. Second, the Background Note further analyzes the role that nature-based solutions offer in terms of preserving key ecosystem services, increasing resilience to natural disasters and reducing anticipated climate change impacts. Drawing from the individual country profiles and information, which map existing policies and measures that the countries are undertaking, the Background Note finally identifies gaps and provides recommendations for further enhancements of existing policies and measures that can derive maximum benefits while improving resilience across the board.

2. KEY CHALLENGES FACING THE CARIBBEAN REGION

The Caribbean region suffers major economic losses from natural hazards. The region frequently experiences hydro-meteorological, seismic, and geological hazards including hurricanes, flooding, storm surge, volcanic eruptions, and landslides; hurricane Dorian in September 2019 is the latest example of a long series of disasters. Since 1950, more than 400 major disasters occurred in the Caribbean as a result of natural phenomena, the majority of which resulted from severe storms and flooding (IMF, 2018, EMDAT 2019). The impacts of such disasters are staggering. An average of 414 people have lost their lives annually to disasters since 1950 (3160 per year if we include the devastating 2010 Haiti earthquake). The economic impacts are also severe and resulted for instance during the hurricanes Ivan (2004), and Maria and Irma (2017) in over 200% of GDP worth of damages and losses in Grenada, Dominica and Saint Maarten. The lack of resilience to disasters is a significant barrier to sustainable growth, as the region loses on average 1.1% worth of GDP in damages and losses every year. In the case of some small countries these compounded impacts are much larger, like the case of Dominica, Haiti and St Vincent and the Grenadines, who respectively lose 20%, 7.6% and 6.9% of yearly GDP to disasters.

The region's geo-physical characteristics¹ lead to its high vulnerability to natural hazards and the challenges countries face for disasters response. For small island or small coastal states, when a disaster strikes a large part of the population, infrastructure and businesses are directly or indirectly affected. This leads to damage to GDP ratios in the Caribbean which are six times higher than the world average (IMF, 2018). The small populations of Caribbean countries² also limits their capabilities to effectively cope with natural disasters. Caribbean countries have small domestic markets that reduce the scope for private sector development or private sector solutions (i.e. risk insurance). Lastly, their size leaves them with constrained fiscal space as there are limited domestic revenue raising and borrowing opportunities.

The region's lack of economic diversification also explains the high levels of disaster risks. The economy of the region is concentrated in a few climate-sensitive sectors like tourism, manufacture, agriculture and fisheries, which suffer nation-wide and regional losses when disasters strike. The services sector (which includes tourism) comprises 61% of GDP on average and most of the export receipts, followed by industry with 21% and agriculture with 6% of GDP (table 1). In the tourism sector, disasters can reduce regional tourist arrivals by 1.2 to 2.0 % in the year of the disaster (LaFramboise et al, 2014), even for non-affected countries; at the national level they can imply a significant loss of income from tourism as countries suffer the total or partial loss of hotels and damages to transport infrastructure (ports and airports). For example, Dominica lost the income of the 2017/18 tourist high season³ due to the impact of hurricane Maria (2017) as various large cruise ships were diverted, causing millions in losses (Dominica PDNA, 2017). Hurricane Georges (1998) damaged the airport of Saint Kitts and Nevis and affected 25% of its operability, limiting tourism arrivals and trade capacity (USAID 1998). The agriculture sector is also highly vulnerable to disasters. For example, Hurricane Ivan (2004) destroyed 50% of Jamaica's sugar harvest while Hurricane

¹ The region is mostly composed of small island states with an average area of 512,000 km² (8900 km² if we exclude Suriname and Guyana) or 4400 km² if we further exclude the island of Hispaniola (Dominican Republic and Haiti)

² On average 1.7 million (400 thousand when excluding Hispaniola)

³ Winter in the northern hemisphere

Irma (2017) destroyed 90% of the DR's yearly fruit and rice crops and most of its animal stock. Furthermore, infrastructure damage can delay or impede farmers and herders from accessing international markets, a severe problem for perishable and seasonal commodities.

Country	GDP per cap	Surface (sq. km)	Population	Services (% GDP)	Agriculture, forestry, fishing (% GDP)
Antigua and Barbuda	16,864.38	440	96,286	68.0	1.71
Bahamas, The	31,857.89	13880	385,640	74.9	1.00
Belize	5,025.18	22970	383,071	62.9	10.83
Barbados	16,327.61	430	286,641	74.9	1.38
Dominica	7,031.71	750	71,625	55.1	12.67
Dominican Republic	7,650.07	48670	10,627,165	58.9	5.49
Grenada	10,833.66	340	111,454	66.7	4.92
Guyana	4,634.68	214970	779,004	42.0	15.44
Haiti	868.28	27750	11,123,176	24.8	17.73
Jamaica	5,355.58	10990	2,934,855	59.2	6.66
St. Kitts and Nevis	19,829.43	260	52,441	63.9	1.23
St. Lucia	10,315.03	620	181,889	75.1	2.07
Suriname	5,950.21	163820	575,991	48.7	12.57
Sint Maarten (Dutch part)	15,400.00	34	40,654	69.3	0.09
Turks and Caicos Islands	27,142.23	950	37,665	74.4	0.51
Trinidad and Tobago	16,843.70	5130	1,389,858	57.1	0.47
St. Vincent and the Grenadines	7,377.68	390	110,210	62.3	6.72

Table. Selected country indicators (Source: WDI database, last accessed on August 2019)

High sovereign debt levels also limit the region's capacity to act on the complex and costly investments required to manage disaster risks effectively. Debt as a percent of GDP continued to exceed the international benchmark of 60 percent in 11 countries by 2018, though the ratio of some countries (for example, Jamaica, Grenada and St. Vincent and the Grenadines) has been decreasing. The average debt level in the Caribbean is 71% of GDP, while in some cases it is significantly higher as is the case of Antigua and Barbuda, or Dominica (with over 80%), and Barbados, Belize and Jamaica with more than 90%. Besides limiting fiscal space to cushion risks, high debt levels threaten fiscal sustainability, increases borrowing costs and discourages private investments.

Relatively high-income levels in the region do not prevent high poverty levels in many Caribbean countries, which increase the socio-economic impacts of disasters, as the poor are more vulnerable to disasters than the rest of the population. According to the most recent poverty statistics available, poverty levels were as high as 41.3% in Belize in 2009; 37.7% in Grenada in 2008; 30.2% in St Vincent in 2008; 28.8% for Dominica in 2009; 25% for St Lucia in 2016; 22.8% for the Dominican Republic in 2018; and 19.2% in Jamaica in 2017. Furthermore, the brunt of disasters is often faced by vulnerable sub-groups such as women and children, who are also disproportionately represented among the poor in several

Caribbean countries. High unemployment in some counties, particularly among youth and women,⁴ and reliance on climate sensitive sectors such as agriculture and tourism for livelihoods, further limit the ability of individuals and households to recover from disasters when they occur.

Recent rapid and unregulated urbanization in the Caribbean has led to an increase in disaster losses over time as the exposed population grows. Urban areas in the Caribbean tend to be relatively small and are mostly composed of low-density urban agglomerations. In 2015, 23% of the region's population lived in dense urban centers (cities) with over 1500 hab/km² and over 49% of the population lives in urban clusters (towns) of around 300 hab/km². The growth of these urban areas was significant, growing from 57.9% in 1975 to 72% in 2015 according to the joint EU-UN assessment of urbanization (GHSL 2015)⁵. As most urban areas are close to the coast, this urban growth has led to an increase in exposure. For example, 50% of the urban population in Suriname lives in highly exposed areas close to the coastline, and the growth in population close to the coastline in countries like Dominica, the DR and Haiti has grown by 10.4%, 19.7% and 25.8% respectively (WDI 2019). Furthermore, unplanned urbanization close to coastlines is often associated with the deterioration of mangroves, sea grass and corals, which are indispensable for marine and coastal ecosystems (a centerpiece of island livelihoods) and provide significant protection from storm surge and winds.

Climate change is expected to significantly increase disaster risk in the Caribbean. The frequency and/or intensity of floods and droughts is expected to increase while sea level rise will bring storm surges further inland (IPCC 2012). In countries like the Bahamas and Turks and Caicos, which both have around 50% of their land below 5 meters, sea level rise will require major coastal adaptation. The availability of fresh water will also become an issue as a result of changes to seasonal rain patterns and sea water intrusion into aquifers. Those countries with significant forests like Guyana, Suriname, Belize and Dominica, will experience significant reductions in the productivity of their forestry sectors and which will affect forest-based livelihoods. While it is difficult to know if climate change will increase the frequency of hurricanes, it will most likely increase their intensity. In 2017, two consecutive Category V hurricanes Irma and Maria passed through the region, a first of its kind event. In September 2019, another category 5 storm affected the region, Hurricane Dorian hit the northern Bahamas as most intense Atlantic storm to reach land since records began⁶. In addition, climate change can bring new mosquito-borne diseases and will negatively impact agriculture as mean temperatures are expected to increase over the suitable levels for most crops. Coastal communities are particularly vulnerable to the climate change impacts. Coastal communities are experiencing the effects of climate change, including sea level rise, more intense storms, flooding, and erosion.

⁴ Recent unemployment rates range from 25.8% for St Vincent and the Grenadines in 2017; 23.6% for Grenada in 2017; 20.2% for St Lucia in 2018; to 7.8% for Jamaica in 2019; 7.6% for Belize in 2019; and 5.8% for the Dominican Republic in 2019.

⁵ Using national definitions of urbanization, the region's urbanization grew from 39.4% to 56%.

⁶ Tied with the 1935 Labor Day hurricane.

3. ROLE OF NATURE & NATURE-BASED SOLUTIONS (NBS) FOR RESILIENCE⁷

2.1. Background

Nature based solutions offer an opportunity to solve challenges at the local and national level but also in an integrated way given their high potential for producing co-benefits and significant multiplier effect. For example, restoring/replanting mangroves along the coast of a low lying country not only provides coastal protection from storm surge, sea level rise and extreme weather events or natural disasters but also a sanctuary for marine flora and fauna, a carbon sink to mitigate climate change emissions (blue carbon), a habitat for terrestrial species (e.g. birds and small mammals) and a livelihood for coastal communities (small scale fisheries, apiculture, sustainable charcoal production, etc).

An ocean-based approach to growth and poverty reduction not only offers the opportunity to preserve marine and coastal resources, but a way to boost growth and tackle some of the key challenges related to high unemployment, food security, poverty, ecosystem loss and resilience to climate change. In this context, it seems that one of the biggest untapped potentials to tackle the global crisis of environmental degradation and climate change and to advance the sustainable development agenda in general relies with the protection, restoration and sustainable use of the ocean and its associated resources and services. This also offers a great opportunity to focus on nature-based solutions given the significance of coastal ecosystems and marine resources, especially for a region such as the Caribbean where the ocean space is so much more significant when compared to the land space and economies heavily rely on resources and services offered by the sea.

Caribbean countries by nature have significant coastal areas that act as natural defense systems protecting population and infrastructure from coastal changes such as erosion, flooding and storm surges. The sustainable and integrated management of these coastal zones is key for survival, especially for environments prone to natural disasters that are exacerbated by the current changing climate. Coasts are highly dynamic zones that hold great importance for society, the economy, and the environment. Coasts support thousands of communities across the world who rely on the ecosystem for the services it provides for their livelihoods. From sandy shores to muddy mangrove forests, the value of coastal environments cannot be overlooked. In order to develop solutions that offer long term coastal resilience it is imperative that we work with the naturally changing coastal system. Nature based solutions offer coastal protection, and in addition provide a variety of benefits such as a healthy ecosystem for flora and fauna and a stimulated economy through tourism and recreation activities.⁸

Sea level rise, warming waters and changes in storm patterns are already affecting coastal areas. Natural ecosystems may help to counter their impacts by binding sediments, reducing waves and growing upwards as sea levels rise, thereby protecting coastal lands and populations from erosion, inundation and storm impacts. This capacity of natural ecosystem to provide protection is important in many locations where nature provides other critical services liker food or recreation, where engineered defenses are too costly or where adjacent lands are of low value and considered not worth extensive investment. The ability of ecosystems to perform these functions is highly variable, however, and so it is vital that we understand when and where ecosystems can help to protect coastlines. Such natural coastal protection depends on

⁷ For the purpose of this Note, and noting the countries unique circumstances, the emphasis of analysis is on the role of nature-based solutions for coastal resilience.

⁸ <https://www.nature-basedsolutions.com/natural-coasts>

the local conditions and the structure of the ecosystems themselves. Coastlines are among the most dynamic environments on earth given that they are constantly shaped by waves, winds, tides and storms. Natural ecosystems thrive amidst this change, and indeed have developed the capacity to shape that change. Mangroves and salt marshes capture the moving sediments and help to reduce waves. Offshore coral reefs act as breakwaters, and further create the rock and sand to build islands and beaches.⁹

2.2. Definition of Nature-Based Solutions

Nature-based solutions (NBS or NbS) are intended to address infrastructure needs, protect from climate impacts, and act as hazard mitigation tools. Nature based solutions differs from conventional engineered infrastructure solutions and can protect, sustainably manage, and restore natural and modified ecosystems that address societal challenges, like coastal flooding and erosion, effectively and adaptively while simultaneously providing human well-being and biodiversity benefits, particularly in the Caribbean region (World Bank, 2017).

	Nature-based Solutions (NBS)	
Built	Hybrid	Natural
Hard, gray, engineered structures built to address development objectives	Combination of ecosystem elements and hard engineering interventions to address development objectives	Creation, protection or restoration of only ecosystem elements to address development objectives

References: World Bank (2017). Implementing Nature-Based Flood Protection: Principles and Implementation Guidance. Washington, D.C.

There is no universal definition for nature-based solutions to date and different organizations define it in different ways and employ different terminologies. Definitions of nature-based solutions include¹⁰:

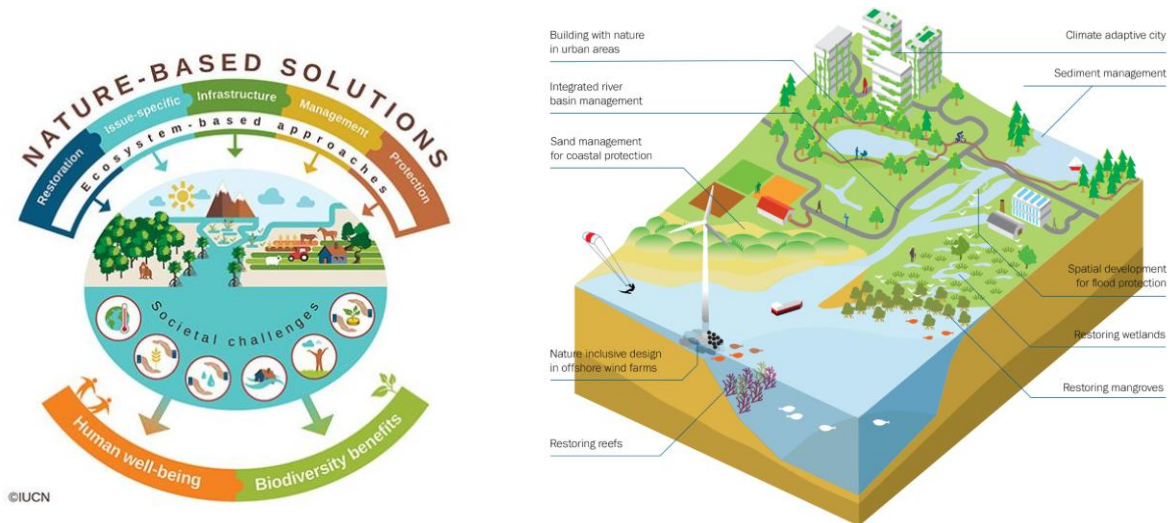
- The International Union for Conservation of Nature (IUCN), the World Bank Group, and the World Resources Institute (WRI) define nature-based solutions as “actions to protect, sustainably manage, and restore natural or modified ecosystems that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits.”
- The Nature Conservancy states nature-based solutions are “project solutions that are motivated and supported by nature and that may also offer environmental, economic, and social benefits, while increasing resilience. Nature-based solutions include both green and natural infrastructure.”
- The National Oceanic and Atmospheric Administration (NOAA) Office for Coastal Management employs a similar term to nature-based solutions, Ecosystem-based Management, defined as “an integrated management approach that recognizes the full array of interactions within an ecosystem ... an approach that works across sectors to manage species and habitats, economic activities, conflicting uses, and the sustainability of resources.”

NBS are intended to support the achievement of society’s development goals and safeguard human well-being in ways that reflect cultural and societal values and enhance the resilience of ecosystems, their

⁹ <https://coastalresilience.org/natural-solutions/>

¹⁰ Environmental and Energy Study Institute (EESI), <https://www.eesi.org/papers/view/fact-sheet-nature-as-resilient-infrastructure-an-overview-of-nature-based-solutions>

capacity for renewal and the provision of services. NBS are designed to address major societal challenges, such as food security, climate change, water security, human health, disaster risk, social and economic development.¹¹



IUCN also defines a set of principles to be used in conjunction with the definition so NBS:

1. Embrace nature conservation norms;
2. Can be implemented alone or in an integrated manner with other solutions to societal challenges (e.g. technological and engineering solutions);
3. Are determined by site-specific natural and cultural contexts that include traditional, local and scientific knowledge;
4. Produce societal benefits in a fair and equitable way, in a manner that promotes transparency and broad participation;
5. Maintain biological and cultural diversity and the ability of ecosystems to evolve over time;
6. Are applied at a landscape scale;
7. Recognize and address the trade-offs between the production of a few immediate economic benefits for development, and future options for the production of the full range of ecosystems services; and
8. Are an integral part of the overall design of policies, and measures or actions, to address a specific challenge.

3.3. Cost-Effectiveness of the use NBS in building coastal resilience

Climate change impacts require a re-evaluation of infrastructure solutions. Recent evidence in Caribbean countries suggests that presence of mangrove helps to mitigate hurricane damages, avoiding between 6% – 40% percent of total economic damage¹². Similar evidence has been corroborated in other contexts, like

¹¹ <https://www.iucn.org/commissions/commission-ecosystem-management/our-work/nature-based-solutions>

¹² Miranda et al. (2020), “Mangroves as a Coastal Protection of local economic activities from hurricanes in the Caribbean”, World Bank. Draft report.

Central America, where the impact of the hurricanes is fully mitigated in areas protected by belts of one or more kilometers of mangrove.¹³

Studies suggest coastal nature-based solutions can mitigate flood and storm damage more effectively than gray infrastructure alone and are more resilient. For these reasons, coastal states are investing in natural infrastructure solutions such as the restoration of wetlands, mangroves, marshes, and oyster reefs, and the installation of living shorelines (plants and natural elements designed to stabilize and protect coastlines) to help reduce wave impacts during storms. Fifteen feet of marsh can “absorb up to 50 percent of incoming wave energy,” and 330 feet of mangrove trees “can reduce wave height by 66 percent.” By contrast, gray infrastructure redirects, rather than dissipates, wave energy. Furthermore, waves can overtop jetties, bulkheads, levees, and seawalls, so flood protection is only provided to a certain peak wave height.

These natural infrastructure solutions are generally cost-effective, depending on the specific site. For many locations along the Gulf of Mexico, wetland and reef restoration have been found to save \$7 in “flood reduction benefits” for every \$1 spent on restoration, and it is estimated that nature-based solutions could help “avert more than 45 percent of the climate risk over a 20-year period, saving the region more than \$50 billion in flood damages.” Across the United States, coastal wetlands are estimated to provide \$23.2 billion in storm protection annually. One case study determined that, with regards to Hurricane Sandy (2012), coastal wetlands prevented an estimated \$625 million in property damages. Annually, in the Northeastern United States, coastal wetlands provide a 16 percent reduction in flood damages. Another study found that combining gray infrastructure with nature-based solutions was the most effective method for mitigating flooding while providing the greatest co-benefits, saving \$225 million in damages for a 1-in-100 year storm event at Howard Beach, Queens, New York. Additionally, initial costs for nature-based solutions are often less costly than for gray infrastructure alternatives. As of June 2019, living shorelines, which last longer and do not require as many or as intensive repairs, on average cost \$361/linear foot, which is a third of the \$1,022/linear foot cost for concrete bulkheads.¹⁴

In defining NBS and considering its applications, it is useful to consider a range of ecosystem-related approaches all of which address societal challenges. Some examples include¹⁵:

1. **Nature-Based Solutions for disaster risk reduction**: Major disasters in the past decade have clearly demonstrated the role nature plays in reducing risks to natural hazards. Following Hurricane Katrina, the US Congress approved US\$ 500 million for the restoration of its coastal national parks and salt marshes, following evidence that the parks and marshes had helped reduce the damage. Similarly, the Government of Japan declared the expansion of its coastal forests, in the form of the Sanriku Fukko Reconstruction Park, as these forests had helped reduce the impacts of the tsunami caused by the Great East Japan Earthquake in 2011 (Renaud & Murti, 2013). These experiences demonstrate that the regulatory role of ecosystem services can be cost-effective in reducing risks posed to society by disasters. A study conducted by Swiss Reinsurance demonstrates that every dollar invested in protection of the Folkestone Marine National Park in

¹³ Del Valle et al. (2020), “Mangroves for Coastal Protection: Evidence from Hurricanes in Central America”, PNAS, January 7, 2020, Vol. 117, No. 1, pp. 265-270.

¹⁴ Environmental and Energy Study Institute (EESI), <https://www.eesi.org/papers/view/fact-sheet-nature-as-resilient-infrastructure-an-overview-of-nature-based-solutions>

¹⁵ IUCN, Nature-based Solutions to address global societal challenges, 2016

Barbados can avoid US\$ 20 million-worth of annual damages from hurricanes (Mueller & Bresch, 2014). Ecosystems such as wetlands, forests and coastal systems can reduce physical exposure to natural hazards by serving as protective barriers or buffers. Furthermore, such NbS can protect development infrastructure and property as well as support quicker recovery of livelihood sources. A study from Bhitarkanika Conservation Area in India, for example, shows that rice crops can take three times longer to recover from salt intrusion following coastal storms, without the presence of mangrove forests along the coastline (Duncan et al. 2014). Such learning from past events has led to the development of the ecosystem-based disaster risk reduction (Eco-DRR) approach. It is important to recognize that a natural hazard event has the potential to turn into a disaster if the community or society is not able to cope with the impacts, using its own resources (UNISDR 2007). Disaster risk reduction efforts can significantly reduce the likelihood of a natural hazard event turning into a disaster “through systematic efforts to analyze and manage the causal factors of disasters, including through reduced exposure to hazards, lessened vulnerability of people and property, wise management of land and the environment, and improved preparedness for adverse events”(Renaud et al. 2013). NbS such as the Eco-DRR approach can strongly support a community’s risk reduction efforts. In the past two years there has been increasing recognition of this approach within global policy frameworks, namely the Convention on Biological Diversity (2014), The Sendai Framework for Disaster Risk Reduction (2015) and the Ramsar Convention on Wetlands (2015). While the lessons learnt from past devastations have led to greater recognition of nature as a critical solution for disaster risk management, scaling up these NbS requires active facilitation of dialogues and capacity development amongst scientists, policy makers and practitioners of conservation and disaster management. NbS to disaster is addressed in part by SDGs 11 and 13 which focus respectively on making cities and human settlements safe and resilient and on mitigating and adapting to climate change. Through its implementation it also contributes to various SDGs such as SDG 1 (no poverty), 2 (no hunger), 3 (good health and wellbeing), 6 (clean water and sanitation) and 15 (life on land).

2. **Nature-based Solutions for climate change:** Climate change is one of the most pressing challenges confronting humanity today. Depending on how the world’s ecosystems are managed, they can either contribute to the problem or provide effective Nature-based Solutions for climate change mitigation and adaptation. First, NbS in the form of ecosystem-based mitigation (EbM) can make a powerful contribution in the fight against climate change by preventing the degradation and loss of natural ecosystems. Deforestation and forest degradation, for example, release an estimated 4.4 Gt of CO₂ per year into the atmosphere (Matthews & van Noordwijk, 2014), or around 12% of anthropogenic CO₂ emissions (IPCC, 2014). When the land sector as a whole, including agriculture, forestry and other land uses (AFOLU), is considered, the contribution is about 24% of annual global anthropogenic emissions (ibid). Avoidance of these emissions, through better conservation and land management actions, is a powerful intervention that can make a significant contribution towards global mitigation efforts. Second, natural and modified ecosystems can also make highly effective contributions in combating climate change through their function as a ‘natural carbon sink’ by absorbing and sequestering CO₂ emissions. Approximately 60% of cumulative anthropogenic GHG emissions since the pre-industrial era have been stored either on land (in plants and soils) or in the ocean (IPCC, 2014). Conservation, restoration and sustainable management of forests, wetlands and oceans thus plays a critical role

in the healthy functioning of the carbon cycle and the balanced regulation of the planet's climate. It has been estimated, for example, that restoring 350 million hectares of degraded or deforested landscapes by 2030 can sequester 1-3 billion tonnes of CO₂e per year while also generating about US\$ 170 billion per year in benefits from other ecosystem services, thereby making it a cost-effective NbS to climate change (New Climate Economy, 2014). Finally, in addition to providing these direct mitigation benefits, ecosystems can also help vulnerable communities, especially those who depend on natural resources, to better adapt and become more resilient to the adverse effects of climate change, including extreme weather events and climate-related disasters, through ecosystem-based adaptation (EbA) and ecosystem-based disaster risk reduction (EcoDRR). Such ecosystem-based interventions, or natural infrastructure, can complement and enhance the effectiveness of physical infrastructure such as sea walls and dykes in a blended, cost-effective manner. It must be noted that for global efforts on climate change to be successful in keeping the temperature rise to well below 2 degrees Celsius, action from all sectors, across all levels and involving all actors, is required. But NbS are a fundamentally important part of this mix, and no long-term solution to climate change can be successful without fully drawing on them. NbS to climate change is also addressed in part by SDG 13 which focuses on climate change.

3. **Nature-Based Solutions for green infrastructure and natural infrastructure approaches:**

Ecosystems perform a number of the same functions as conventional 'grey' infrastructure, such as water collection, purification, storage, and conveyance (Dalton & Murti, 2013). Water-related ecosystem services perform an 'infrastructure-like' function (Ozment et al. 2015; Smith 2013). For example, upland forests, aquifers, lakes and wetlands provide water storage, wetlands filter water, rivers provide conveyance and transportation, floodplains and wetlands lower flood peaks in downstream cities, while mangroves, coral reefs and barrier islands protect coasts against storms and inundation (Krchnak et al., 2011). Natural infrastructure underpins the way we manage our river basins and therefore the way we grow food, generate electricity, and supply water to cities (Coates & Smith 2012). The term infrastructure is defined as the stock of facilities, services and installations needed for the functioning of a society. Therefore, built infrastructure has natural counterparts in watersheds which complement, augment or replace conventional built infrastructure such as reservoirs, dams, levees and canals (Krchnak et al., 2011). For example, although representing less than one percent of the earth's land surface, river floodplains are estimated to provide nearly 25% of the terrestrial (i.e. non-marine) ecosystem services, with primary benefits including attenuation of flood flows, fisheries productivity, groundwater recharge, and water filtration (Costanza et al., 2014). The Green Infrastructure approach emerged in the USA in the mid-1990s, but has its origins in the 1850s, with the first references to greenbelts in the UK and urban open-space networks in the USA. The European Commission in the context of the EU Green Infrastructure Strategy defines green infrastructure as: "a strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services" (European Commission, 2013). Green infrastructure incorporates green spaces (or blue if aquatic ecosystems are concerned) and other physical features in terrestrial (including coastal) and marine areas. A green infrastructure approach considers conservation values and actions related to land development, growth management and built infrastructure planning, thus differing from conventional approaches to open space planning (Benedict & McMahon, 2002). Due to its broad definition, the term green

infrastructure is used both as a theoretical concept and as a practical tool. The terms green infrastructure (GI) and natural infrastructure (NI) are often used interchangeably (UNEP, 2014), though they tend to be used to refer to planning and conservation work in different contexts and at different scales. A natural infrastructure approach could be seen to be restoring structure, function and composition of ecosystems to deliver ecosystem services, whereas a green infrastructure approach would enhance these aspects of ecosystems, to deliver these services. Furthermore, while a green infrastructure approach is used at both an urban and a landscape scale, a natural infrastructure approach is used only at a landscape scale. However, the two approaches share many of the same principles and objectives, including connectivity, multifunctionality and smart conservation (European Environment Agency, 2011). In both GI and NI approaches, hybrid solutions are commonly used, mixing hard infrastructure with ecosystem-based infrastructure. Green infrastructure is used in the spheres of policy, practice and scientific research; its research applications tend to relate to urban settings (Tzoulas et al., 2007).

3.4. Nature-Based Solutions Co-benefits

As presented in the section above, the unique feature that sets NBS apart from for example ecosystem-based approaches is the fact that their very definition requires these solutions to provide co-benefits. NBS work intimately with eco-systems to adapt to and mitigate the impacts from climate change, conserve biodiversity and improve human health and well-being. They represent solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. NBS bring together established ecosystem-based approaches, such as ecosystem services, green-blue infrastructure, ecological engineering, ecosystem-based management and natural capital with assessments of the social and economic benefits of resource-efficient and systemic solutions that combine technical, business, finance, governance, regulatory and social innovation.¹⁶ In addition to protecting coastlines from flooding and erosion, these NBS can generate income for local communities by underpinning fisheries, tourism, and recreation; some nature-based solutions can aid in the storage of freshwater supplies and improve water quality; they also enhance habitat and biodiversity.

Nature-Based Solutions (NBS) are a fundamental part of action¹⁷ for climate and biodiversity. Research¹⁷ indicates that NBS can provide over one-third of the cost-effective climate mitigation needed between now and 2030 to stabilize warming to below 2 °C, achieving nature's mitigation potential of 10-12 gigatons of CO₂ per year¹⁸. Adequate investment in NBS will help reduce financial consequences of climate change, and contribute to the creation of new jobs, to livelihood resilience and to reducing people's poverty. Through direct benefits and co-benefits, NBS underpin the Sustainable Development Goals: they support vital ecosystem services, biodiversity, access to fresh water, improved livelihoods, healthy diets and food security from sustainable food systems. NBS are an essential component of the overall global effort to achieve the goals of the Paris Agreement on Climate Change. They are a vital complement to decarbonization, reducing climate change risks and establishing climate resilient societies. They value harmony between people and nature, as well as ecological development and represent a holistic, people-

¹⁶ A framework for assessing and implementing the co-benefits of nature-based solutions in urban areas, Christopher M. Raymond et al, November 2017

¹⁷ <https://www.pnas.org/content/114/44/11645>

¹⁸ https://wedocs.unep.org/bitstream/handle/20.500.11822/22070/EGR_2017.pdf

centered response to climate change. They are effective, long-term, cost-efficient and globally scalable. NBS are already being delivered, they are visible and credible, and can be exponentially scaled-up if they are fully valued and receive proper investment. Action is needed now to ensure that they achieve their full potential. At present, NBS only receive a small share of climate finance. Success depends on maximizing nature’s contribution to climate action, with intensified NBS from now onwards. Indeed, there are many examples of best practices and many emerging initiatives are ready for extension and intensification.¹⁹

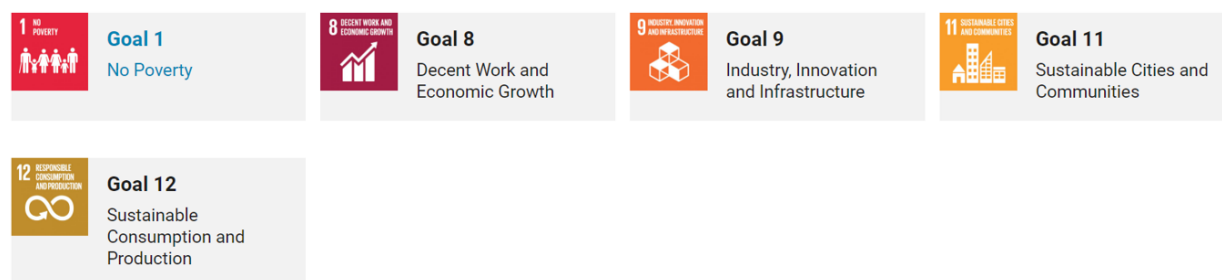


Figure 1. SDGs to which NBS contribute, either through direct benefits or co-benefits.

NBS also have the potential to enhance the ambition and implementation progress of countries’ Nationally Determined Contributions (NDCs) and therefore are critical to meeting the Paris Agreement goals and other national development priorities. Countries have captured multiple NBS-related actions as goals or commitments under different conventions and in various plans, strategies and commitments, including National Biodiversity Strategies and Action Plans (NBSAPs) for the Convention on Biological Diversity (CBD), REDD+ Strategies and Actions, National Land Degradation Neutrality (LDN) targets for the United Nations Convention to Combat Desertification (UNCCD), and the Bonn Challenge. While in some cases the NDCs are aligned with these plans and commitments, there are several NBS actions present in those plans that can help in the enhancement process of the NDCs.

One example of how to incorporate NBS-related commitments, strategies and plans into the NDCs in order to scale cost-effective, proven nature-based solutions that have multiple co-benefits is that of REDD+. REDD+ is a high-mitigation potential NBS with multiple co-benefits such as ecosystem (services) conservation and restoration, community involvement, soil stabilization and erosion control, creation of alternative livelihoods and preservation of key habitats, among others. In addition to the economic benefits presented in previous sections of this report and unlike engineered (gray) solutions for the same hazards, NBS and hybrid approaches provide multiple co-benefits (i.e. ecosystem services), such as access to food and water, pollination and soil formation, carbon storage and diversified livelihoods. For example, 25 years of forest restoration in the Poyang Lake basin in Southern China not only halved heavy soil erosion but increased net carbon sequestration five-fold and net income for local farmers six-fold. Similarly, afforestation in the Republic of Korea in 1960-2010 achieved a significant reduction of disaster risk while increasing in carbon sequestration with a break-even point of investment after 20 years.²⁰

¹⁹ The Nature-Based Solutions for Climate Manifesto, Developed for the UN Climate Action Summit 2019

²⁰ Evidence Brief - How effective are Nature-based Solutions to climate change adaptation, The Nature Based Solutions Initiative, August 2018

3.5. A Closer Look at NBS in Action - Integrating green and grey infrastructure²¹

Rising weather extremes, combined with increasing development along vulnerable areas such as rivers and coastlines, are leading to a surge in impacts from climate-related disasters. Increasingly, governments are turning to nature to help manage these disasters. “Nature-Based Solutions” (NBS) that strategically conserve or restore nature (green infrastructure) while supporting conventionally built infrastructure systems (gray infrastructure) can reduce disaster risk and produce more resilient and lower-cost services. Such solutions include widening of natural flood plains, protecting and expanding wetlands, restoring oyster and coral reefs and investing in urban green spaces that reduce run-off. Evidence from around the world shows that these approaches are often successful and cost-effective. Vietnam has implemented a widespread mangrove restoration project integrated with dike systems to reduce coastal flooding—which ultimately saved US\$215 million. Meanwhile, China’s “Sponge Cities” program in 30 pilot cities is integrating vast amounts of green space into urban design to prevent surface flooding. In addition to effectively reducing disaster risk, nature-based solutions can have a wide range of positive effects on ecosystem conservation, carbon storage, tourism and local employment.²²

Moreover, climate change impacts require a re-evaluation of infrastructure solutions. Studies suggest coastal nature-based solutions can mitigate flood and storm damage more effectively than gray infrastructure alone and are more resilient. For these reasons, coastal states are investing in natural infrastructure solutions such as the restoration of wetlands, mangroves, marshes, and oyster reefs, and the installation of living shorelines (plants and natural elements designed to stabilize and protect coastlines) to help reduce wave impacts during storms. Fifteen feet of marsh can “absorb up to 50 percent of incoming wave energy,” and 330 feet of mangrove trees “can reduce wave height by 66 percent.” By contrast, gray infrastructure redirects, rather than dissipates, wave energy. Furthermore, waves can overtop jetties, bulkheads, levees, and seawalls, so flood protection is only provided to a certain peak wave height.

As such, a new generation of infrastructure projects is necessary to achieve development goals, including water security, disaster risk reduction, poverty alleviation, and resilience to climate change. Nearly half the world’s population already lives in areas with water scarcity, and natural disasters affected 96 million people in 2017 (Burek et al. 2016; CRED 2017). Climate change and growth patterns will exacerbate these threats: by 2050, nearly 20 percent of the world’s population will be at risk of floods, and up to 5.7 billion people will live in water-scarce areas (WWAP 2018). At the same time, communities, rural and urban, developed and developing, are struggling to build reliable, safe, and economically viable infrastructure to provide residents with clean water and power, flood protection, and resilience against drought. Protecting populations from these multiplying threats with traditional built infrastructure such as massive dams and seawalls alone will be insufficient. The consequences of unabated coastal flooding can be extremely costly. In 2005, average losses suffered by the world’s 136 largest coastal cities amounted to roughly \$6 billion per year. By 2050, these losses are expected to soar to at least \$52 billion per year, and as high as \$1 trillion per year if climate change and land subsidence significantly worsen (Hallegatte et al. 2013). Coastal ecosystems such as mangroves, coral reefs, and sand dunes can act as buffers against sea-level rise as well as against natural hazards that bring intense wind, rainfall, or storm surge. Yet, globally, these ecosystems are at risk due to coastal development, unsustainable fishing, watershed and marine

²¹ Integrating Green and Grey, World Bank and World Resources Institute, 2019

²² <https://www.wri.org/blog/2019/03/insider-using-nature-prevent-disasters>

pollution, or thermal stress triggered by climate change. As of 2010, more than 60 percent of the world’s reefs are under high threat, and about 1 percent of mangrove forests are lost each year (Burke 2011).

Solutions that are cost-effective, enhance infrastructure service provision, contribute to enhancing resilience in a changing climate, and contribute to social and environmental goals must be developed and deployed worldwide. Integrating green and gray infrastructure can help fill the need for climate-resilient 21st century solutions. While it is still early days, there is mounting evidence that natural systems can be combined with traditional gray infrastructure to provide lower-cost and more resilient services. Proponents argue that while gray infrastructure typically serves limited purposes, green infrastructure can sometimes deliver multiple benefits, simultaneously, underpinning environmental and social goals. In addition, research suggests that green infrastructure is more flexible and resilient to climate change than its gray counterpart (Cohen Shacham et al. 2016; Ozment et al. 2015; WBCSD 2017). Over time, and done properly, combining green and gray infrastructure offers the potential to help provide water, food, and energy to growing populations, lift communities out of poverty, and mitigate climate change.

SERVICE	GRAY INFRASTRUCTURE COMPONENTS	EXAMPLES OF GREEN INFRASTRUCTURE COMPONENTS AND THEIR FUNCTION
Water supply and sanitation	Reservoirs, treatment plants, pipe network	Watersheds: Improve source water quality and thereby reduce treatment requirements Wetlands: Filter wastewater effluent and thereby reduce wastewater treatment requirements
Hydropower	Reservoirs and power plants	Watersheds: Reduce sediment inflows and extend life of reservoirs and power plants
Coastal flood protection	Embankments, groynes, sluice gates	Mangrove forests: Decrease wave energy and storm surges and thereby reduce embankment requirements
Urban flood management	Storm drains, pumps, outfalls	Urban flood retention areas: Store stormwater and thereby reduce drain and pump requirements
River flood management	Embankments, sluice gates, pump stations	River floodplains: Store flood waters and thereby reduce embankment requirements
Agriculture irrigation and drainage	Barrages/dams, irrigation and drainage canals	Agricultural soils: Increase soil water storage capacity and reduce irrigation requirements

Figure 2. How green and grey infrastructure can work together

Although green infrastructure may not be appropriate for every project or location, opportunities to use natural systems in project designs are frequently overlooked and have not yet entered the mainstream. This is partly the result of piecemeal research, focused mainly on isolated case studies with limited relevance to other contexts or insight into long-term trends. However, successful examples of and experience with green infrastructure have now gained critical mass, generating robust design processes that enable service providers and development partners to confidently consider green and gray infrastructure approaches, and investment opportunities, on an equal footing. Green infrastructure has gained momentum among governments, civil society, and development partners such as multilateral development banks and bilateral agencies. As green infrastructure gains momentum, development partners historically focused on gray infrastructure are embracing the concept and value of “putting nature to work.” For example, the World Bank’s Wealth Accounting and the Valuation of Ecosystem Services framework seeks to account for the value of nature in mainstream planning processes, and its programs aim to drive uptake of nature-based solutions in disaster risk management and other relevant sectors (WAVES 2016). From 2012 to 2017, the World Bank approved at least 81 projects with green

infrastructure components in the environment, urban, water, and agricultural sectors—however, this remains a small percentage of all approved projects in these sectors.

3.6. NBS in Action: Global Case Studies

There is mounting evidence on the effectiveness of NBS approaches to solve societal problems in a successful and cost-effective manner. This section shows some relevant examples of these types of projects and initiatives that could be applied to the Caribbean given that they tackle challenges similar to those the region faces in similar local contexts.²³

PROJECT NAME AND LOCATION	<i>Prins Hendrik Sand Dike</i> On the Dutch island of Texel a pre-existing dike has experienced heavy wave action and no longer meets safety standards. Using a nature-based solutions approach, a natural sandy reinforcement has been applied to protect the dike for the future.
PROBLEM	A pre-existing dike that no longer meets safety standards Texel is one of the Dutch Wadden islands, found in the Northern region of the Netherlands. The island is naturally below sea-level but is habitable thanks to the creation of dunes and dikes that protect the island from the surrounding sea. The seventeen-kilometer dike that runs along the Wadden Sea no longer meets safety standards and needs re-enforcement to ensure the safety of the island, it’s coasts, and its inhabitants.
CHALLENGE	To create a natural reinforcement for the dike with additional benefits The goal of the project is to create natural reinforcement using sand to ensure flood defense and protection of local agricultural and inhabited land. As an additional goal, the project will enhance the ecological value of the area by generating additional living, breeding, and feeding grounds for local flora and fauna. The project also includes the creation of recreation and tourism opportunities. The developed land will equate to 200 hectares.
SOLUTION	Use sand nourishment to protect the dike The solution implemented to address Texel’s issue was to use sand nourishment along the pre-existing dike. This solution uses large volumes of beach-quality sediments to restore or protect a sandy coastline. The sand is extracted from two areas in the North Sea, near Den Helder and Vlieland. Appropriate surveys are carried out before any extraction takes place. The dredged sediments will be reclaimed onto the beach through a floating pipeline and then further spread out by bulldozers. Over time the sand shifts continuously in response to the action of wind and wave activity, creating a healthy and protective shoreline.

²³ More case studies and projects can be found in the following links: <https://naturebasedsolutions.org/map> and https://wriorg.s3.amazonaws.com/s3fs-public/NBS_for_DRM_brochure.pdf

RESULT/S	<p>A wider, healthier beach that meets safety standards and further habitat and recreation opportunities</p> <p>The project is currently in its final stages of implementation. It is expected that the nourishment will result in a wider beach, dunes, tidal flats, and saltmarshes. All of this new land will offer new territory for a wide range of flora and fauna. Recreation and tourism are expected to increase in the area, in turn improving local well-being and stimulating economic activity. Results will provide further fundamental knowledge about the possibilities of using sand nourishment.</p>
COMMENTS	<p>The approach of concentrating nourishment operations is seen as a climate-robust and environment-friendly way of countering coastal erosion. Sand nourishment is a long-term nature-based solution that can solve flooding and erosion issues, all while creating additional benefits for the environment, society, and the economy. The expansion of the island's coast meets new safety standards, improves the ecological integrity and diversity, and will enable more people to enjoy the natural environment through recreation and tourism.</p> <p>The project is highly co-operative with a range of stakeholders. The idea of using a sand nourishment approach came from the local municipality and inhabitants of Texel. Decision making processes are and will be inclusive throughout the span of the project.</p> <p>For more information about this project visit www.hnk.nl/prinshendrikzanddijk</p>

PROJECT NAME AND LOCATION	<p><i>Building with Nature Indonesia</i></p> <p>Communities in Central Java are suffering from coastal erosion affecting hundreds of kilometers of coastline due to unsustainable development coupled with the effects of climate change. By addressing the issues at the root of the cause, a nature-based solution is used to reverse the trend of continued coastal erosion and unsustainable economic development.</p>
PROBLEM	<p>Heavy erosion and flooding along the coastline</p> <p>Central Java's deltaic shorelines suffer from severe erosion and related flooding hazards, caused by mangrove conversion for aquaculture, groundwater extraction and infrastructure development. At some places, the coast has retreated by up to a few kilometers. As a result, over 30 million people in Java are at risk.</p>
CHALLENGE	<p>To achieve a safe and healthy coast using a climate-adaptive approach</p> <p>The goal of the Building with Nature Indonesia project is to create a safe and healthy coastline by using a holistic and long-term solution that addresses the root causes of the problem, while taking into account the economic and social well-being of the local residents.</p>
SOLUTION	<p>Restore vegetation to act as a natural form of coastal protection</p>

	<p>Conventional hard-infrastructure solutions to enhance coastal safety have been found to be ineffective, expensive and unable to adapt to climate change in soft muddy coasts, like the coasts along Central Java. Using a green belt is an effective and sustainable solution for eroding muddy coastlines. Mangroves are a native type of vegetation to the shores of Indonesia and are naturally growing. By restoring and protecting these mangroves, the future of the coastline can achieve safety and resiliency. Demak, a community in Central Java, served as the hub for the implementation of the project. In Demak, permeable structures made of bamboo were placed along the shore to initiate land reclamation. Once the land has been re-claimed, mangroves will begin to recover and in time grow along the shore to act as a natural buffer between the community and the sea</p>
RESULT/S	<p>Climate smart and productive land-use</p> <p>The actions of the project in Demak have been implemented and progress is being made. The restored coastline will enhance protection against natural hazards, protect arable land from erosion, revive fisheries, improve water purification, enhance carbon storage, as well as offer opportunities for recreation and tourism. It is planned that aquaculture systems will transition into sustainable industry that co-exist with the restored mangroves.</p>
COMMENTS	<p>The Building with Nature project in Central Java is an example of how a nature-based solution can be used to address the root causes to coastal vulnerability and create a long-term answer for communities at risk.</p> <p>For Demak, potential and hope has been created for a new landscape in which mangroves and aquaculture can be combined in a sustainable way. This project plan, including its approach and techniques, can be adapted and replicated in areas with similar environmental, social, and economic situations.</p> <p>Building with Nature Indonesia is a programme by Ecoshape, Wetlands International, the Indonesian Ministry of Marine Affairs and Fisheries (MMAF), and the Ministry of Public Work and Human Settlement (PU), supported by supported by the Dutch Sustainable Water Fund and The Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB).</p> <p>For more information about this project go to www.buildingwithnatureindonesia.exposure.co</p>

PROJECT NAME AND LOCATION	<p><i>Costa Rica: Securing livelihoods through mangrove conservation and restoration</i></p> <p>Mangrove forests in Costa Rica, especially in the Gulf of Nicoya, are important ecosystems at local, national and global levels because of the many ecosystem services they provide. Satellite images of 2010 have shown that approximately 34% of the Gulf of Nicoya’s mangroves had been illegally converted into salt and shrimp production ponds. These forests protect the shoreline from erosion, support the health of estuarine ecosystems, and provide habitat for invertebrate species such as clams and mollusks that local women and fishermen folk rely on for their livelihoods.</p>
PROBLEM	<p>Illegal conversion of mangrove forest area into ponds for salt and shrimp production</p>

	<p>By the 1960s many of Costa Rica’s mangrove forests in the Nicoya Peninsula were degraded as a result of their overexploitation for firewood and their illegal conversion to salt evaporation and shrimp ponds. In addition, encroachment of agricultural land continues to threaten the country’s mangrove forests. These activities compromise the health of the ecosystems and threaten the services and resources it provides for the environment and communities that depend on it for their livelihoods.</p>
<p>CHALLENGE</p>	<p>To make the case of the importance of mangrove ecosystems and be able to affect policy formulation and capacity building/awareness to ensure community involvement and ownership</p> <p>The project had to undertake activities such as baseline measurement of mangroves and carbon sequestration, i.e. Blue carbon (carbon stored in mangroves, salt tidal marshes and seagrass meadows) to present the results to local policy makers to inform policy on broader climate change mitigation strategies.</p> <p>The project also replanted mangrove forests as a demonstrative pilot to proof the effectiveness of the intervention. Women from Montero, a fishing community on Chira island, agreed to implement the program since they realized that the success of their husbands’ fishing depended on healthy mangrove ecosystems. In addition to replanting mangroves, two successful mangrove nurseries were established and operated by local stakeholders.</p> <p>Education and capacity building was also an integral part of the project to ensure children’s participation and awareness as well as training on marine tourism management provided for potential micro-entrepreneurs for potential eco-tourism opportunities arising from the project.</p>
<p>SOLUTION</p>	<p>Implementation of a mangrove restoration pilot to restore coastal ecosystems</p> <p>In response to these issues, Conservation International began a pilot mangrove restoration project in 2014, as a Nature-based Solution to the socio-economic impacts of mangrove degradation in two coastal communities located on the island of Chira in the Gulf of Nicoya. This project consisted of establishing baseline measures and assessments of carbon sequestration for policy making, replanting of mangrove forests by local stakeholders, building local capacity for sustainable use of mangroves and livelihood diversification, and creating a local education program.</p>
<p>RESULT/S</p>	<p>Multiple benefits were derived from the intervention</p> <p>Carbon sequestration. Since the blue carbon estimates followed internationally recognized scientific methods, these estimates can be published and shared with international audiences. Carbon stocks at the Gulf of Nicoya were estimated for the first time and vary between 413 and 1,335 MgC/ha. Conservation International has since designed a blue carbon project that could use carbon credits to finance community development activities and the organization continues to work on the necessary policy to implement such a project.</p>

	<p>Mangrove replanting. One year after the start of the project, local stakeholders had planted more than 8,000 mangrove saplings, which had a survival rate of over 90%. This pilot project serves as a model for other communities on the island, some of which have also started replanting mangroves.</p> <p>Education and capacity building. Children are involved in monthly classes on mangrove and marine biology. Capacity building of adults started with 30 local stakeholders, out of which 14 finalized the training modules. Six of them currently run small businesses related to tourism (mangrove tours, food, lodging). A second stage of the project is currently being planned.</p>
COMMENTS	<p>Key lessons learned</p> <p><u>Collaboration.</u> The combined knowledge of scientists, local stakeholders and policy makers is necessary for feasible and sound projects. Trust and long-term working relationships between local stakeholders and outside organizations (in this case Conservation International) facilitates community engagement, knowledge sharing, and collaboration.</p> <p><u>Stakeholder assessment.</u> Clarification of values and interests that motivate local stakeholders is key in project design and implementation to achieve lasting results.</p> <p><u>Local commitment.</u> Strong local commitment to project implementation increases success. The strong commitment of local women, who volunteered their time in the midst of caring for their families and searching for alternative sources of income, was especially crucial to the success of this project.</p>

4. NBS IN THE CARRIBEAN: AN OVERVIEW AND WAY FORWARD

4.1. Assessment of NBS in the Caribbean

For the purpose of this Note, the indicators were developed used for the providing a traffic light visualization of the state of NBS in the Caribbean region. They are outlined in the table below.

INDICATOR 1	
<p><u>Strategies, plans, policies, laws and regulations:</u> this indicator aims to determine the existence of national plans/strategies or similar documents to inform resilience, adaptation, environmental management (including NBS) and disaster risk planning and management</p>	National Climate Change Adaptation Plan considering relevant economic sectors
	Long term strategy/sustainable development plan/vision
	Long-term Resilient Infrastructure Plan
	Integrated coastal zone management plan covering a wide range of sectors (environment, water

	resources, infrastructure, tourism, wastewater and solid waste management, blue economy)
	Updated NDC that incorporates adaptation targets and environmental restoration considerations
	Relatively updated environmental laws (enacted or revised less than 7 years ago)
	Disaster/emergency preparedness and management plan
INDICATOR 2	
<u>Tools and basic data availability for planning:</u> this indicator aims to determine the existence and availability of tools to be used in resilience building and adaptation/disaster risk planning with the potential to increase the uptake of NBS	Early warning system/s for natural disasters or extreme weather-related events
	LIDAR (topographic and/or bathymetric) data at the national or local levels
	Vulnerability and hazard maps in key areas
	Downscaled climate change scenarios for the country
INDICATOR 3	
<u>Financial:</u> this indicator aims to determine the existence of financial instruments for resilience and/or disaster management including insurance policy with CCRIF (level of coverage: earthquake, tropical cyclone and excess rainfall policies)	Resilience/adaptation insurance schemes (not including CCRIF)
	Disaster contingency/response funds
	Environmental/climate change taxes/incentives
	Insurance policy with CCRIF and level of coverage (country subscribed to 1, 2 or 3 policies)
INDICATOR 4	
<u>Institutional capacity and set up:</u> this indicator aims to determine if the necessary bodies and coordination mechanisms exist and if national, regional and international targets and priorities are properly assigned to a responsible body that enforces and monitors them	Inter-ministerial committee or governmental body responsible for climate change/resilience
	National emergency management agency
	Coastal zone management unit/institute/agency
	Civil society organizations or NGOs with a strong role in climate change/resilience
	Evidence of enforcement of policies and regulations related to environment, climate change and natural resources

Drawing on the country-specific information, the following are key takeaways on the state of NBS in the Caribbean region:

In terms of availability and timeliness of national plans, strategies, laws, policies and regulations to inform resilience, adaptation, environmental management (including NBS) and disaster risk planning and management, the performance of the region is “medium” (orange in the traffic light system). Moreover, most countries seem to be in the process of developing key documents related to DRM, environmental management, coastal zone/blue economy management, climate change and resilience.

Some more detailed conclusions are as follows²⁴:

- Only 6 countries have a National Climate Adaptation Plan (NAP) that considers relevant economic sectors, 4 do not have such a plan at all and the remaining 7 are in the process of developing a NAP or similar type of document.
- Only 7 countries have long term strategies or sustainable development plans/visions, 3 do not have such a plan at all and the remaining 7 are in the process of developing it.
- Only 3 countries have a long-term Resilient Infrastructure Plan or similar type of document, the Bahamas and Suriname do not have such a plan or anything similar at all and the remaining 12 are in the process of developing such type of plans and policies.
- In regard to integrated coastal zone management, the majority of countries (7) do not have any dedicated plan to CZM covering a wide range of sectors (environment, water resources, infrastructure, tourism, wastewater and solid waste management, blue economy) at all, only 4 countries have such plans and a total of 6 are in the process of developing such documents.
- Disaster/emergency preparedness and management plans or similar documents and legislation guiding the DRM agenda exist for a total of 11 countries which is very good news. However, Belize and Suriname do not have such plans at all and the remaining 4 countries are in the process of developing such documents.
- Climate Change Law/Policies exist for 10 of the countries under study, only Sint Maarten does not have a CC Policy or similar and 6 are in the process of developing them in order to inform their climate change and resilience agenda.
- Most countries do not have an updated NDC that incorporates adaptation targets and environmental restoration considerations. Turks and Caicos Islands and Sint Maarten do not have an NDC at all given their status as Overseas Countries or Territories (OCTs) and only Suriname has a recently updated NDC. A total of 10 countries show evidence of some sort of effort to update their NDCs in accordance with their UNFCCC commitments but still 4 do not show any sort of movement towards developing a second NDC or at least improving or updating their existing one.
- In terms of the timeliness of environmental laws in the 17 countries studied, ten results are more balanced with 6 countries having updated or revised environmental laws, 5 not having an adequate legislative framework and the remaining 6 countries currently working on it.

In terms of the existence and availability of tools to be used in resilience building and adaptation/disaster risk planning with the potential to increase the uptake of NBS, the performance of the region is “good” (green in the traffic light system). Most countries seem to already have the data and tools for comprehensive DRM, environmental management, coastal zone/blue economy management, climate change and resilience. The challenge seems to be how to bridge the gap between having the information and data available and translating it such information that can be applied to policy making and inform tangible actions while also ensuring the data is maintained, improved, and updated regularly.

Some more detailed conclusions are as follows²⁵:

²⁴ Please see detailed country information in the Annex of this document and in the country profiles provided as additional documents to this background note.

²⁵ Ibid.

- Only Turks and Caicos Islands does not have any Early Warning System (EWS) for natural disasters or extreme weather-related events. Most countries do have such systems (10) and 6 are in the process of developing EWS or similar systems as part of their disaster preparedness plans.
- Availability of LIDAR (topographic and/or bathymetric) data at the national or local levels is surprisingly high in the region, 10 countries have this type of data available in some sort of form. However, there are still at least 3 countries that do not have any LIDAR and 4 that are currently developing it.
- Vulnerability and hazard maps in key areas exists for all countries although in some cases these may be outdated. For example, Barbados and SVG are currently developing new maps keeping their databases up-to-date.
- As a result of CARIBSAVE's 2012 Risk Atlas assessment study for the Caribbean, downscaled climate change scenarios exist for several countries in the region. Other studies in the countries of subject (for example those related to the development of National Communications to the UNFCCC) have also produced this type of information. This has resulted in only 3 countries (Sint Maarten, SVG and Barbados) not having this information available at the country level even though Regional Climate Scenarios exist for the Caribbean.

In terms of the existence of financial instruments for resilience and/or disaster management including insurance policy with CCRIF and levels of coverage, the performance of the region is “good” (green in the traffic light system). It is worth noting however that even though CCRIF coverage is good in general, the level of availability of contingency and reserve funds for disaster response is lower than desired for such a vulnerable region. Also, the existence of other insurance mechanisms to provide financial resilience in case of disasters, both at the government and the individual holder levels, is very low which again shows a weak disaster financing context in general.

Some more detailed conclusions are as follows²⁶:

- Only Haiti, Dominican Republic and Sint Maarten seem to have resilience/adaptation insurance schemes or some sort of natural disaster insurance policy products. Other countries like Grenada, Jamaica, Saint Lucia and Trinidad and Tobago are participating countries in programs like Munich Re's Climate Risk Adaptation and Insurance in the Caribbean and CCRIF's Livelihoods Protection Policy (LPP) but most of them do not have such insurance products (at least 9) while others are in the process of exploring such products (e.g. Suriname).
- In terms of contingency or disaster response funds, only Belize, Bahamas, Jamaica and Dominican Republic have such financial instruments at disposal. Most countries are currently working on such arrangements (at least 9) and 4 don't show any evidence of having them as part of the DRF strategy not do they show evidence of having prioritized it as part of their resilience building strategy.
- Most countries (13) collect some sort of environmental or climate change related tax or levy.
- With the exception of Dominican Republic, Guyana and Suriname, all countries assessed are members of CCRIF and the vast majority of them (9) enjoys full coverage under CCRIF's 3 insurance policies against excess rainfall, earthquakes and tropical cyclones.

²⁶ Ibid.

In terms of the existence of the necessary bodies and coordination mechanisms as well as proper assignment of national, regional and international targets and priorities to a responsible body that enforces and monitors them, the performance of the region is “good” (green in the traffic light system). However, this “favorable” result mainly relies on the fact that in most cases the necessary public institution or agency with a specific mandate related to DRM, environmental management, coastal zone/blue economy management, climate change and resilience exists but there are major challenges in regards to institutional coordination, enforcement and monitoring as well as technical and human capacity constraints.

Some more detailed conclusions are as follows²⁷:

- Only SVG, Suriname and Sint Maarten do not currently have set up any sort of inter-ministerial committee or governmental body responsible for climate change/resilience. Every other country (14) under this study has such an entity/body.
- All 17 countries have national emergency management agencies or an institution of some sort that is tasked with the coordination and oversight of disaster management and response.
- Surprisingly, the majority of countries (10) does not have a dedicated coastal zone management unit/institute/agency, only Trinidad and Tobago, Barbados and Belize have such agencies with clear mandates and the remaining 4 have somewhat of an agency with a mandate over the coast and the ocean.
- Civil society organizations (CBOs and NGOs) are quite active in all 17 countries and often undertake activities that in reality would fall under the responsibility of the government, therefore their strong role in resilience and adaptation building as well as environmental management is key for the successful management of those agendas.
- Enforcement is one of the main challenges in the region with only Dominican Republic and Turks and Caicos lands scoring somewhat above the average. Most countries have several challenges with the enforcement of their environmental and natural resources policies and regulations, mainly related to human and technical capacities, coordination and confusion about roles and mandates among the different involved stakeholders.

The table below provides a visualization of the scores and traffic light classification of each of the participating countries for the purpose of facilitating the interpretation of the conclusions outlined the paragraphs above.

²⁷ Ibid.

DOES THE FOLLOWING EXIST?	TRAFFIC LIGHT AND COUNTRIES		
	Yes	In progress/Somewhat	No
National Climate Change Adaptation Plan	Dominican Republic Grenada Guyana St. Lucia St. Vincent and the Grenadines Suriname	Antigua and Barbuda Barbados Belize Dominica Haiti Jamaica St. Kitts and Nevis	The Bahamas Sint Maarten Trinidad and Tobago Turks and Caicos Islands
Long term strategy/sustainable development plan/vision	Belize Dominican Republic Guyana Haiti Jamaica Sint Maarten Trinidad and Tobago	Antigua and Barbuda The Bahamas Barbados Dominica Grenada St. Vincent and the Grenadines Turks and Caicos Islands	St. Kitts and Nevis St. Lucia Suriname
Long-term Resilient Infrastructure Plan	Belize Sint Maarten Turks and Caicos Islands	Antigua and Barbuda Barbados Dominica Dominican Republic Grenada Guyana Haiti Jamaica St. Kitts and Nevis St. Lucia St. Vincent and the Grenadines Trinidad and Tobago	The Bahamas Suriname
Integrated coastal zone management plan	Barbados Belize Suriname Trinidad and Tobago	The Bahamas Grenada Guyana St. Lucia	Antigua and Barbuda Dominica Dominican Republic Haiti

		St. Vincent and the Grenadines Turks and Caicos Islands	Jamaica St. Kitts and Nevis Sint Maarten
Disaster/emergency preparedness and management plan	Antigua and Barbuda Dominica Dominican Republic Grenada Guyana Jamaica St. Lucia Sint Maarten St. Vincent and the Grenadines Trinidad and Tobago Turks and Caicos Islands	The Bahamas Barbados Haiti St. Kitts and Nevis	Belize Suriname
Climate Change Law/Policy	Barbados Belize Dominica Dominican Republic Grenada Guyana Haiti Jamaica St. Lucia Suriname	Antigua and Barbuda The Bahamas St. Kitts and Nevis St. Vincent and the Grenadines Trinidad and Tobago Turks and Caicos Islands	Sint Maarten
Updated NDC	Suriname	Antigua and Barbuda Barbados Belize Dominica Dominican Republic Grenada Guyana Haiti Jamaica	The Bahamas St. Kitts and Nevis Sint Maarten St. Vincent and the Grenadines Trinidad and Tobago Turks and Caicos Islands

		St. Lucia	
Relatively updated environmental laws	Antigua and Barbuda Belize Dominican Republic Grenada St. Kitts and Nevis Suriname	The Bahamas Guyana St. Lucia Sint Maarten Trinidad and Tobago Turks and Caicos Islands	Barbados Dominica Haiti Jamaica St. Vincent and the Grenadines
Early warning system/s for natural disasters or extreme weather-related events	Antigua and Barbuda The Bahamas Belize Dominica Dominican Republic Grenada Guyana Jamaica Suriname Trinidad and Tobago	Barbados Haiti St. Kitts and Nevis St. Lucia Sint Maarten St. Vincent and the Grenadines	Turks and Caicos Islands
LIDAR (topographic and/or bathymetric) data at the national or local levels	Belize Dominica Grenada Guyana Haiti Jamaica St. Kitts and Nevis St. Lucia St. Vincent and the Grenadines Turks and Caicos Islands	Barbados Dominican Republic Sint Maarten Trinidad and Tobago	Antigua and Barbuda The Bahamas Suriname
Vulnerability and hazard maps in key areas	Antigua and Barbuda The Bahamas Belize Dominica Dominican Republic Grenada	Barbados St. Vincent and the Grenadines	

	Guyana Haiti Jamaica St. Kitts and Nevis St. Lucia Sint Maarten Suriname Trinidad and Tobago Turks and Caicos Islands		
Downscaled climate change scenarios for the country	Antigua and Barbuda The Bahamas Belize Dominica Dominican Republic Grenada Guyana Haiti Jamaica St. Kitts and Nevis St. Lucia Suriname Trinidad and Tobago Turks and Caicos Islands		Barbados Sint Maarten St. Vincent and the Grenadines
Resilience/adaptation insurance schemes (not including CCRIF)	Dominican Republic Grenada Haiti Jamaica St. Lucia Sint Maarten	Suriname Trinidad and Tobago	Antigua and Barbuda The Bahamas Barbados Belize Dominica Guyana St. Kitts and Nevis St. Vincent and the Grenadines Turks and Caicos Islands
Disaster contingency/response funds	The Bahamas	Barbados	Antigua and Barbuda

	Belize Dominican Republic Jamaica	Dominica Grenada Guyana Haiti St. Kitts and Nevis St. Lucia St. Vincent and the Grenadines Suriname	Sint Maarten Trinidad and Tobago Turks and Caicos Islands
Environmental/climate change taxes/incentives	Antigua and Barbuda The Bahamas Barbados Belize Dominica Dominican Republic Grenada Guyana Jamaica St. Kitts and Nevis St. Lucia St. Vincent and the Grenadines Trinidad and Tobago	Sint Maarten	Haiti Suriname Turks and Caicos Islands
Insurance policy with CCRIF and level of coverage	Dominica Grenada Haiti Jamaica St. Kitts and Nevis St. Lucia Sint Maarten St. Vincent and the Grenadines Trinidad and Tobago	Antigua and Barbuda The Bahamas Barbados Belize Turks and Caicos Islands	Dominican Republic Guyana Suriname ** NOT CCRIF MEMBERS

Inter-ministerial committee or governmental body responsible for climate change/resilience	Antigua and Barbuda The Bahamas Barbados Belize Dominica Dominican Republic Grenada Guyana Haiti Jamaica St. Kitts and Nevis St. Lucia Trinidad and Tobago Turks and Caicos Islands		Sint Maarten St. Vincent and the Grenadines Suriname
National emergency management agency	Antigua and Barbuda The Bahamas Barbados Belize Dominica Dominican Republic Grenada Guyana Haiti Jamaica St. Kitts and Nevis St. Lucia Sint Maarten St. Vincent and the Grenadines Suriname Trinidad and Tobago Turks and Caicos Islands		
Coastal zone management unit/institute/agency	Barbados Belize	The Bahamas Haiti	Antigua and Barbuda Dominica

	Trinidad and Tobago	Jamaica Turks and Caicos Islands	Dominican Republic Grenada Guyana St. Kitts and Nevis St. Lucia Sint Maarten St. Vincent and the Grenadines Suriname
Civil society organizations or NGOs with a strong role in climate change/resilience	The Bahamas Belize Dominican Republic Guyana Haiti Jamaica Sint Maarten Suriname Trinidad and Tobago Turks and Caicos Islands	Antigua and Barbuda Barbados Dominica Grenada St. Kitts and Nevis St. Lucia St. Vincent and the Grenadines	
Evidence of enforcement of policies and regulations related to environment, climate change and natural resources	Dominican Republic Turks and Caicos Islands	Antigua and Barbuda Belize Grenada Guyana Jamaica St. Lucia Sint Maarten Suriname Trinidad and Tobago	The Bahamas Barbados Dominica Haiti St. Kitts and Nevis St. Vincent and the Grenadines

4.2. A way forward: Priority areas for enhancing the role of NBS for resilience in the Caribbean

Noting the vulnerability of Caribbean countries covered in other sections, as well as the role that NBS can play in reducing them, the examples of on the ground interventions that integrate these solutions into coastal development and flood risk mitigation strategies are as follows.

- **Investments in coastal wetlands, such as mangroves and salt marshes**, can stabilize coastlines by trapping sediment with their root systems, and by reducing wave height and velocity with their dense vegetation. Salt marshes can reduce non-storm wave heights by an average of 72 percent, and mangroves, by 31 percent. Median restoration costs for salt marshes are \$1.11/square meter (m²) (ranging from \$0.01 to \$33.00), and \$0.1/m² for mangroves (ranging from \$0.05 to \$6.50). It can be two to five times cheaper to restore coastal wetlands than to construct submerged breakwaters to deal with wave heights of up to half a meter.
- **Coral and oyster reef systems** can control coastal erosion by reducing wave velocity. By one estimate, coral reefs reduce non-storm wave heights by 70 percent. Median restoration costs for coral reefs are \$166/m² (ranging from \$2 to \$7,500), while oyster reef restoration costs range from \$107 to \$316/m².
- **Sandy beaches and dunes** prevent coastal erosion caused by strong winds, waves, and tides. They can also stop waves and storm surge from reaching inland areas. The natural services these NBS provide can be enhanced through artificial sand nourishment, which costs between \$6,500 to \$16,400/meter (m). Revegetating and restoring sand dunes can cost between \$100 to \$16,400/m.
- **Seagrass** helps stabilize sediment and regulates water currents that contribute to coastal erosion. Seagrass beds reduce non-storm wave height 36 percent on average. A cost of \$11/m² (ranging from \$0.20 to \$410) is estimated for seagrass restoration.

Noting that one key to successful NBS implementation is understanding the institutional and policy environment that creates enabling conditions for NBS, further enhancements in terms of creating an enabling environment to integrate NBS into DRM and other development strategies are as follows:

- **Incorporating sustainable landscape vision into strategies and policies:** Land-use planning can help create a shared vision of the multiple goals of sustainable landscapes and help embed that vision into relevant jurisdictional strategies.
- **Creating incentives for local actors to participate in NBS:** This can include aligning public incentives with local or privately led NBS efforts, establishing national payment for ecosystem service programs or land acquisition programs for NBS.
- **Authorizing and enabling NBS and allowing for regulatory flexibility:** Governments can signal that NBS can be used to comply with environmental requirements of building codes, water safety regulations, and environmental impact mitigation plans as well as to achieve climate mitigation and adaptation objectives, air quality and public health objectives.
- **Mainstreaming NBS into decision-making processes:** Integrating NBS into planning often involves guidance or policy (e.g. providing criteria for infrastructure projects to include NBS) or adopting building codes or zoning laws that require a portion of space dedicated to green elements.

- **Supporting monitoring, research, and innovation on NBS** through government sponsored research and data collection programs.
- **Facilitating cross-sector coordination:** To operationalize NBS, governments should promote interagency coordination to ensure NBS. Governments can grant legal authority to DRM agencies to implement cross-sector NBS projects. At the same time, governments can link NBS to existing policy objectives such as climate mitigation, adaptation, infrastructure, and water security.
- **Creating financing mechanisms to unlock investment in NBS:** Governments can earmark public funds for explicit use in NBS or set policy that generates funds from other sources.

Another key to successful NBS implementation is ensuring the necessary funding is rerouted or unlocked to support these projects. The following types of financing mechanisms and opportunities can help provide the necessary funding required to fully achieve the NBS investment potential:

- **International public finance opportunities:** Taking advantage of the financing provided by international environmental and climate funds can definitely unlock a remarkable amount of financing for NBS purposes. Examples of these aid programs/funds are the Global Environmental Facility (GEF) and the Green Climate Fund (GCF). Other options include the use/creation of pay-for-success models where loan disbursements are made against actual results or debt for-nature swaps which are particularly helpful for developing countries with a large national debt and threatened natural ecosystems.
- **Domestic public finance opportunities:** These include the use of existing or definition of new local and national taxes, fees, and charges to earmark funding for NBS and environmental projects as well as structuring and defining municipal bonds for green/NBS projects.
- **Definition of new financing models to make NBS bankable and to appeal to commercial interests:** examples include (1) structuring and defining green bonds, (2) use of insurance payments for risk reduction (catastrophe bonds such as the Global Ecosystem Resilience Facility (GERF) to support coastal communities in the Caribbean), (3) pay-for-success models such as environmental impact bonds or conservation impact bonds, and (4) use of corporate stewardship models for corporations to incorporate sustainable practices that improve company reputation, offset negative environmental impacts, safeguard valuable natural assets, and make businesses more profitable.

Lastly, and noting the above referenced recommendations, there is also a merit in adopting multi-sectoral and innovative approaches for improving resilience in Caribbean countries. Traditionally, risk assessments and risk management strategies have focused on asset and production losses following disasters. However, over the past few years the World Bank has proposed new approaches to resilience, for example through nature-based solutions (Browder et al., 2019), and new metrics for assessing disaster losses, which focus on household consumption and welfare losses rather than capital loss (Hallegatte et al., 2017, 2018). This approach provides a more nuanced view of natural disasters than usual reporting, and a perspective that takes fuller account of poor and vulnerable communities. Understanding the disproportionate vulnerability of poor people also makes the case for setting new intervention priorities to reduce populations' vulnerability and improve recovery from disasters, like expanding financial

inclusion, disaster risk and health insurance, social protection and adaptive safety nets, contingent finance and reserve funds, and universal access to early warning systems. It requires partnerships and a collaborative approach, it provides a source of clean energy and transportation, it helps overcoming food security challenges, it supports coastal economies, it provides new economic sectors and employment opportunities, it helps solving the climate crisis and it certainly provides a platform to unify people and efforts.

Against this backdrop, and at the *country level*, the priority areas for improving the role of NBS for resilience building are as follows:

1. **Policy and Legal Framework:**

- The vast majority of countries, do not have an updated **National Climate Adaptation Plan (NAP), or none at all**. National Adaptation Plan (NAP) processes help countries conduct comprehensive medium and long-term climate adaptation planning. It is a flexible process that builds on each country's existing adaptation activities and helps integrate climate change into national decision-making. Such plan presents a great opportunity to incorporate nature-based solutions as a way of creating resilience. These can be stand alone solutions but can also be combined with grey infrastructure solutions.
- **Saint Kitts and Nevis, Saint Lucia and Suriname do not currently have long-term strategy or development plan**. Long-term development plans (or national horizons/visions as they are commonly called) are comprehensive strategic documents that establish a set of long-term development goals, targets and indicators to guide concerted action by all stakeholders involved. Long-term strategies play a key role to in the transition toward net-zero emissions and climate resilient economies. They set out long-term goals for climate and development, and direct short-term decision-making to support the necessary shifts to limit global warming and lift people out of poverty. They are key developmental documents that provide a framework for action and help programming investments and actions, including those related to resilience building which can include nature-based solutions to certain challenges.
- Very few countries (only Belize, Sint Maarten and Turks and Caicos Islands) have **Resilient Infrastructure Plans**. The defining characteristic of resilient infrastructure is that it is planned, designed, built and operated in a way that anticipates, prepares for, and adapts to changing climate conditions and unexpected natural disasters. It can also withstand, respond to, and recover rapidly from disruptions. For countries with high levels of vulnerability to natural disasters and climate change given their geographical locations (isolated and in most cases in the Atlantic hurricane belt), low-lying territories and extensive coastal areas, and limited financial resources with conflicting priorities, this is a significant gap. Nature based solutions have been proven to be effective when combined with grey infrastructure, so the development of these plans offers a great opportunity to explore the incorporation of green solutions for resiliency purposes.
- The existence of **Integrated Coastal Zone Management Plans** is overall low, with most countries a not having such a plan. With most of these countries being islands and therefore surrounded by water and others that are continental countries having significant coastal areas and being very low-lying, the expectation would have been that all countries would have had such plans. This is considered a significant gap that can affect the way coastal ecosystems are managed and protected and therefore could determine the feasibility of incorporating nature-based solutions into resilience planning.

- Most of countries currently have an up-to-date **Climate Change Policy or Plan**. Climate Change Policies and Plans also offer a good entry point and opportunity to introduce nature-based solutions and ecosystem-based adaptation alternatives to resilience building. A few countries are still in the process of either developing such plan or updating it to incorporate post Paris Agreement developments, aspects related to the Sustainable Agenda 2030 and latest development in terms of climate change impacts and their vulnerabilities.
- Nationally determined contributions (NDCs) are at the heart of the Paris Agreement and the achievement of its long-term goals. NDCs embody efforts by each country to reduce national emissions and adapt to the impacts of climate change. NDCs are also an excellent space for the introduction of NBS, most countries are in the process of updating their NDCs. Going forward, it will be important to ensure that NBS are part of this process as well.

Resiliency tools and data availability:

- One important aspect of resilience building and disaster response and preparedness is having the right tools and systems in place. **Early warning systems** are adaptive measures for climate change and natural disasters, using integrated communication systems to help communities prepare for hazardous climate-related events or other natural disasters. Most countries in the Caribbean have such EWS in place, which is very positive in terms of preparedness and response to natural disasters and speaks positively about their disaster management systems. A few are in the process of setting up these types of systems (or upgrading existing ones) to improve their response capacity, as is the case of Barbados, Haiti, Saint Kitts and Nevis, St. Lucia, Sint Maarten and St. Vincent and the Grenadines.
- Availability of climate relevant data for adaptation and resilience building is key for the successful development of appropriate plans and interventions. As such, the existence of LIDAR (bathymetric and topographic) was assessed in the 17 countries included in this background note. Surprisingly, most countries currently do have LIDAR data available although the timeliness and relevance based on most vulnerable areas would have to be further assessed. A few countries are in the process of acquiring this data (Barbados, Dominican Republic, Sint Maarten and Trinidad and Tobago), but in these and many others, such as Antigua and Barbuda, The Bahamas and Suriname that do not have similar data, there is room for further improvements.
- Most of the Caribbean countries currently have vulnerability and hazard studies and assessments and, therefore, this area is not deemed as one that needs significant and immediate action. That being said, ensuring that these vulnerability assessments are still relevant is critical and therefore some may need to be updated even though this could be assessed on a case by case basis.
- Downscaled scenarios are also a powerful tool for resilience building and planning. The small size of most of the countries analyzed oftentimes makes it quite difficult to produce results at such small scale since circulation models and climate projections are done at a larger more regional scale that sometimes does not have the level of granularity or resolution needed for small countries. That said, most of Caribbean the countries included in the analysis of subject did have some level of downscaled climate scenarios/projections. However, these could benefit from being updated, especially if new information such as vulnerability maps and Digital Elevation Models (DEMs) are or have been recently developed.

2. **Financial framework and tools:**

- Other than the Caribbean Catastrophe Risk Insurance Facility (CCRIF), there are generally no resilience/adaptation insurance products with the exception of Haiti , Dominican Republic and Sint Maarten have such types of insurance products.

In terms of **domestic sources of funding and related instruments that governments can utilize to prepare and respond to an emergency or disaster**, including contingency funds, national budget appropriations, etc. Only the Bahamas, Belize, Dominican Republic and Jamaica have such mechanisms already in place. That said, the majority of countries are in the process of setting such instruments up but concerningly, with further room for improvements and scaling up. Furthermore, even though most countries, with the exception of Haiti, Suriname and Turks and Caicos Islands, collect a form of **environmental tax or levy**, related budgeted allocations as an instrument for scaling up NBS for resilience objectives is not explored and utilized across the board. .

3. **Institutional framework and coordination:**

- Ensuring that the necessary coordination mechanisms, bodies and protocols are in place is key to ensuring an efficient and effective mainstreaming of NBS in overall resilience and disaster risks management efforts. Most countries assessed, except for Sint Maarten, St. Vincent and the Grenadines, and Suriname, have an inter-ministerial committee or governmental body of some sort responsible for climate change and resilience building. Going forward, it will be important to ensure that these committees are properly staffed, tasked with a specific mandate and given the necessary financial resources in order to ensure their long-term sustainability.
- Most of the Caribbean countries do not have a dedicated agency to deal with the management of coastal areas and the ocean space and resources. Sometimes, certain departments exist within Ministries but their mandate and relevance if not often clear; also their role normally expands beyond just the coast and ocean which is the reason why a dedicated agency is a great asset, especially for island countries and countries with significant coastal areas like the ones under study. Noting that these agencies can also play a key role in the efforts of mainstreaming nature-based solutions into the resiliency agenda, going forward it will be important to ensure their institutional capacity development.
- The issue of enforcement of laws and regulations, especially those related to the environment and nature conservation is a common challenge in the region Most of the Caribbean countries are currently implementing efforts to improve their enforcement capacity and frameworks or have very low performance and evidence to show in this regard. Oftentimes, the issue of low capacity to enforce these laws is even reflected in national development plans and other key documents and is therefore an issue that needs urgent action.

ANNEX. Summary of indicators and traffic light system for the 17 participating countries

Strategies, plans, policies, laws and regulations:

this indicator aims to determine the existence of national plans/strategies or similar documents to inform resilience, adaptation, environmental management (including NBS) and disaster risk planning and management

TRAFFIC LIGHT SYSTEM		
YES	IN PROGRESS	NO

DOES THE FOLLOWING EXIST?	COUNTRY	ANSWER	COMMENTS AND MEANS OF VERIFICATION	TRAFFIC LIGHT
National Climate Change Adaptation Plan considering relevant economic sectors	Antigua and Barbuda	In progress	<ul style="list-style-type: none"> Antigua & Barbuda's National Action Plan: Combatting Desertification, Land Degradation & Drought (2015-2020) National Adaptation Plan (NAP) – in progress 	
	The Bahamas	No	<ul style="list-style-type: none"> The absence of a National Adaptation Plan and a National Adaptation Programs of Action (NAPA) is one of the biggest identified gaps in the resilience agenda 	
	Barbados	In progress	<ul style="list-style-type: none"> Barbados' Green Economy Scoping Study (2014) The Roof to Reef Program (R2RP) – just approved but not published yet 	

	Belize	In progress	<ul style="list-style-type: none"> • A National Adaptation Plan seems to be ongoing as part of Belize's engagement with the Green Climate Fund 	
	Dominica	In progress	<ul style="list-style-type: none"> • National Resilience Development Strategy (NRDS): Dominica 2030 • Dominica's National Adaptation Plan (NAP) is currently underway 	
	Dominican Republic	Yes	<ul style="list-style-type: none"> • National Adaptation Plan of Action (2016) 	
	Grenada	Yes	<ul style="list-style-type: none"> • Grenada's National Climate Change Adaptation Plan (NAP) (2017-2021) 	
	Guyana	Yes	<ul style="list-style-type: none"> • Guyana's National Drought Mitigation and Adaptation Plan (2020) • National Adaptation Plan (Climate Change) for the Cooperative Republic of Guyana (2019) • National Climate Change Policy and Action Plan (2020-2030) 	
	Haiti	In progress	<ul style="list-style-type: none"> • Haiti made a commitment in its NDC to develop a NAP by 2020 and has submitted a request to the GCF under its Readiness Program that includes a NAP project request for funding 	
	Jamaica	In progress	<ul style="list-style-type: none"> • Jamaica is planning to request readiness resources from the GCF to start the NAP process 	
	St. Kitts and Nevis	Yes, but outdated	<ul style="list-style-type: none"> • National Adaptation Strategy (2006–2013) 	

	St. Lucia	Yes	<ul style="list-style-type: none"> • Saint Lucia's National Adaptation Plan (NAP) (2018-2028) and associated sectoral strategies and action plans 	
	Sint Maarten	No		
	St. Vincent and the Grenadines	Yes	<ul style="list-style-type: none"> • SVG National Adaptation Plan (NAP) (2018-2030) 	
	Suriname	Yes	<ul style="list-style-type: none"> • Suriname National Adaptation Plan (2019-2029) 	
	Trinidad and Tobago	No		
	Turks and Caicos Islands	No		
Long term strategy/sustainable development plan/vision	Antigua and Barbuda	In progress (they exist but are outdated)	<ul style="list-style-type: none"> • Government of Antigua and Barbuda Medium-Term Development Strategy (2016 – 2020) • Strategy for the Protection of the Environment and the Sustainable Development of Antigua and Barbuda (2017-2018) 	
	The Bahamas	In progress	<ul style="list-style-type: none"> • Vision 2040: The Bahamas National Development Plan – in draft form since 2017 	
	Barbados	In progress (they exist but are outdated)	<ul style="list-style-type: none"> • Barbados Sustainable Development Policy (2004) • Barbados National Strategic Plan (2006-2025) 	
	Belize	Yes	<ul style="list-style-type: none"> • Belize Horizon (2010-2030) 	
	Dominica	In progress (they exist but are outdated)	<ul style="list-style-type: none"> • Dominica's Growth and Social Protection Strategy (2006) • Low-Carbon Climate-Resilient Strategy (2012) 	

			<ul style="list-style-type: none"> • Dominica Strategic Program for Climate Resilience (2012) 	
	Dominican Republic	Yes	<ul style="list-style-type: none"> • National Development Strategy 2030 	
	Grenada	In progress (awaiting Cabinet approval)	<ul style="list-style-type: none"> • Grenada's National Sustainable Development Plan 2020–2035 	
	Guyana	Yes	<ul style="list-style-type: none"> • Green State Development Strategy: Vision 2040 	
	Haiti	Yes	<ul style="list-style-type: none"> • Strategic Development Plan of Haiti 2010-2030 (PSDH 2010) 	
	Jamaica	Yes	<ul style="list-style-type: none"> • Jamaica Vision 2030 	
	St. Kitts and Nevis	No	<ul style="list-style-type: none"> • No evidence of a long-term sustainable development plan has been found 	
	St. Lucia	No	<ul style="list-style-type: none"> • Saint Lucia's National Vision 2008 is outdated. One of the IMF's recommendation is to update it in make it into a long-term development plan 	
	Sint Maarten	Yes	<ul style="list-style-type: none"> • National Development Vision 2030 "The Nation Building Project" 	
	St. Vincent and the Grenadines	Yes but outdated	<ul style="list-style-type: none"> • SVG's National Economic and Social Development Plan (2013-2025) 	
	Suriname	No	<ul style="list-style-type: none"> • Suriname 2035 has not been developed yet 	
	Trinidad and Tobago	Yes	<ul style="list-style-type: none"> • Vision 2030 - The National Development Strategy of Trinidad and Tobago (2016 – 2030) 	
	Turks and Caicos Islands	In progress	<ul style="list-style-type: none"> • TCI Vision 2040 	

Long-term Resilient Infrastructure Plan	Antigua and Barbuda	In progress	<ul style="list-style-type: none"> • The Sustainable Island Resource Management and Zoning Plan (2012) • Antigua and Barbuda Building Code (currently being revised) 	Yellow
	The Bahamas	No	<ul style="list-style-type: none"> • Through the GCF, Bahamas is planning to develop a concept note that contributes to build climate resilient infrastructure. However, to date no Resilient Infrastructure Plan has been identified • Through the IDB funded “Climate-Resilient Coastal Management and Infrastructure Program” it is expected that building codes, coastal and natural infrastructure design guidance tools, etc. will be developed or revised 	Red
	Barbados	In progress	<ul style="list-style-type: none"> • Barbados Roof to Reef program (not public yet) • Physical Development Plan Amendment (2017) • Building Standards Act (2018) 	Yellow
	Belize	Yes	<ul style="list-style-type: none"> • National Climate Resilience Investment Plan (2013) 	Light Green
	Dominica	In progress	<ul style="list-style-type: none"> • National Physical Development Plan (2016) • The National Resilience Development Strategy calls for resilient infrastructure but isn’t really a comprehensive plan 	Yellow
	Dominican Republic	In progress	<ul style="list-style-type: none"> • National Building Codes Bill (2011) 	Yellow

	Grenada	In progress	<ul style="list-style-type: none"> National Physical Development Plan (2003) Grenada Building Code (2017) 	
	Guyana	Yes/Somewhat	<ul style="list-style-type: none"> Sea and River Defense Sector Policy (2015) Comprehensive Sea and River Defense Sector Strategy (2016-2020) Green State Development Strategy: Vision 2040 (2019) – Annex A: Resilient Infrastructure and Spatial Development 	
	Haiti	In progress	<ul style="list-style-type: none"> Haiti's National Land Use Plan is currently under development 	
	Jamaica	In progress	<ul style="list-style-type: none"> Jamaica's National Spatial Plan is currently being finalized Building Code Bill (2013) 	
	St. Kitts and Nevis	Yes, but existing instruments are either outdated or incomplete	<ul style="list-style-type: none"> St. Kitts National Physical Development Plan (2005) Nevis Physical Development Plan (under development) St. Kitts-Nevis Building Regulations, Code and Guidelines (2000) 	
	St. Lucia	In progress	<ul style="list-style-type: none"> National Land Policy (Revised 2015, awaiting adoption) Draft Revised Building Code (2018, awaiting approval) 	

	Sint Maarten	Yes	<ul style="list-style-type: none"> • Sint Maarten National Recovery and Resilience Plan “A Roadmap to Building Back Better” (2018) • Building a Sustainable Sint Maarten – Sint Maarten United Christian Democratic Coalition Governing Program (2018-2022) • Building code (2010) • National Development Plan and Zoning Plans (under development) 	
	St. Vincent and the Grenadines	In progress	<ul style="list-style-type: none"> • It appears that SVG is still taking steps to reduce damage by hurricanes and other natural disasters, by encouraging effective building codes. The Ministry of Housing is working on harmonizing and streamlining the National Building Codes to build resilience against the impact of Climate Change • A Resilient Infrastructure Plan doesn't seem to exist either although several resilient infrastructure projects, including slope stabilization, rivers defense, and coastal protection, are underway. 	

	Suriname	No	<ul style="list-style-type: none"> • The National Climate Change Policy, Strategy and Action Plan for Suriname (2014-2021) recognizes the need to develop resilient infrastructure and housing and to incorporate climate change and disaster risk considerations into existing and new designs • The Coastal Resilience Assessment of Paramaribo (2017) also identifies coastal defenses and other infrastructure in order to protect the country's coasts 	
	Trinidad and Tobago	In progress	<ul style="list-style-type: none"> • (Draft) National Spatial Development Strategy (2013-2023) • Planning and Facilitation of Development Bill (PAFD) currently before Parliament 	
	Turks and Caicos Islands	Yes	<ul style="list-style-type: none"> • National Disaster Recovery Plan (2019) • TCI Building Code (2014) – includes climate change and disaster resilience considerations • TCI Development Manual (2014) 	
Integrated coastal zone management plan covering a wide range of sectors (environment, water resources, infrastructure, tourism, wastewater and solid waste management, blue economy)	Antigua and Barbuda	No	<ul style="list-style-type: none"> • Various strategies/plans such as the NAP and the SIRMZP include considerations related to coastal zone management but there is no dedicated CZM strategy or plan yet 	

	The Bahamas	In progress	<ul style="list-style-type: none"> National Maritime Policy (2015) Draft Policy Framework for Climate resilient Integrated Coastal Zone Management (ICZM) – under development Andros Sustainable Development Master Plan 	
	Barbados	Yes	<ul style="list-style-type: none"> Integrated Coastal Zone Management Plan (1990-present) 	
	Belize	Yes	<ul style="list-style-type: none"> Integrated Coastal Zone Management (ICZM) Plan for Belize (2016) 	
	Dominica	No	<ul style="list-style-type: none"> Dominica’s Disaster Vulnerability Reduction Project under the GFDRR includes activities related to CZM but no specific plan has been developed 	
	Dominican Republic	No		
	Grenada	In progress	<ul style="list-style-type: none"> Even though an Integrated Coastal Zone Management Policy for Grenada, Carriacou and Petite Martinique exists since 2015, the Coastal Zone Management Plan is still being produced 	
	Guyana	In progress	<ul style="list-style-type: none"> Integrated Coastal Zone Management Policy – seems to have been drafted Sea and River Defense Sector Policy (2015) Comprehensive Sea and River Defense Sector Strategy (2016-2020) 	

	Haiti	No	<ul style="list-style-type: none"> No evidence (aside from some projects focused on integrated coastal zone management and some regional CZM plans for example in the Department du Nord currently underway) has been found regarding the existence of a national integrated coastal zone management plan or policy 	
	Jamaica	No	<ul style="list-style-type: none"> An Action Plan has been developed Towards Ocean and Coastal Zone Management in Jamaica but this is more a plan on how to develop a strategy or management plan 	
	St. Kitts and Nevis	No	<ul style="list-style-type: none"> No ICZM Plan has been found although in 2010, TNC in collaboration with USAID completed a pilot project on Marine Zoning in Saint Kitts and Nevis "A Path Towards Sustainable Management of Marine Resources" which included a whole chapter for policy makers on recommendations regarding the establishment of a marine planning and zoning framework and governance body 	
	St. Lucia	In progress	<ul style="list-style-type: none"> The Coastal Zone Management (CZM) in Saint Lucia: Policy, Guidelines and Selected Projects (2004) and the "Towards the Development of a Coastal Zone Management Strategy and Action Plan for Saint Lucia (2005)" are 2 existing but outdated relevant 	

			documents in the context of CZM. The National Ocean Policy, Coastal Master Plan and Marine Spatial Plan for the Blue Economy are all currently being finalized	
	Sint Maarten	No	<ul style="list-style-type: none"> No evidence of an ICZM plan has been found. The only related document is the St. Maarten Nature Foundation's Climate Change Response Plan for the coastal zone and nearshore ecosystems of St. Maarten which was submitted to stakeholders in 2017 to be included in plans towards the mitigation of climate change effects²⁸ 	
	St. Vincent and the Grenadines	In progress	<ul style="list-style-type: none"> A National Ocean Policy and associated plans and strategies in being developed under PPCR 	
	Suriname	Yes	<ul style="list-style-type: none"> Integrated Coastal Zone Management Plan (2010) Coastal Resilience Assessment of Paramaribo (2017) 3 coastal management plans were rewritten within the Global Climate Change Alliance+ (GCCA+) project (2016-2019) 	

²⁸ News article (2017): <https://www.sxm-talks.com/721news/nature-foundation-submits-plan-on-climate-change-in-st-maarten/>

	Trinidad and Tobago	Yes	<ul style="list-style-type: none"> • Comprehensive National Coastal Monitoring Program (CNCMP) • Critical Coastal Protection Program • Coastal Erosion a Monster that Beckons Report (2019) • Draft Integrated Coastal Zone Management (ICZM) Policy Framework (2019) 	
	Turks and Caicos Islands	In progress	<ul style="list-style-type: none"> • TCI seems to be in the process of developing a shoreline management plan and a comprehensive integrated coastal zone management plan with the support of the CDB and EIB 	
Disaster/emergency preparedness and management plan	Antigua and Barbuda	Yes	<ul style="list-style-type: none"> • Disaster Management Act (2002) • National Comprehensive Disaster Management Policy and Strategy for Antigua And Barbuda (2015– 2017) • Country document for disaster risk reduction (2016) 	
	The Bahamas	Yes, but inadequate	<ul style="list-style-type: none"> • Disaster and Preparedness Response Act (2006) • National Disaster Plan & Instructions for Emergency Situations (2016 – 2018) 	
	Barbados	Yes, but outdated	<ul style="list-style-type: none"> • Emergency Management Act (2006) 	

	Belize	No	<ul style="list-style-type: none"> There are scattered publications and reports (on NEMO's website) but no comprehensive plan for disaster preparedness and response. In Belize, there is an overarching Hazard Mitigation Policy with clearly defined goals and objectives, but no comprehensive Disaster Management Policy. 	
	Dominica	Yes	<ul style="list-style-type: none"> National Disaster Plan (last revised in 2006) National Hurricane Management Plan, Disaster Preparedness Plan for the Agriculture Sector (2006) National Emergency Management Policy (2009) 	
	Dominican Republic	Yes	<ul style="list-style-type: none"> Disaster Risk Management Law of (2002) National Comprehensive Risk Management Plan for Disasters (2013) National Plan for the Reduction of Seismic Risk (2013) 	
	Grenada	Yes	<ul style="list-style-type: none"> National Disaster Management Plan (2011) Comprehensive Disaster Management Policy (2015) 	

	Guyana	Yes	<ul style="list-style-type: none"> • Disaster Risk Management Policy (2013) • National Integrated Disaster Mitigation Plan and Implementation Strategy for Guyana (2013-2023) • Early Warning Systems Framework (2013) • National Multi-Hazard Disaster Preparedness and Response Plan (2013) • Guyana Drought Early Warning System Protocol (2015) 	
	Haiti	Yes but outdated	<ul style="list-style-type: none"> • National Disaster Risk Management System and National Disaster Risk Management Plan (2001) 	
	Jamaica	Yes	<ul style="list-style-type: none"> • Disaster Action Plan for Jamaica • Disaster Risk Management Act (2015) • Comprehensive Disaster Management Strategy (2014-2024) • Disaster Preparedness and Emergency Management Act (1993) 	
	St. Kitts and Nevis	Yes, but outdated	<ul style="list-style-type: none"> • Nevis Disaster Plan (2005) - outdated • National Disaster Management Act for St. Kitts and Nevis (1998) • Saint Kitts and Nevis: Natural hazard mitigation policy and plan (2001) 	
	St. Lucia	Yes	<ul style="list-style-type: none"> • Hurricane Response Plan (2002) • Disaster Management Policy Framework for Saint Lucia (2004) • Comprehensive Disaster Management Strategy and Program Framework (2007-2012) 	

			<ul style="list-style-type: none"> National Emergency Management Plan (2014) 	
	Sint Maarten	Yes	<ul style="list-style-type: none"> St. Maarten's National Disaster Management plan (2018) 	
	St. Vincent and the Grenadines	Yes	<ul style="list-style-type: none"> National Emergency and Disaster Management Act (2006) SVG National Comprehensive Disaster Management Policy (2014) Disaster Risk Reduction Country Document: Saint Vincent and the Grenadines (2014) 	
	Suriname	No	<ul style="list-style-type: none"> This is one of the gaps identified in the National Adaptation Plan (2019-2029) 	
	Trinidad and Tobago	Yes	<ul style="list-style-type: none"> Draft Disaster/Emergency Standard Operating Procedures & Contingency Plans (2000) National Flood Contingency Plan (2003) Disaster Management Strategy for Trinidad and Tobago (2010) National Response Framework (2010) Wet/Hurricane Season Preparedness Guide (2019) 	

	Turks and Caicos Islands	Yes	<ul style="list-style-type: none"> • TCI Damage and Needs Assessment Plan (Draft 3 of 2014) • TCI Ports Contingency Plan (2014) • TCI National Multi-Hazard Mitigation Plan (2017) • TCI Earthquake Contingency Plan (2017) • TCI Draft Disaster Relief Management Plan (2018) • National Emergency Shelter Management Plan (2018) • TCI Tsunami Response Sub-Plan (2018) • TCI Draft National Disaster Management Plan (2018) • TCI Draft National Hurricane Response Plan (2018) 	
Climate Change Law/Policy	Antigua and Barbuda	In progress	<ul style="list-style-type: none"> • National Adaptation Plan (NAP) – in progress • Policy Framework for Integrated Adaptation Planning and Management in Antigua and Barbuda (2002) - outdated 	
	The Bahamas	Yes, but very outdated	<ul style="list-style-type: none"> • National Policy for the Adaptation to Climate Change (2005) 	
	Barbados	Yes	<ul style="list-style-type: none"> • National Climate Change Policy Barbados (2012) 	
	Belize	Yes	<ul style="list-style-type: none"> • National Climate Change Policy, Strategy and Action Plan (2015-2020) – currently being updated 	
	Dominica	Yes	<ul style="list-style-type: none"> • National Climate Change Policy Barbados (2012) 	

	Dominican Republic	Yes	<ul style="list-style-type: none"> The Dominican Republic approved and enacted in to law its 2015 National Climate Change Policy. The Dominican Republic is committed to protecting the environment and natural resources, which is reflected in the 2010 constitution, specific domestic laws, such as the General Law on the Environment and Natural Resources (Law 64-00) and the Sectoral Law on Protected Areas (Law 202-04) 	
	Grenada	Yes	<ul style="list-style-type: none"> National Climate Change Policy for Grenada, Carriacou and Petite Martinique (2017-2021) Climate Resilience, Environment and Natural Resource Management Bill (2018) 	
	Guyana	Yes	<ul style="list-style-type: none"> National Climate Change Policy and Action Plan (2020-2030)²⁹ 	
	Haiti	Yes	<ul style="list-style-type: none"> National Policy to fight against Climate Change (2019) 	
	Jamaica	Yes	<ul style="list-style-type: none"> Jamaica's Climate Change Policy Framework (2015) is currently being reviewed to incorporate recent development, especially those related to the Paris Agreement 	
	St. Kitts and Nevis	In progress	<ul style="list-style-type: none"> A draft National Climate Change Adaptation Strategy (NCCAS) dates from 2018 but doesn't seem to have been completed 	

²⁹ The National Climate Change Policy and Action Plan is awaiting Cabinet endorsement.

	St. Lucia	Yes	<ul style="list-style-type: none"> • Saint Lucia Climate Change Policy (2013) • Saint Lucia National Climate Adaptation Policy (2015) 	
	Sint Maarten	No		
	St. Vincent and the Grenadines	In progress	<ul style="list-style-type: none"> • The elaboration of a Climate Change Policy has not yet been completed 	
	Suriname	Yes	<ul style="list-style-type: none"> • National Climate Change Policy, Strategy and Action Plan for Suriname (2014-2021) 	
	Trinidad and Tobago	Yes – but outdated	<ul style="list-style-type: none"> • National Climate Change Policy (2011) 	
	Turks and Caicos Islands	Yes – but outdated	<ul style="list-style-type: none"> • Draft Climate Change Policy of the Turks and Caicos Islands (2011) 	
Updated NDC that incorporates adaptation targets and environmental restoration considerations	Antigua and Barbuda	In progress	<ul style="list-style-type: none"> • Intended Nationally Determined Contribution (2015) – has not been updated but included adaptation and environmental consideration already 	
	The Bahamas	No	<ul style="list-style-type: none"> • Bahamas does not have a country program under the NDC Partnership, and no evidence has been found regarding the update of the 2015 NDC. Adaptation and environmental conservation considerations/options are included in the original NDC but these need to be further developed and properly costed 	
	Barbados	In progress	<ul style="list-style-type: none"> • Barbados Intended Nationally Determined Contribution, 2015 (currently being updated) 	

	Belize	In progress	<ul style="list-style-type: none"> Belize's collaboration with the NDC Partnership focuses on the development of an updated NDC that would be more innovative, ambitious and accurate. Additionally, Belize will work towards developing an NDC implementation plan, a Climate Finance Strategy, and a Measurement, Reporting, Verification (MVR) tool to track and report progress on mitigation, adaptation and support 	
	Dominica	In progress	<ul style="list-style-type: none"> Barbados Intended Nationally Determined Contribution, 2015 (currently being updated) 	
	Dominican Republic	In progress	<ul style="list-style-type: none"> To bring its NDC to reality, the Government of the Dominican Republic launched their NDC Partnership Plan for implementation in May 2019. Due to the country's high vulnerability to climate change-related impacts, its Partnership Plan looks to develop a package of legal and planning instruments to implement its NDC in the land use, waste, energy efficiency, renewable energy, and forestry sectors 	
Grenada	In progress	<ul style="list-style-type: none"> Grenada has engaged in a Partnership Plan for 2019-2023 with the NDC Partnership's Climate Action Enhancement Package (CAEP) 		

			in order to review and update its NDC	
	Guyana	In progress	<ul style="list-style-type: none"> Since early 2020, the Office of Climate Change (OCC) with support from the Food and Agriculture Organization (FAO) of the United Nations, commenced the process of revising Guyana's Nationally Determined Contributions (NDCs)³⁰ 	
	Haiti	In progress	<ul style="list-style-type: none"> Haiti's NDC incorporated adaptation measures and preliminary costings. Also, a request has been sent to the GCF that includes a NAP project request for funding so it is expected that targets and level of investment required will be revised during that process 	
	Jamaica	In progress	<ul style="list-style-type: none"> In December 2018, Jamaica submitted a Request for Support Letter to the NDC Partnership, which included two main requests: review and update Jamaica's NDC by 2020 and prepare an NDC Implementation Plan 	
	St. Kitts and Nevis	No		
	St. Lucia	In progress	<ul style="list-style-type: none"> Saint Lucia has a Cabinet approved Partnership Plan with the NDC Partnership to work on the achievement of its NDC targets, but it is not clear if its initial INDC is being reviewed to increase targets and ambition 	

³⁰ News article (2020): <https://guyanachronicle.com/2020/01/22/guyana-begins-process-to-re-submit-realistic-ndcs-to-unfccc/>

			<ul style="list-style-type: none"> The IMF also recommended strengthening the NDC to provide a comprehensive strategy of St. Lucia's climate-change related efforts, particularly by adding costed adaptation plans 	
	Sint Maarten	No	<ul style="list-style-type: none"> Sint Maarten doesn't have an NDC 	
	St. Vincent and the Grenadines	No	<ul style="list-style-type: none"> There is no evidence of SVG working on an updated NDC, especially as it relates to adaptation targets and costs 	
	Suriname	Yes	<ul style="list-style-type: none"> Suriname submitted its 2020 NDC on December 2019 in fulfilment of obligations under the Paris Agreement on climate change 	
	Trinidad and Tobago	No	<ul style="list-style-type: none"> T&T was one of the first countries to develop an implementation plan for achieving its NDC, which reveals the country's commitment to the Paris Agreement and low-carbon development. It was expected that the plan would be further refined and updated periodically to reflect national circumstances, new inputs from Climate science, as well as from international climate change negotiations, and with a view to developing economy-wide commitments consistent with the Paris Agreement. Despite the fact, no evidence has been found that T&T is updating or plans to update its current NDC 	

	Turks and Caicos Islands	No	<ul style="list-style-type: none"> • TCI doesn't have an NDC 	
Relatively updated environmental laws (enacted or revised less than 7 years ago)	Antigua and Barbuda	Yes	<ul style="list-style-type: none"> • The Environmental Protection and Management Act (2015) 	
	The Bahamas	In progress	<ul style="list-style-type: none"> • Environmental Health Services Act (2001) • Forestry Act (2014) • There is a draft version of the Environmental Planning and Protection Bill dated from 2019 that has been published online but it is uncertain if it was approved by Cabinet 	
	Barbados	No	<ul style="list-style-type: none"> • Most of its laws date from between the 1950s and 90s and few have been updated to reflect resilience considerations 	
	Belize	Yes	<ul style="list-style-type: none"> • Even if there are some gaps and room for improvement, Belize's environmental laws are being kept fairly updated 	
	Dominica	No	<ul style="list-style-type: none"> • Most of its laws date from between the 1950s and 90s and few have been updated to reflect resilience considerations 	
	Dominican Republic	Yes	<ul style="list-style-type: none"> • The Environmental and Natural Resources Law No. 64-00 (2000) • Disaster Risk Management Act (Law No. 147) (2002) and Regulations (2009) • Protected Areas and Biodiversity Law No. 202-04 (2004) 	

	Grenada	Yes	<ul style="list-style-type: none"> • Climate Resilience, Environment and Natural Resource Management Bill (2018) • Physical Planning and Development Control Act (2016) 	
	Guyana	Somewhat mostly outdated	<ul style="list-style-type: none"> • Draft Environmental Protection Compliance and Enforcement Regulations (2014) • Protected Areas Act (2011) • Forest Act (2009) • National Parks Commission Act (1977) • Environmental Protection Act (1996) 	
	Haiti	No	<ul style="list-style-type: none"> • State of the Environment Report for Jamaica (2013) • Despite the “fairly” new report above, most of environmental laws are outdated 	
	Jamaica	No	<ul style="list-style-type: none"> • State of the Environment Report for Jamaica (2013) • Despite the “fairly” new report above, most of environmental laws are outdated 	
	St. Kitts and Nevis	Yes	<ul style="list-style-type: none"> • National Conservation and Environmental Management Act (2019) 	
	St. Lucia	In progress	<ul style="list-style-type: none"> • Climate Change Bill (being drafted) • Environmental Management Act (2008, revised draft in 2018) – awaiting approval • National Environmental Policy & National Environmental 	

			Management Strategy (NEP/NEMS) (2005, revised in 2014)	
	Sint Maarten	In progress	<ul style="list-style-type: none"> • National Ordinance on Spatial Development Planning (2013) • St. Maarten National Nature Conservation Ordinance (2003) • Environmental Policy and Management Plan (under development) • Nature Policy Plan (under development) 	
	St. Vincent and the Grenadines	No	<ul style="list-style-type: none"> • Most legislation is outdated (over 15 years or more old) 	
	Suriname	Yes	<ul style="list-style-type: none"> • Nature Conservation Act (1954, revised in 2017) • Forestry Law/Forest Management Act (1992) • State Decree on Nature Protection (1998) • Environmental Framework Act (2020) 	
	Trinidad and Tobago	Somewhat	<ul style="list-style-type: none"> • National Environmental Policy of Trinidad and Tobago (2018) • National Biodiversity Strategy and Action Plan for Trinidad and Tobago (2017-2022) • Environmental Management Act (2000, revised 2011) 	
	Turks and Caicos Islands	In progress / Outdated	<ul style="list-style-type: none"> • Turks And Caicos Islands Environmental Strategy (under development) • Sargassum Policy and Management Plan (under development) 	

			<ul style="list-style-type: none"> • Wetland Management Policy (under development) • TCI Environment Charter (2001) • National Parks Ordinance (2009, last amended 2016) • Public and Environmental Health Ordinance (2009) • Coast Protection Ordinance (2009) • Marine Pollution Ordinance (2010) 	
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Tools and basic data availability for planning:

this indicator aims to determine the existence and availability of tools to be used in resilience building and adaptation/disaster risk planning with the potential to increase the uptake of NBS

TRAFFIC LIGHT SYSTEM		
YES	IN PROGRESS	NO

DOES THE FOLLOWING EXIST?	COUNTRY	ANSWER	COMMENTS AND MEANS OF VERIFICATION	TRAFFIC LIGHT
Early warning system/s for natural disasters or extreme weather-related events	Antigua and Barbuda	Yes	<ul style="list-style-type: none"> • Antigua and Barbuda has an EWS and also is part of a regional project financed by the European Civil Protection and Humanitarian Aid Operations (ECHO) in collaboration with UNDP, Red Cross and CDEMA to support a more integrated EWS and enhance disaster risk reduction at the regional, national and community level 	

	The Bahamas	Yes	<ul style="list-style-type: none"> • For hurricanes and tropical storms, the Meteorology Department has an early warning system linked to satellites that tracks and records the progress of storm systems as they approach the islands • Additionally, NEMA has also installed a Severe Weather Warning Siren System to warn residents of an approaching severe weather system • CCCCC is currently working on a proposal with the GCF that includes an activity to enhance the ability of the National Meteorological Service, National Emergency Management Agency and The Bahamas National Geographic Information Systems (BNGIS) Centre through the development and implementation of a Storm Surge and Climate Change Risk Atlas and Digital Platform. This Atlas will be digital and allow for easy of update and analysis and real time monitoring and issuing warning related to storm surge and flooding 	
	Barbados	In progress	<ul style="list-style-type: none"> • Barbados is part of the CREWS project on “Strengthening Hydro-Meteorological and Early Warning Services in the Caribbean” led by the WBG 	

	Belize	Yes	<ul style="list-style-type: none"> Belize was one of the beneficiary countries under the MACC project implemented by 5Cs which installed Coral Reef Early Warning systems. Also, in 2009 the World Food Program installed a Central America wide early warning system for droughts, earthquakes, floods, hurricanes and volcanic eruptions that included Belize. Most recently, in 2019, Belize and Taiwan partnered for a project on urban resilience and disaster prevention that also included the installation of early warning system technology. 	
	Dominica	Yes	<ul style="list-style-type: none"> Dominica has early warning systems (EWS) put in place under the Caribbean Disaster Mitigation Project (CDMP) implemented by CDEMA. The EWS covers seismic and hydro-meteorological hazards and are linked to regional organizations. 	
	Dominican Republic	Yes	<ul style="list-style-type: none"> Current systems in high-risk areas include a hydrometeorological early warning system in the North-East Region and a forest fire early warning system. There is also a tsunami surveillance network managed by ONAMET which has agreements with NOAA in Puerto Rico to exchange information on tsunamis in the region There are a number of community-based early warning / early alarm initiatives supported by the Dominican Red Cross 	

	Grenada	Yes	<ul style="list-style-type: none"> • Early warning mechanisms in Grenada are mostly developed around hurricanes and tropical storms. Warnings are issued through NaDMA's public education and information sharing systems, which includes linkages with the media and private sector. In addition, there are flood warning systems in selected communities. 	
	Guyana	Yes	<ul style="list-style-type: none"> • The 2019 DRM Bill establishes a National Early Warning Alert System (EWS) that shall consist of a National Emergency Broadcast System, siren warnings, remote broadcast connections; and any early systems as may be prescribed • Guyana Drought Early Warning System Protocol (2015) • Early Warning Systems Framework (2013) 	
	Haiti	In progress	<ul style="list-style-type: none"> • The GFDRR in Haiti has developed a text message-based platform (SMS Lapli) that serves as a somewhat EWS for farmers to be informed about reliable hydrological and meteorological data • Also, the PPCR funded project "Strengthening Hydro-meteorological Services" focuses on supporting the institutional reform of hydromet services. By creating a national open-data platform, the project aims to give decision makers and the public access to information services. In addition, 	

			improvement on the delivery of weather information and early warning systems will focus on farmers and civil protection committees	
	Jamaica	Yes	<ul style="list-style-type: none"> • CCCCC in collaboration with NOAA installed coral reef EWS in Jamaica for climate risk planning, management and action • The JA REEACH II project also installed flood early warning systems in strategic points of the Rio Grande Valley 	
	St. Kitts and Nevis	In progress	<ul style="list-style-type: none"> • SKN installed a Coral Reef Early Warning System years ago to be able to predict coral bleaching events • CDEMA has an approved Readiness proposal with the GCF to provide support for improving regional and national level mechanisms and capacity for achieving climate resilience through advancing Multi-hazard Early Warning Systems (MHEWS) in 10 countries in the Caribbean, including SKN 	

	St. Lucia	In progress	<ul style="list-style-type: none"> • Saint Lucia seems to have a network of automatic rainfall stations and stream gauges but one of the recommendations of the 2018 NAP is to improve early warning systems that deliver timely and accurate predictions of climate change related hazards and trigger effective response actions, especially for the fisheries sector. Consideration is also being given to installation of one Coral Reef Early Warning System in Saint Lucia under the EU Global Climate Change Alliance (GCCA) 	
	Sint Maarten	In progress/ Somewhat	<ul style="list-style-type: none"> • Sint Maarten was one of the participating countries in the Overseas Territories Regional Risk Reduction Initiative (R3i) implemented by UNDP, through which early warning systems were installed. • The National Meteorological and Hydrological Service and the Disaster Management Office (DMO) are responsible for disseminating alerts and warnings well in advance of the hurricane season • Sint Maarten had a weather radar that was damaged during hurricane Irma which was connected to a regional observation and early warning network 	
	St. Vincent and the Grenadines	In progress	<ul style="list-style-type: none"> • SVG will benefit from the FEWER project which is part of the regional Caribbean track of the PPCR and will receive to EWS for the fisheries sector 	

	Suriname	Yes	<ul style="list-style-type: none"> Following the flooding in 2006, 2008 and 2009, a project was executed under the National Coordination Centre for Disasters (NCCR) to install 5 water level measurement devices in the Tapanahony River basin as part of the establishment of an Early Flood³¹ 	
	Trinidad and Tobago	Yes	<ul style="list-style-type: none"> According to TT Weather Center and the TT Meteorological Service, an Early Warning System is designed in T&T to cover hydro-meteorological hazards such as Severe Weather & Thundershowers (i.e. Adverse Weather), Flooding, Dry Spells/Droughts, Extreme [High] Temperatures, and Hazardous Seas, in addition to already established notifications for Tropical Cyclones (Depressions, Storms, and Hurricanes) 	
	Turks and Caicos Islands	No	<ul style="list-style-type: none"> After hurricane Joaquin in 2015 there was some discussion about setting up early warning system, but no evidence was found that this materialized³² 	

³¹ Caribsave Climate Change Risk Profile for Suriname (2012)

³² News article: <https://magneticmediatv.com/2015/10/tci-and-bahamas-considering-better-early-warning-systems-post-hurricane-joaquin/>

LIDAR (topographic and/or bathymetric) data at the national or local levels	Antigua and Barbuda	No	<ul style="list-style-type: none"> A&B has GIS data being managed by the government's Survey & Mapping Division, but data sets do not include any LIDAR. However, after hurricane Irma the UK government commissioned the disaster mapping and satellite-derived surface models were produced to show onshore elevation and offshore water depth measurements for both islands. 	
	The Bahamas	No		
	Barbados	In progress	<ul style="list-style-type: none"> Barbados is part of the regional LIDAR program executed by the 5Cs with support from USAID, CDB and the Gov of Italy. The Coastal Zone Management Unit also has LIDAR topographic and bathymetric surveys produced under its Coastal Risk Assessment and Management Program although these may need to be updated. 	
	Belize	Yes	<ul style="list-style-type: none"> A LIDAR survey was undertaken in 2009 for the Caracol archeological Mayan site. Later in late 2018-early 2019, a bathymetric LIDAR survey was undertaken in Belize's waters north of Belize City, through funding provided under the United Kingdom Commonwealth Marine Economies Program 	

	Dominica	Yes	<ul style="list-style-type: none"> Under the Disaster Vulnerability Reduction Project, LiDAR Bathymetry Surveys were completed in June 2017. The LiDAR Topographic Surveys of the island have also been mobilized but have been delayed given the passage of Hurricane Maria 	
	Dominican Republic	In progress	<ul style="list-style-type: none"> In 2018 LIDAR Services International (LSI) announced a LIDAR project in DR for SNC Lavalin and Barrick Gold Corporation but it is unclear if the information is publicly available 	
	Grenada	Yes	<ul style="list-style-type: none"> Through the Regional Disaster Vulnerability Reduction Project, topographical and bathymetric data of Grenada, Carriacou and Petite Martinique, using LiDAR Technology was collected in 2017 and 2018 	
	Guyana	Yes	<ul style="list-style-type: none"> In 2014, the WB through the GFDRR completed the project “ Guyana: Strengthening Coastal Lands Information Systems and Adaptation Awareness” which included LIDAR data management and utilization The Guyana Lands and Surveys Commission (GL&SC) is forging ahead with its plan to remap Guyana. A contract has already been awarded, works are set to commence and the company will be using the latest Light Detection and Ranging (LIDAR) technology to capture relevant data³³ 	

³³ News article (2019): <https://www.guyanastandard.com/2019/12/09/remapping-of-guyana-to-cost-3-7b-exercise-set-to-commence-in-region-one-four/>

			<ul style="list-style-type: none"> • CDB also approved resources in 2018 to undertake LIDAR surveys of Guyana³⁴ 	
	Haiti	Yes	<ul style="list-style-type: none"> • The regional track of the PPCR has produced LIDAR data for several areas in Haiti to be used for planning and design of climate-resilient infrastructure, coastal zone management, climate hazard assessments and improved strategies for disaster risk management • The CNGIS as the national agency whose official mission is to collect and disseminate spatial data in Haiti (and the main governmental agency in terms of GIS capabilities), manages the HaitiData platform (www.haitidata.org) that hosts LIDAR data, among other things 	
	Jamaica	Yes	<ul style="list-style-type: none"> • The regional track of the PPCR has produced LIDAR data for several areas in Jamaica to be used for planning and design of climate-resilient infrastructure, coastal zone management, climate hazard assessments and improved strategies for disaster risk management 	
	St. Kitts and Nevis	Yes	<ul style="list-style-type: none"> • The SKN 2020 Budget address states that satellite and LIDAR imagery of the protected areas is being used to GPS track the areas for public use 	

³⁴ News article (2018): <https://www.thewestindianonline.com/cdb-approves-funds-for-guyana-climate-resilience-in-the-region/>

			<ul style="list-style-type: none"> Some data was also found from a USAID/OAS Post-Georges Disaster Mitigation project (2001)³⁵ 	
	St. Lucia	Yes	<ul style="list-style-type: none"> Through the Regional Disaster Vulnerability Reduction Project, high resolution LiDAR data was collected and a high resolution digital topographic and bathymetric model for Saint Lucia was produced 	
	Sint Maarten	In progress	<ul style="list-style-type: none"> According to a national report from the Netherlands to the Meso American & Caribbean Sea Hydrographic Commission (MACHC19), a land/sea LIDAR survey for Sint Maarten will be tendered, in cooperation with local government and the World Bank but it is unclear if this has been done³⁶ Also, the Management Plan of the Man of War Shoal Marine Park mentions that some bathymetric charts may have been developed in 2011 but again this is not clear either 	
	St. Vincent and the Grenadines	Yes	<ul style="list-style-type: none"> An airborne LiDAR bathymetric survey was performed on behalf of the UK Hydrographic Office as part of the wider Commonwealth Marine Economies Program 	
	Suriname	No	<ul style="list-style-type: none"> No evidence of LIDAR data in Suriname has been found 	

³⁵ Information available at: https://www.oas.org/pgdm/data/gis_data.htm

³⁶ Information available at: https://iho.int/mtg_docs/rhc/MACHC/MACHC19/MACHC19-03R-National_Report-Netherlands.pdf

			<ul style="list-style-type: none"> Flood and elevation maps do exist for several cities in Suriname³⁷ 	
	Trinidad and Tobago	Yes (but no info)	<ul style="list-style-type: none"> According to the National Biodiversity Strategy and Action Plan for Trinidad and Tobago (2017-2022), a survey of T&T's land use and land cover was conducted in 2015 using LIDAR Radar technology, but the results of this survey do not seem to be available 	
	Turks and Caicos Islands	Yes	<ul style="list-style-type: none"> In 2018, the UK's Hydrographic Office (UKHO) undertook one of the most comprehensive seabed mapping surveys of the seas surrounding the Turks and Caicos Islands (TCI) which included LIDAR bathymetric surveys to support the country's obligations under the IMO and to provide basic information for the development of a blue economy. In 2020, the results and data were handed over to TCI's local government³⁸ 	
Vulnerability and hazard maps in key areas	Antigua and Barbuda	Yes	<ul style="list-style-type: none"> CARIBSAVE Climate Change Risk Profile for Antigua and Barbuda (2012) – somewhat outdated The SIRMZP and NAP also contain flood vulnerability maps and vulnerability assessments 	

³⁷ FloodMap - Elevation and Elevation Maps of Cities/Towns/Villages in Suriname: <https://www.floodmap.net/Elevation/CountryElevationMap/?ct=SR>

³⁸ News articles: <https://www.hellenicshippingnews.com/turks-and-caicos-islands-future-economic-development-promoted-by-the-uk-government/> and <https://suntci.com/uk-hydrographic-office-presents-turks-and-caicos-with-findings-from-recent-p4921-129.htm>

	The Bahamas	Yes	<ul style="list-style-type: none"> • Vulnerability analyses were developed for Nassau and New Providence Island under the IDB's Sustainable Cities Initiative • Flooding maps also exist for Harbour Island developed under an IDB technical cooperation project • There are also plans to develop a Comprehensive Vulnerability and Needs Assessment to identify, evaluate and prioritize climate response options for building climate resilience under the latest GCF concept note developed by CCCCC • The CARISAVE's country profile provides a whole chapter on vulnerabilities and impacts for the Bahamas 	
	Barbados	In progress	<ul style="list-style-type: none"> • Barbados is currently working on the National Coastal Risk Information and Planning Platform (NCRIPP) Project and there is also an Assessment of Housing Stock that has been completed for the Country. The Coastal Zone Management Unit also has hazard, vulnerability and risk maps produced under its Coastal Risk Assessment and Management Program although these may need to be updated. 	
	Belize	Yes	<ul style="list-style-type: none"> • As an example, the IDB's Climate Vulnerability Reduction project has produced vulnerability maps for several areas of Belize such as Belize City, Goffs Caye and Caye Caulker 	

	Dominica	Yes	<ul style="list-style-type: none"> With GFDRR support, Dominica has participated in the regional Caribbean Risk Information Program. This led to the creation of flood and landslide hazard maps for the country, as well as the development of a handbook that support hazard and risk analyses for physical and infrastructure planning. 	
	Dominican Republic	Yes	<ul style="list-style-type: none"> CARIBSAVE Climate Change Risk Profile for DR (2012) – somewhat outdated Dominican Republic developed a NAPA in 2008 which was updated in 2016. The country has conducted vulnerability assessments, estimated costs and conducted some sectoral planning DR’s Third National Communication also contains vulnerability analyses carried out for the tourism, health, water and coastal marine resources sectors 	
	Grenada	Yes	<ul style="list-style-type: none"> CARIBSAVE Climate Change Risk Profile for Grenada (2012) – somewhat outdated Grenada’s Disaster Vulnerability Reduction Project and Resettlement Policy Framework (2011) produced several vulnerability maps and Digital Elevation Models 	
	Guyana	Yes	<ul style="list-style-type: none"> Over the years, several projects implemented in Guyana have produced various hazard and vulnerability maps for the country. Guyana's Coastal Vulnerability and Risk Assessment project o the Guyana National Land Use 	

			<p>Program with Guyana Lands and Surveys Commission are some examples</p> <ul style="list-style-type: none"> • Disaster Risk and Climate Change Vulnerability Assessment of the city of Georgetown (2019) 	
	Haiti	Yes	<ul style="list-style-type: none"> • The GFDRR has helped enable the consolidation of risk data and information as part of a hazard, exposure, and vulnerability database platform. • Climate change vulnerability assessments have been conducted through the NAPA in 2006 and through a survey conducted during its revision in 2017 • The World Bank has produced a number of resources to assess disaster risks, for example high-resolution maps for flooding risk assessments and assessments of community vulnerabilities 	
	Jamaica	Yes	<ul style="list-style-type: none"> • CARIBSAVE Climate Change Risk Profile for Jamaica (2012) – somewhat outdated • Jamaica Disaster Vulnerability Reduction Project (2016) included collection of targeted hazard and risk information, its analysis and use in monitoring systems and decision making • Jamaica’s Third National Communication also contains vulnerability maps 	

	St. Kitts and Nevis	Yes	<ul style="list-style-type: none"> • CARIBSAVE Climate Change Risk Profile for SKN (2012) – somewhat outdated • Some maps were also found in the USAID/OAS Post-Georges Disaster Mitigation project (2001)³⁹ • The World Bank’s climate knowledge portal also presents information related to SKN’s vulnerabilities 	
	St. Lucia	Yes	<ul style="list-style-type: none"> • CARIBSAVE Climate Change Risk Profile for Saint Lucia (2012) – somewhat outdated • Saint Lucia Disaster Vulnerability Reduction Project (2014) produced Sea Level Rise Modelling and Flood, Erosion Risk Mapping and Landslide Hazard Maps • Saint Lucia’s Third National Communication also contains flooding and vulnerability maps 	
	Sint Maarten	Yes	<ul style="list-style-type: none"> • Sint Maarten was one of the participating countries in the Overseas Territories Regional Risk Reduction Initiative (R3i) implemented by UNDP, through which storm surge and tsunami models were developed together with coastal hazard maps • In 2014, the Nature Foundation of Sint Maarten published a report on the impacts of sea level rise on the country in 20-50 years which included flooding maps 	

³⁹ Information available at: https://www.oas.org/pgdm/data/gis_data.htm

	St. Vincent and the Grenadines	In progress	<ul style="list-style-type: none"> Some of these maps exist but are outdated. Under SVG's PPCR modelling of coastal inundation impacts (storm surge, sea level rise, high energy wave action, winter swells) are being undertaken 	
	Suriname	Yes	<ul style="list-style-type: none"> Suriname's Policy Development Plan (2017-2021) includes flood risk maps. Suriname's Second National Communication to the UNFCCC also includes vulnerability assessments for different sectors Suriname's National Climate Change Policy, Strategy and Action Plan for Suriname (2014-2021) identifies vulnerabilities based on national development planning themes The Netherlands Climate Assistance Programme (NCAP) undertook various vulnerability assessments for the coastal zone of Suriname Caribsave's Climate Change Risk Profile for Suriname (2012) identifies vulnerabilities by sector Coastal Resilience Assessment of Paramaribo (2017) 	
	Trinidad and Tobago	Yes	<ul style="list-style-type: none"> Over the years, several projects implemented in T&T have produced various hazard and vulnerability maps for the country. Most recently the Vulnerability and Capacity Assessment (VCA) Report for Trinidad and Tobago (2019) was produced with funding from 	

			<p>the EU which provides detailed information about T&T's vulnerabilities</p> <ul style="list-style-type: none"> The T&T Office of Disaster Preparedness and Management also provides hazard maps for the country 	
	Turks and Caicos Islands	Yes	<ul style="list-style-type: none"> TCI National Multi-Hazard Mitigation Plan (2017) – it dates from July 2017 which is pre-hurricane Irma so it may need updating CARIBSAVE's Climate Change Risk Profile for TCI also provides vulnerability assessments for selected areas in TCI 	
Downscaled climate change scenarios for the country	Antigua and Barbuda	Yes	<ul style="list-style-type: none"> CARIBSAVE Climate Change Risk Profile for Antigua and Barbuda (2012) 	
	The Bahamas	Yes	<ul style="list-style-type: none"> The CARISAVE's country profile provides downscaled projections The IDB also produced downscaled CC scenarios and projections for Bahamas as part of an airport infrastructure project in 2016 	
	Barbados	No		
	Belize	Yes	<ul style="list-style-type: none"> The Climate Change Policy and CARISAVE's country profile speak to them 	
	Dominica	Yes	<ul style="list-style-type: none"> The Climate Studies Group at UWI in Jamaica produced a report on climate trends and projection in Dominica using downscaled climate scenarios.⁴⁰ 	
	Dominican Republic	Yes	<ul style="list-style-type: none"> As part of the Third National Communication, scenarios for 	

⁴⁰ <https://research.fit.edu/media/site-specific/researchfitedu/coast-climate-adaptation-library/latin-america-and-caribbean/eastern-carib-amp-dutch-antilles/Taylor-et-al.--Dominica-Climate-Trends--Projections..pdf>

			temperature and precipitation, including extreme events, were developed for the periods 2040-2060 and 2061-2080, with some detail at regional level	
	Grenada	Yes	<ul style="list-style-type: none"> CARIBSAVE Climate Change Risk Profile for Grenada 	
	Guyana	Yes	<ul style="list-style-type: none"> The Climate Resilience Strategy and Action Plan for Guyana (2015) includes climate change scenarios for Guyana Guyana's National Climate Change Policy and Action Plan (2020-2030) also includes climate scenarios Guyana's Second National Communication to the UNFCCC also includes climate scenarios 	
	Haiti	Yes	<ul style="list-style-type: none"> The IDB commissioned a study on "Haiti: historical and future climatic changes" in 2015 that included downscaled CC scenarios for the country 	
	Jamaica	Yes	<ul style="list-style-type: none"> CARIBSAVE Climate Change Risk Profile for Jamaica (2012) Third National Communication to the UNFCCC (2017) State of the Climate Report for Jamaica (2015) - the Climate Change Studies Group at UWI Mona produces downscaled CC scenarios for Jamaica 	
St. Kitts and Nevis	Yes	<ul style="list-style-type: none"> CARIBSAVE Climate Change Risk Profile for SKN (2012) The World Bank's climate knowledge portal also presents information climate projections for SKN 		

	St. Lucia	Yes	<ul style="list-style-type: none"> CARIBSAVE Climate Change Risk Profile for Saint Lucia (2012) Third National Communication to the UNFCCC (2017) 	
	Sint Maarten	No		
	St. Vincent and the Grenadines	No	<ul style="list-style-type: none"> This is one of the gaps highlighted in SVG's NAP 	
	Suriname	Yes	<ul style="list-style-type: none"> Suriname's National Climate Change Policy, Strategy and Action Plan for Suriname (2014-2021) contains projected climate change impacts based on Regional Climate Models Suriname's Second National Communication to the UNFCCC also includes climate scenarios Caribsava's Climate Change Risk Profile for Suriname (2012) includes detailed climate modelling projections 	
	Trinidad and Tobago	Yes	<ul style="list-style-type: none"> Under the CARIBSAVE Climate Change Risk Atlas (CCCRA) initiative, unpublished modelling outputs for T&T seem to exist⁴¹ The met service provides climate projections on its website (https://www.metoffice.gov.tt/Climate) The Climate Change Policy includes climate change projections from regional downscaled models 	

⁴¹ According to the EU's Vulnerability and Capacity Assessment of T&T Report (2019). As part of the CCCRA, climate modelling was done for all Caribbean countries however, Trinidad and Tobago and other countries were not beneficiaries of the risk assessment work conducted for key socioeconomic sectors. These countries would therefore not have published results in a Climate Change Risk Profile document, which is only available for 15 CARICOM countries.

	Turks and Caicos Islands	Yes	<ul style="list-style-type: none"> CARIBSAVE Climate Change Risk Profile for TCI (2012) 	
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Financial:

This indicator aims to determine the existence of financial instruments for resilience and/or disaster management including insurance policy with CCRIF (level of coverage: earthquake, tropical cyclone and excess rainfall policies)

TRAFFIC LIGHT SYSTEM		
YES	IN PROGRESS	NO

DOES THE FOLLOWING EXIST?	COUNTRY	ANSWER	COMMENTS AND MEANS OF VERIFICATION	TRAFFIC LIGHT
Resilience/adaptation insurance schemes (not including CCRIF)	Antigua and Barbuda	No		
	The Bahamas	No		
	Barbados	No		
	Belize	No		
	Dominica	No		
	Dominican Republic	Yes	<ul style="list-style-type: none"> It seems that in 2017 DR was engaged by the WBG in a parametric insurance scheme to insure farmers against climate change impacts Between 2012 and 2017 USAID and REDDOM (a Dominican NGO) also implemented a program aimed at developing and commercializing climate change insurance products 	

			(especially for droughts) in DR coupled with applied adaptation interventions in the agricultural sector and improvements to weather forecasting systems.	
	Grenada	Yes	<ul style="list-style-type: none"> Grenada is one of the participating countries of the “Climate Risk Adaptation and Insurance in the Caribbean” project implemented by the Munich Climate Insurance 	
	Guyana	No		
	Haiti	Yes	<ul style="list-style-type: none"> One example is the MiCRO project implemented in partnership with Fonkoze and the IFC 	
	Jamaica	Yes	<ul style="list-style-type: none"> Jamaica is one of the participating countries in the Livelihoods Protection Policy (LPP) and other local insurance companies offer a range of insurance schemes related to resilience 	
	St. Kitts and Nevis	No		
	St. Lucia	Yes	<ul style="list-style-type: none"> Saint Lucia is one of the participating countries in the Livelihoods Protection Policy (LPP), a weather-index based insurance policy launched by the Munich Climate Insurance Initiative (MCII) in partnership with the CCRIF 	

	Sint Maarten	Yes	<ul style="list-style-type: none"> Sint Maarten's National Recovery and Resilience Plan states that between USD320-430 million of the estimated 2.4billion needed for recovery and reconstruction after hurricane Irma in late 2017 were expected to come from insurance payments for property 	
	St. Vincent and the Grenadines	No		
	Suriname	In progress	<ul style="list-style-type: none"> Bearing in mind Suriname's vulnerability to natural hazards, the Government has recently prioritized the development of a disaster risk financing and insurance strategy to support the private and public sectors in the event of a crisis. This is pertinent to national disaster preparedness as there is limited coverage for these types of events. While companies do offer policies for home and corporate building insurance, fire, and burglary; only two companies presently offer coverage against severe winds and rain, and none offer flooding insurance. 	
	Trinidad and Tobago	In progress	<ul style="list-style-type: none"> T&T is one of the participating countries of the second phase of the Climate Risk Adaptation and Insurance in the Caribbean 	

	Turks and Caicos Islands	No	<ul style="list-style-type: none"> • TCI receives assistance in case of and in preparation for disaster from the UK Government, however it doesn't seem to offer for example individual insurance products to insure public and private infrastructure. 	
Disaster contingency/response funds	Antigua and Barbuda	No	<ul style="list-style-type: none"> • No evidence has been found that these instruments exist. A&B has benefited from the Red Cross' Disaster Relief Emergency Fund (DREF) after passage of several hurricanes, the last one being Irma in 2017 	
	The Bahamas	Yes	<ul style="list-style-type: none"> • In 2019, Bahamas reached an agreement with the Inter-American Development Bank (IDB) on a US\$100 million Contingent Credit Facility for Natural Disaster Emergencies 	
	Barbados	In progress	<ul style="list-style-type: none"> • Barbados is currently under discussions with the IDB on a contingent credit facility and a Sustainability Policy Based Loan 	
	Belize	Yes	<ul style="list-style-type: none"> • In 2019, Belize reached an agreement with the Inter-America Development Bank (IDB) on a US\$10 million Contingent Credit Facility for Natural Disaster Emergencies. • Also, a Contingent Emergency Response Component (CERC) has been incorporated into Belize's World Bank-financed climate resilient infrastructure projects to 	

			allow quick access to resources should a disaster strike.	
	Dominica	In progress	<ul style="list-style-type: none"> The Climate Change and Environment Trust Fund is underway 	
	Dominican Republic	Yes	<ul style="list-style-type: none"> DR signed a contingent precautionary loan with the World Bank (Catastrophe Deferred Drawdown Option, or CAT-DDO) 	
	Grenada	In progress	<ul style="list-style-type: none"> Grenada currently saves a portion of its Citizenship-By-Investment (CBI) proceeds for disaster-related impacts and has drafted regulations for the operationalization of a contingency fund for natural disasters. Grenada has also been successful in incorporating disaster relief provisions (“hurricane clauses”) in some of its loan instruments 	
	Guyana	Yes, but is efficacy and proper use is questionable	<ul style="list-style-type: none"> National Contingency Fund 	
	Haiti	In progress	<ul style="list-style-type: none"> Contingent Emergency Response Component (CERC) in Haiti’s Strengthening Disaster Risk Management and Climate Resilience Project with the WBG (project in implementation) 	
	Jamaica	Yes	<ul style="list-style-type: none"> Contingent Emergency Response Component (CERC) in Jamaica’s Disaster Vulnerability Reduction Project with the WBG 	

			<ul style="list-style-type: none"> • IDB Disaster contingent loan • The National Disaster Fund • The Contingencies Fund 	
	St. Kitts and Nevis	In progress	<ul style="list-style-type: none"> • Growth and Resilience Fund (GRF) • Saint Kitts and Nevis: St. Christopher and Nevis Conservation Foundation (SCNCF) 	
	St. Lucia	In progress	<ul style="list-style-type: none"> • Through the Regional Disaster Vulnerability Reduction Project, the following instruments were created: a Climate Adaptation Financing Facility (US\$5.0 million), and a Contingent Emergency Response Mechanism (US\$1.0 million). Additionally, St. Lucia is working with the World Bank to devise a Development Policy Loan with a catastrophe deferred drawdown option (Cat DDO) of US\$20 million 	
	Sint Maarten	No	<ul style="list-style-type: none"> • This is one of the areas the government is currently exploring 	
	St. Vincent and the Grenadines	In progress	<ul style="list-style-type: none"> • Since 2017 SVG has a Contingency Fund to help release pressure on the budget in case of natural disasters. However, the fund is still small and additional financial mechanisms should be pursued. 	
	Suriname	Yes, but it is very limited	<ul style="list-style-type: none"> • It seems like NCCR has a fund at its disposal but only for disasters like flooding and heavy winds (storm) • Emergency Fund is managed by Suriname's Ministry of Social Affairs 	

	Trinidad and Tobago	No	<ul style="list-style-type: none"> Despite having some financial instruments available, it does not seem T&T has any well-defined, functioning, and reliable contingencies/catastrophe/natural disaster Fund or loan mechanism 	
	Turks and Caicos Islands	No	<ul style="list-style-type: none"> TCI receives assistance in case of and in preparation for disaster from the UK Government, however it doesn't seem to have any in house contingency/emergency funds or loan options 	
Environmental/climate taxes/incentives	Antigua and Barbuda	Yes	<ul style="list-style-type: none"> Antigua and Barbuda collects an environmental levy since 2002 to finance the cost of protecting and preserving the environment 	
	The Bahamas	Yes	<ul style="list-style-type: none"> Bahamas charges an environmental Levy (Customs Department) and other environmental fees (Environmental Health Services Department) 	
	Barbados	Yes	<ul style="list-style-type: none"> Environmental taxes and green subsidies exist but are mostly restricted to the renewable energy sector 	
	Belize	Yes	<ul style="list-style-type: none"> Belize charges an environmental conservation tax to stay-over visitors 	
	Dominica	Yes	<ul style="list-style-type: none"> Dominica collects an environmental levy 	

	Dominican Republic	Yes	<ul style="list-style-type: none"> A carbon tax for the transportation sector was introduced in 2012. There is also a tax on the use of fossil fuels including in electricity production, which is used to develop renewable energy-projects 	
	Grenada	Yes	<ul style="list-style-type: none"> Grenada collects an environmental levy 	
	Guyana	Yes	<ul style="list-style-type: none"> Guyana uses several different environmental taxes⁴² 	
	Haiti	No	<ul style="list-style-type: none"> No evidence has been found of Haiti's collecting these types of taxes/levies 	
	Jamaica	Yes	<ul style="list-style-type: none"> Jamaica customs agency collects an environmental levy on goods imported 	
	St. Kitts and Nevis	Yes	<ul style="list-style-type: none"> SKN collects an environmental levy on international trade and transactions according to its 2020 Estimates 	
	St. Lucia	Yes	<ul style="list-style-type: none"> Saint Lucia collects an environmental levy – one of the recommendations of the IMF is to introduce a carbon tax for mitigation financing purposes to support the fulfilment of St. Lucia's commitment under the Paris Agreement 	

⁴² IDB Policy Brief (2014), Survey and Assessment of Environmental Taxes in the Caribbean

	Sint Maarten	No/ Somewhat	<ul style="list-style-type: none"> No evidence has been found of a government tax in Sint Maarten, however it seems like some hotels charge a daily environmental fee per person and the Nature Foundation does charge fees associated with the access to the Man of War Shoal Marine Park that together with donations received and some funds received from the government are invested in environmental projects 	
	St. Vincent and the Grenadines	Yes	<ul style="list-style-type: none"> SVG charges stay-over visitors a Climate Resilience Levy since October 2018 	
	Suriname	No	<ul style="list-style-type: none"> Even though some of the taxes applied by Suriname could be linked to environmental taxation regimes⁴³ there is no specific tax or levy set up specifically for environmental purposes 	
	Trinidad and Tobago	Yes	<ul style="list-style-type: none"> A green fund levy of 0.3% on gross income is applicable to companies and partnerships doing business in Trinidad and Tobago. 	
	Turks and Caicos Islands	No	<ul style="list-style-type: none"> No evidence has been found of an environmental tax or levy in TCI 	
Insurance policy with CCRIF and level of coverage (country subscribed to 1, 2 or 3 policies)	Antigua and Barbuda	Yes	<ul style="list-style-type: none"> It appears that A&B insures only against hurricanes with CCRIF so the coverage level is classified as medium-low 	

⁴³ IDB Policy Brief (2014), Survey and Assessment of Environmental Taxes in the Caribbean

	The Bahamas	Yes	<ul style="list-style-type: none"> Bahamas insures against excess rainfall and tropical cyclones with CCRIF so the coverage level is classified as medium 	
	Barbados	Yes	<ul style="list-style-type: none"> Barbados insures against excess rainfall and hurricanes with CCRIF so the coverage level is classified as medium 	
	Belize	Yes	<ul style="list-style-type: none"> Belize only insures against excess rainfall with CCRIF so the coverage level is classified as medium-low 	
	Dominica	Yes	<ul style="list-style-type: none"> Dominica insures against excess rainfall, earthquakes and tropical cyclones although its policies are on the lower end of the maximum eligible amount. Policy coverage should be extended. Nevertheless, coverage level is classified as high 	
	Dominican Republic	No	<ul style="list-style-type: none"> DR is currently not part of CCRIF 	
	Grenada	Yes	<ul style="list-style-type: none"> Grenada insures against excess rainfall, tropical storms and earthquakes although its level of coverage is very low (Grenada has never qualified to receive a payout). It also participates in CCRIF's COAST to protect the food security and livelihoods and to promote the resilience of the fisheries sector. Nevertheless, coverage level is classified as high 	
	Guyana	No	<ul style="list-style-type: none"> Guyana is not a member of CCRIF 	

	Haiti	Yes	<ul style="list-style-type: none"> Haiti insures against excess rainfall, tropical storms and earthquakes so the coverage level is classified as high 	
	Jamaica	Yes	<ul style="list-style-type: none"> Jamaica insures against excess rainfall, tropical storms and earthquakes so the coverage level is classified as high 	
	St. Kitts and Nevis	Yes	<ul style="list-style-type: none"> SKN insures against excess rainfall, tropical storms and earthquakes so the coverage level is classified as high 	
	St. Lucia	Yes	<ul style="list-style-type: none"> Saint Lucia insures against excess rainfall, tropical storms and earthquakes so the coverage level is classified as high 	
	Sint Maarten	Yes	<ul style="list-style-type: none"> Sint Martin insures against excess rainfall, tropical storms and earthquakes so the coverage level is classified as high 	
	St. Vincent and the Grenadines	Yes	<ul style="list-style-type: none"> SVG insures against excess rainfall, tropical storms and earthquakes although its level of coverage seems to be low. Nevertheless, coverage level is classified as high 	
	Suriname	No	<ul style="list-style-type: none"> Suriname is not a member of CCRIF 	
	Trinidad and Tobago	Yes	<ul style="list-style-type: none"> T&T insures against excess rainfall, tropical storms and earthquakes so the coverage level is classified as high 	

	Turks and Caicos Islands		<ul style="list-style-type: none"> • TCI insures against excess rainfall and tropical cyclones with CCRIF so the coverage level is classified as medium 	
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Institutional capacity and set up:

this indicator aims to determine if the necessary bodies and coordination mechanisms exist and if national, regional and international targets and priorities are properly assigned to a responsible body that enforces and monitors them

TRAFFIC LIGHT SYSTEM		
YES	SOMEWHAT	NO

DOES THE FOLLOWING EXIST?	COUNTRY	ANSWER	COMMENTS AND MEANS OF VERIFICATION	TRAFFIC LIGHT
Inter-ministerial committee or governmental body responsible for climate change/resilience	Antigua and Barbuda	Yes	<ul style="list-style-type: none"> • There are a number of functioning committees in A&B, two of the most relevant ones being the DOE's Technical Advisory Committee and the SIRF Fund technical and Finance committees 	
	The Bahamas	Yes	<ul style="list-style-type: none"> • Bahamas Environment Science and Technology Commission (BEST) <ul style="list-style-type: none"> ◦ National Climate Change Committee (NCCC) • Bahamas Climate Change Unit 	
	Barbados	Yes	<ul style="list-style-type: none"> • Barbados also has an inter-ministerial Climate Finance Working Group 	

	Belize	Yes	<ul style="list-style-type: none"> • Belize National Climate Change Committee (BNCCC) – even though not 100% operationalized yet • National Climate Change Office (NCCO) 	
	Dominica	Yes	<ul style="list-style-type: none"> • Department of Climate Change, Environment and Development • National Climate Change Committee • National Emergency Planning Advisory Committee • Council on Environment, Climate Change and Development 	
	Dominican Republic	Yes	<ul style="list-style-type: none"> • National Council for Climate Change and Clean Development Mechanism (CNCCMDL) • National Climate Change Committee 	
	Grenada	Yes	<ul style="list-style-type: none"> • National Climate Change Committee 	
	Guyana	Yes	<ul style="list-style-type: none"> • Multi-Stakeholder Advisory Committee of the Green State Development Strategy (GSDS) • Natural Resource and Environment Cabinet Sub-Committee renamed DRM Commission • National Disaster Risk Reduction Coordination Platform • National Climate Change Committee of Guyana 	
	Haiti	Yes	<ul style="list-style-type: none"> • National Committee on Climate Change (CNCC) • Civil Society Platform on Climate Change (PSC-CC) 	
	Jamaica	Yes	<ul style="list-style-type: none"> • Climate Change Focal Point Network (CCFPN) 	

			<ul style="list-style-type: none"> • Climate Change Advisory Board (CCAB) • Climate Change Division within the Ministry of Economic Growth and Job Creation 	
	St. Kitts and Nevis	Yes	<ul style="list-style-type: none"> • National Sustainable Development Coordinating Committee (oversees the project preparation process for climate-resilient investments) 	
	St. Lucia	Yes	<ul style="list-style-type: none"> • National Climate Change Committee 	
	Sint Maarten	No	<ul style="list-style-type: none"> • The National Recovery Program Bureau (NRPB) provides somewhat of a coordinating role but is almost entirely focused on recover and reconstruction activities 	
	St. Vincent and the Grenadines	No	<ul style="list-style-type: none"> • The creation of a National CC Committee (NCCC) and Technical arm is being recommended in SVG's NAP charged with the development of a CC annual plan and budget 	
	Suriname	No		
	Trinidad and Tobago	Yes	<ul style="list-style-type: none"> • Climate Change Focal Point Network • Ministerial Committee of Climate Change (MCCC) • Ministerial Committee of Climate Change (MCCC) 	
	Turks and Caicos Islands	Yes	<ul style="list-style-type: none"> • Climate Change Committee • National Disaster Advisory Committee • Island Disaster Committees 	

National emergency management agency	Antigua and Barbuda	Yes	<ul style="list-style-type: none"> National Office of Disaster Services 	
	The Bahamas	Yes	<ul style="list-style-type: none"> Ministry of Disaster Preparedness, Management and Reconstruction <ul style="list-style-type: none"> Disaster Reconstruction Authority National Emergency Management Agency (NEMA) 	
	Barbados	Yes	<ul style="list-style-type: none"> Department of Emergency Management 	
	Belize	Yes	<ul style="list-style-type: none"> National Emergency Management Office (NEMO) 	
	Dominica	Yes	<ul style="list-style-type: none"> National Emergency Planning Organization (NEPO) 	
	Dominican Republic	Yes	<ul style="list-style-type: none"> National System for Disaster Prevention, Mitigation, and Response National Technical Committee for the Prevention and Mitigation of Risks National Dominican Emergency Commission 	
Grenada	Yes	<ul style="list-style-type: none"> National Emergency Advisory Council National Disaster Management Committee National Disaster Management Advisory Council (NaDMAC) National Disaster Management Agency (NaDMA) National Disaster Office and Network of 18 Sub-National Committee 		

			<ul style="list-style-type: none"> National Emergency Operation Centre 	
	Guyana	Yes	<ul style="list-style-type: none"> Civil Defense Commission (CDC) 	
	Haiti	Yes	<ul style="list-style-type: none"> National Risk and Disaster Management System Civil Protection Directorate 	
	Jamaica	Yes	<ul style="list-style-type: none"> Office of Disaster Preparedness and Emergency Management 	
	St. Kitts and Nevis	Yes	<ul style="list-style-type: none"> Saint Kitts-Nevis National Disaster Management Offices (NEMA/NDMD) 	
	St. Lucia	Yes	<ul style="list-style-type: none"> National Emergency Management Office (NEMO) National Disaster Management Committees (there are 13 of them classified by topic) 	
	Sint Maarten	Yes	<ul style="list-style-type: none"> Fire Department/Office of Disaster Management (ODM) National Recovery Program Bureau (NRPB) Emergency Operation Center (EOC) 	
	St. Vincent and the Grenadines	Yes	<ul style="list-style-type: none"> National Emergency Management Office (NEMO) 	
	Suriname	Yes	<ul style="list-style-type: none"> National Coordination Centre For Disaster Relief (NCCR) 	
	Trinidad and Tobago	Yes	<ul style="list-style-type: none"> Office of Disaster Preparedness and Management 	
Turks and Caicos Islands	Yes	<ul style="list-style-type: none"> Department of Disaster Management and Emergencies Domestic Fire Department 		

Coastal zone management unit/institute/agency	Antigua and Barbuda	No		
	The Bahamas	In progress	<ul style="list-style-type: none"> A phased establishment of a Coastal Protection Unit combined with enhanced information management, planning and coordination functions in the Ministry of public Works with participating agencies is being implemented under the IDB funded "Climate-Resilient Coastal Management and Infrastructure Program" 	
	Barbados	Yes	<ul style="list-style-type: none"> Coastal zone Management Unit in the Ministry of Maritime Affairs and the Blue Economy 	
	Belize	Yes	<ul style="list-style-type: none"> Coastal Zone Management Authority and Institute (CZMAI) 	
	Dominica	No	<ul style="list-style-type: none"> The Forestry Division incorporates aspects of both watershed and coastal zone management but there are many other institutions with mandates over the marine space and coastal zones. No CZM Unit currently exists. 	
	Dominican Republic	No		
	Grenada	No		
	Guyana	No		

	Haiti	Somewhat	<ul style="list-style-type: none"> No evidence has been found regarding the existence of a CZM Unit/Agency. However, the Department of Coastal and Marine Zones Management exists within the Ministry of Environment. Unfortunately, not much information is available about its mandate and active role. 	
	Jamaica	Somewhat	<ul style="list-style-type: none"> National Council on Ocean and Coastal Zone Management 	
	St. Kitts and Nevis	No	<ul style="list-style-type: none"> However various departments seem to be tasked with mandates over the ocean and marine environment and space: Department of Maritime Affairs, Department of Marine Resources 	
	St. Lucia	No		
	Sint Maarten	No	<ul style="list-style-type: none"> The Department of Civil Aviation, Shipping and Maritime Affairs, the Coast Guard and the Port Authority of St Maarten all have mandates related to the ocean and coasts, but no dedicated unit/office currently exists 	
	St. Vincent and the Grenadines	No		
	Suriname	No		
	Trinidad and Tobago	Yes	<ul style="list-style-type: none"> Institute of Marine Affairs Coastal Protection Unit (CPU) and the Maritime Services Division at the Ministry of Works and Transport 	

			<ul style="list-style-type: none"> Integrated Coastal Zone Management Inter-Ministerial Committee 	
	Turks and Caicos Islands	Somewhat	<ul style="list-style-type: none"> The Coastal Radar Unit at the Ministry of Immigration, Citizenship, Labour and Employment Services as well as the Department of Environment&Coastal Resources and the Department of Maritime Affairs of the Ministry of Tourism, Environment, Heritage, Maritime and Gaming all have mandates related to the ocean and coasts, but there is no independent agency/unit/office dedicated solely to CZM 	
Civil society organizations or NGOs with a strong role in climate change/resilience	Antigua and Barbuda	Somewhat	<ul style="list-style-type: none"> They are limited in number but seem to be quite active 	
	The Bahamas	Yes	<ul style="list-style-type: none"> Bahamas has an extensive CBO and NGO community that is active in environmental and resilience efforts 	
	Barbados	Somewhat	<ul style="list-style-type: none"> They exist and are active to a certain extent 	
	Belize	Yes	<ul style="list-style-type: none"> Belize has a quite extensive CBO and NGO community that is active 	
	Dominica	Somewhat	<ul style="list-style-type: none"> The NGO community is not very big nor noticeably active but it exists 	
	Dominican Republic	Yes	<ul style="list-style-type: none"> DR has an extensive network of NGOs and CBOs working on environmental and climate change related matters 	

	Grenada	Somewhat	<ul style="list-style-type: none"> They are limited in number and not very active 	
	Guyana	Yes	<ul style="list-style-type: none"> Guyana has several NGOs and CBOs working on environmental and climate change related matters 	
	Haiti	Yes	<ul style="list-style-type: none"> Haiti has an extensive network of NGOs and CBOs working on environmental and climate change related matters 	
	Jamaica	Yes	<ul style="list-style-type: none"> Jamaica has an extensive network of NGOs and CBOs working on environmental and climate change related matters 	
	St. Kitts and Nevis	Somewhat	<ul style="list-style-type: none"> SKN, given its small size, has some active NGOs but the number is limited when it comes to implementation of resilience activities 	
	St. Lucia	Somewhat	<ul style="list-style-type: none"> They are limited in number and not very active 	
	Sint Maarten	Yes	<ul style="list-style-type: none"> NGOs such as the Sint Maarten Nature Foundation, the Dutch Caribbean Nature Alliance (DCNA) and Environmental Protection in the Caribbean (EPIC) are currently very relevant and active in terms of environmental management and resilience 	
	St. Vincent and the Grenadines	Somewhat	<ul style="list-style-type: none"> They are limited in number even though they are active 	

	Suriname	Yes	<ul style="list-style-type: none"> Suriname has several NGOs and CBOs working on environmental and climate change related matters 	
	Trinidad and Tobago	Yes	<ul style="list-style-type: none"> T&T has an extensive network of NGOs and CBOs working on environmental and climate change related matters 	
	Turks and Caicos Islands	Yes	<ul style="list-style-type: none"> A limited number of NGOs in TCI are undertaking environmental activities. The most known and active ones are the Turks and Caicos Reef Fund, the Turks & Caicos National Trust and the UK Overseas Territories Conservation Forum 	
Evidence of enforcement of policies and regulations related to environment, climate change and natural resources	Antigua and Barbuda	Somewhat	<ul style="list-style-type: none"> Environmental matters are approved, monitored and enforced by the DOE under the EMPA and there is a clear mechanism and protocol 	
	The Bahamas	No	<ul style="list-style-type: none"> Low enforcement of environmental laws is one of the challenges identified in the country's draft Vision 2040 	
	Barbados	No	<ul style="list-style-type: none"> There is a general absence of Statutory Rules and Orders necessary to effect purposes of Acts, e.g. Regulations to Marine Pollution Act. There is a weak enforcement of existing legislation relevant to the environment in all sectors 	
	Belize	Somewhat	<ul style="list-style-type: none"> Belize does a fairly good on enforcing laws and regulations 	

			although but there is room for improvement mainly due to the limited human capacity and resources in the country	
	Dominica	No	<ul style="list-style-type: none"> • There is some evidence of enforcement of building codes post Maria but sources are not 100% reliable • There is an overall feeling of weak enforcement of existing legislation 	
	Dominican Republic	Yes	<ul style="list-style-type: none"> • Infringements of the Environmental Law and complementary regulations can result in criminal, civil and administrative penalties. If a third party commits an offence or crime against the environment, the Attorney General for the Defense of the Environment and Natural Resources can pursue a criminal action and start the corresponding investigations in search of evidence 	
	Grenada	Somewhat	<ul style="list-style-type: none"> • The issue of enforcement as an institutional weakness comes up quite often, especially due to the human capacity constraints 	

	Guyana	Somewhat	<ul style="list-style-type: none"> Guyana is currently rewriting its Environmental Protection Act addressing several challenges which include the issue of enforcement⁴⁴. The issue of enforcement will be especially important once Guyana starts exploiting its newly discovered oil and gas reserves in full force 	
	Haiti	No	<ul style="list-style-type: none"> Enforcement is one of the biggest challenges in Haiti as its high deforestation, environmental degradation and pollution problems reveal together with the weakness of its Public Administration 	
	Jamaica	Somewhat	<ul style="list-style-type: none"> The issue of enforcement is a common institutional weakness. NEPA is the responsible agency for environmental law enforcement and even though the system and protocols seem to be clearly defined there are always enforcement issues, especially related to EIAs 	
	St. Kitts and Nevis	No	<ul style="list-style-type: none"> SKN's environmental laws include stipulations for enforcement of these provisions but no actual evidence of enforcement has been found 	

⁴⁴ News article (2020): <https://guyanachronicle.com/2020/03/29/epa-rewriting-outdated-environmental-protection-act/>

	St. Lucia	Somewhat	<ul style="list-style-type: none"> The issue of enforcement is a common institutional weakness. Right now, Saint Lucia does not have an approved Coastal Policy and Strategy, it is pending approval of the Lan Use Policy and also awaiting enactment of the Environmental Management and Climate Change Bills. Also of this reveals a weak level of enforcement. 	
	Sint Maarten	Somewhat	<ul style="list-style-type: none"> The Nature Foundation manages and monitors the Man of War Shoal Marine Park and enforcement of regulations is ensured in this MPA, however in general there is a lack of enforcement of existing environmental legislation mainly due to the lack of qualified staff 	
	St. Vincent and the Grenadines	No	<ul style="list-style-type: none"> Weak enforcement of environmental legislation is explicitly identified in SVG's NAP 	
	Suriname	Somewhat	<ul style="list-style-type: none"> Environmental enforcement falls under the responsibilities of NIMOS through its Office of Environmental Monitoring & Enforcement 	

	Trinidad and Tobago	Somewhat	<ul style="list-style-type: none"> Lack of enforcement is an issue recognized in T&T's National Biodiversity Strategy, however the EMA enforces environmental law utilizing the Environmental Police Unit and has the ability to send violation notices when it has reason to believe that environmental violations have occurred so some level of enforcement does occur 	
	Turks and Caicos Islands	Yes	<p>Even though enforcement is always a weak area, TCI seems to have been working on strengthening its capacity. In 2018, several training sessions to improve the capacity to enforce environmental laws and regulations took place in TCI:</p> <ul style="list-style-type: none"> Over 15 enforcement Officers from the Department of Environment and Coastal Resources received specific training to effectively administer the various environmental protection laws of the TCI⁴⁵ DECR also delivered a mandatory training to tour operators in TCI geared towards ensuring that vendors and park users adhere to the National Parks Ordinance⁴⁶ DECR in collaboration with MPA Enforcement International, organized a training course to 	

⁴⁵ News article, 2018: <https://magneticmediatv.com/2018/08/tci-decr-hosts-training-for-enforcement-officers/>

⁴⁶ Facebook post on the TCI Government's official profile: <https://magneticmediatv.com/2018/08/tci-decr-hosts-training-for-enforcement-officers/>

			improve capacities for the sustainable usage and protection of TCI's 15 MPAs ⁴⁷	
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⁴⁷ Environmental news article: <http://www.greenantilles.com/training-in-enforcement-for-marine-protected-areas-in-turks-and-caicos/>