

Grenada National Ecosystem Assessment

Scoping Report

*LINKING SCIENCE
AND POLICY*

April 2020



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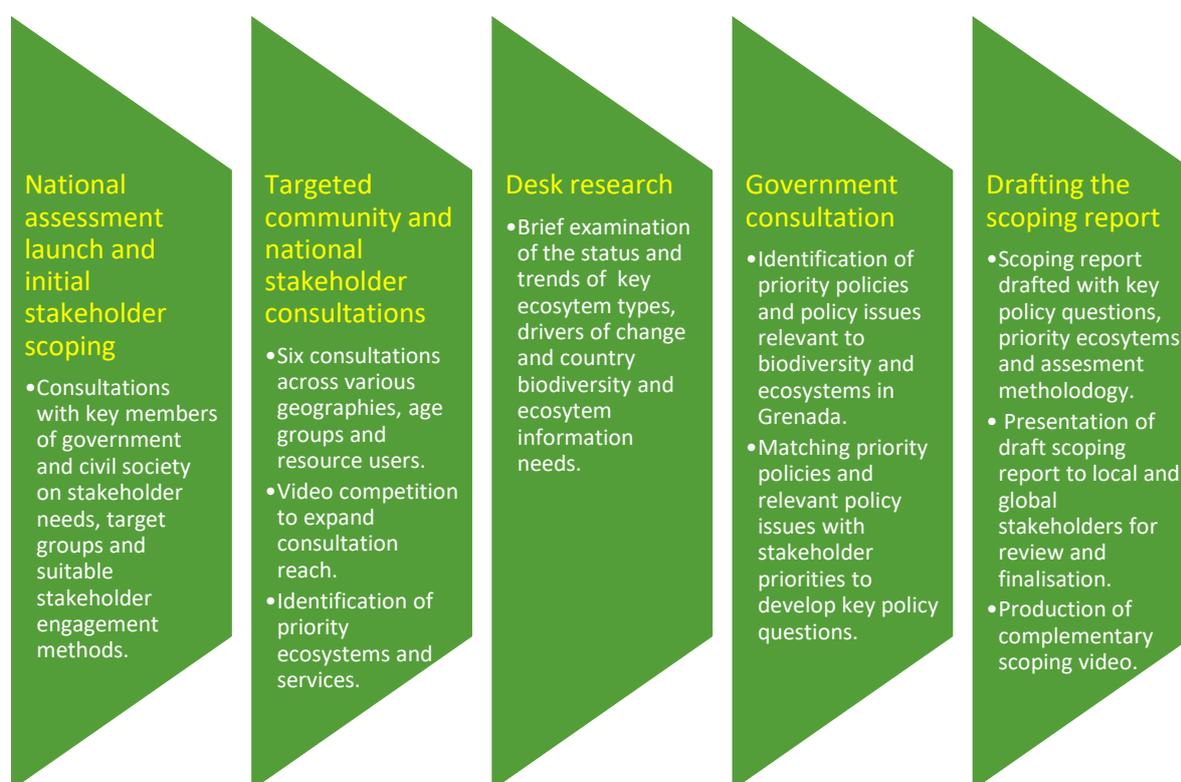
LIST OF ACRONYMS

BMU	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (Germany)
CANARI	Caribbean Natural Resources Institute
CARICOM	Caribbean Community
CBD	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
GEF	Global Environment Facility
ICCAS	Integrated Climate Change Adaptation Strategies project
IKI	International Climate Initiative
IPBES	Intergovernmental Platform on Biodiversity and Ecosystem Services
NBSAP	National Biodiversity Strategy and Action Plan
NEA	National Ecosystem Assessment of Grenada
NGO	Non-governmental organisation
NR	National Report to the Convention on Biodiversity
OECS	Organisation of Eastern Caribbean States
NSDC	National Sustainable Development Council
SLM	Sustainable Land Management
UNDP	United Nations Development Programme
UNEP-WCMC	United Nations Environment Programme-World Conservation Monitoring Centre
UNFCCC	United Nations Framework Convention on Climate Change

EXECUTIVE SUMMARY

Known as the “Spice Isle”, Grenada’s very identity is connected to the biodiversity and ecosystem services provided by its diverse natural capital. The country’s rich and biodiverse ecosystems underpin critical economic sectors such as tourism, fisheries and agriculture. At the same time, its ecosystems and biodiversity face a number of pressures and drivers of change, that jeopardise the health of the country’s economy, environment and people.

The Grenada National Ecosystem Assessment (NEA) aims to form an essential knowledge base for the safeguarding of essential biodiversity and ecosystem services that underpin national well-being. This report outlines the critical scoping phase of the assessment, which in preparation for the compilation of the main report, outlines the assessment’s scope, priorities, and proposed methodology for execution. This scoping phase was conducted using the steps outlined in the diagram below.



The methodology above yielded the following key policy questions which will guide the scope of the assessment:

- What are the status, trends and threats to Grenada’s forest, coastal, marine, freshwater and agricultural ecosystems and ecosystem services?
- What is the current and projected value of coastal, marine, freshwater and agricultural ecosystem services for the Grenadian economy and human well-being?
- How do Grenada’s ecosystems contribute to climate resilience (food and water security, disaster resilience, climate change adaptation/mitigation)?
- What is the value of the genetic resources across the different ecosystem types, in particular, the agricultural landscapes of Grenada?
- What opportunities exist to support, enhance and amplify the delivery of ecosystem services for the economic and social well-being of Grenadians?

These questions, and the subsequent NEA are designed to mainstream the consideration of biodiversity and ecosystem services into Grenadian decision-making. Policy questions are also designed to strengthen the science-policy interface for the Government of Grenada and for civil society and the private sector. Based on the aforementioned policy questions, the proposed outline for the Grenadian NEA is as follows:

- Chapter 1. Setting the scene: Why a National Ecosystem Assessment and how will it contribute to better decision-making?
- Chapter 2. What are the status, trends and threats to Grenada's forest, coastal, marine, freshwater and agricultural ecosystems and ecosystem services?
- Chapter 3. What is the current and projected value of coastal, marine, freshwater and agricultural ecosystem services for the Grenadian economy and human well-being?
- Chapter 4. How do Grenada's ecosystems contribute to climate resilience (food and water security, disaster resilience, climate change adaptation/mitigation)?
- Chapter 5. What is the value of the genetic resources across the different ecosystem types, in particular, the agricultural landscapes of Grenada?
- Chapter 6. What opportunities exist to support, enhance and amplify the delivery of ecosystem services for the economic and social well-being of Grenadians?
- Chapter 7. Scenarios and pathways to a sustainable future.

As an independent small island developing state, Grenada faces numerous challenges due to its high vulnerability to climate change related impacts and its susceptibility to global economic shocks. While it is one of many small island developing states, it is the first one conducting an NEA under the guidance of Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) and the United Nations Environment Programme-World Conservation Monitoring Centre (UNEP-WCMC) as part of a commitment to a sustainable development pathway. As such, this NEA will produce information and showcase methodologies that can be used to support future NEAs across other island states and states with similar geographies and environmental and economic challenges. The assessment team and Government of Grenada hope to set a regional and global example of how to conduct NEAs within this context, through the mainstreaming of Grenada's NEA learnings into governance, policy, decisions and way of life.

1 INTRODUCTION

With its rich and biodiverse ecosystems, the Caribbean is one of the world's biodiversity hotspots. These ecosystems are important ecologically, economically and socially to Caribbean peoples and in many cases, form a critical part of national and regional identity. Ranging from cloud forest on island ridgelines down to fringing barrier reefs, the islands have numerous ecosystem types and high levels of endemism.

This Caribbean scenario is true of Grenada, where the country's biodiversity and ecosystems provide essential goods and services which enable and enhance the well-being of Grenada's population. Unfortunately, these same ecosystems face a number of anthropogenic and environmental drivers of change that have led to their degradation, jeopardising key economic sectors and human well-being. These drivers of change include land-based sources of pollution, urbanisation, climate change and the impact of invasive species (Government of Grenada, 2000).

One of the main hurdles in protecting Grenadian and, by extension, Caribbean ecosystems is the lack of consideration of the value of ecosystems in decision-making and policy formulation. This is partly due to the absence of national assessments which showcase the importance of said ecosystems, coupled with limited Caribbean expertise and skills to assess and advocate for ecosystems' value to key decision-makers.

Nonetheless, Grenada is leading the way in addressing these challenges. The country has already conducted several protected area ecosystem valuation exercises and through this current initiative, the Environment Division of the Government of Grenada is partnering with the Caribbean Natural Resources Institute (CANARI) to execute the country-wide National Ecosystem Assessment (NEA) of Grenada.

1.1 PROJECT BACKGROUND

As part of the global initiative, "Supporting decision-making and building capacity to support the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) through National Ecosystem Assessments", Grenada was selected as one of the participating countries. Other project countries include Azerbaijan, Bosnia and Herzegovina, Cambodia, Cameroon, Colombia, Ethiopia and Vietnam. The project began in 2019 and is scheduled to conclude in 2023. Funding is provided by the Government of Germany, Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) and International Climate Initiative (IKI), with global project oversight by the United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC).

The Grenada NEA provides information on the country's biodiversity and ecosystems which can then be used for national reporting on regional and international biodiversity-related frameworks. Over the duration of the project, the NEA will produce the following key reports and documents:

- Technical scoping report (this document)
- Summary for policy makers
- NEA technical report
- A plan for dissemination and use of assessment findings

The project will also create various supporting information products, including but not limited to, briefs and videos aimed at advancing the integration of biodiversity and ecosystem values into

national decision-making. The assessment will also utilise and promote relevant policy tools and methodologies to inform and assist decision-making.

The initiative will build capacity at different levels to mainstream ecosystem services into government decision-making. This includes building capacity on ecosystem valuation within the project's Technical Secretariat, National Management Committee, relevant government personnel and assessment authors. Capacity building for civil society stakeholders on ecosystem valuation will also be emphasised. In addition, the project will focus on building civil society's capacity on environmental advocacy, in particular to advocate for the consideration of the assessment findings in national decision-making processes.

Overall, it is envisioned that this project will contribute information towards to the achievement of the goals of Grenada's National Biodiversity Strategy and Action Plan (NBSAP), which aims to achieve balanced national sustainable growth and development through proper ecosystem functioning for the benefit of the present and future generations.

1.2 SCOPING REPORT OBJECTIVES

This scoping report is the first milestone of the NEA. This report aims to:

- determine the need and utility of a national ecosystem assessment;
- establish key policy questions that are relevant to guide the assessment;
- determine the scope and priorities for the national ecosystem assessment; and
- compile and synthesise key biodiversity information and data sources that will be used in the NEA.

1.3 METHODOLOGY

This scoping report was developed using information gathered through stakeholder consultations with governmental and non-governmental stakeholders, combined with desk research using academic literature, grey literature, project reports and national plans and policies. A key aspect of the methodology used in the scoping exercise was a strong participatory approach. Participatory approaches facilitate dialogue among all actors; mobilise and validate popular knowledge and skills; encourage communities and their institutions to manage and control resources; seek to achieve sustainability, economic equity and social justice; and maintain cultural integrity (Krishnarayan et al, 2002). As such, great attention was paid to the design of the scoping exercise, as explained below, to incorporate as broad a range of stakeholder perspectives as possible and to include local knowledge. The overall process for the scoping exercise is summarised in Figure 1 below and explained in detail in subsequent sections.

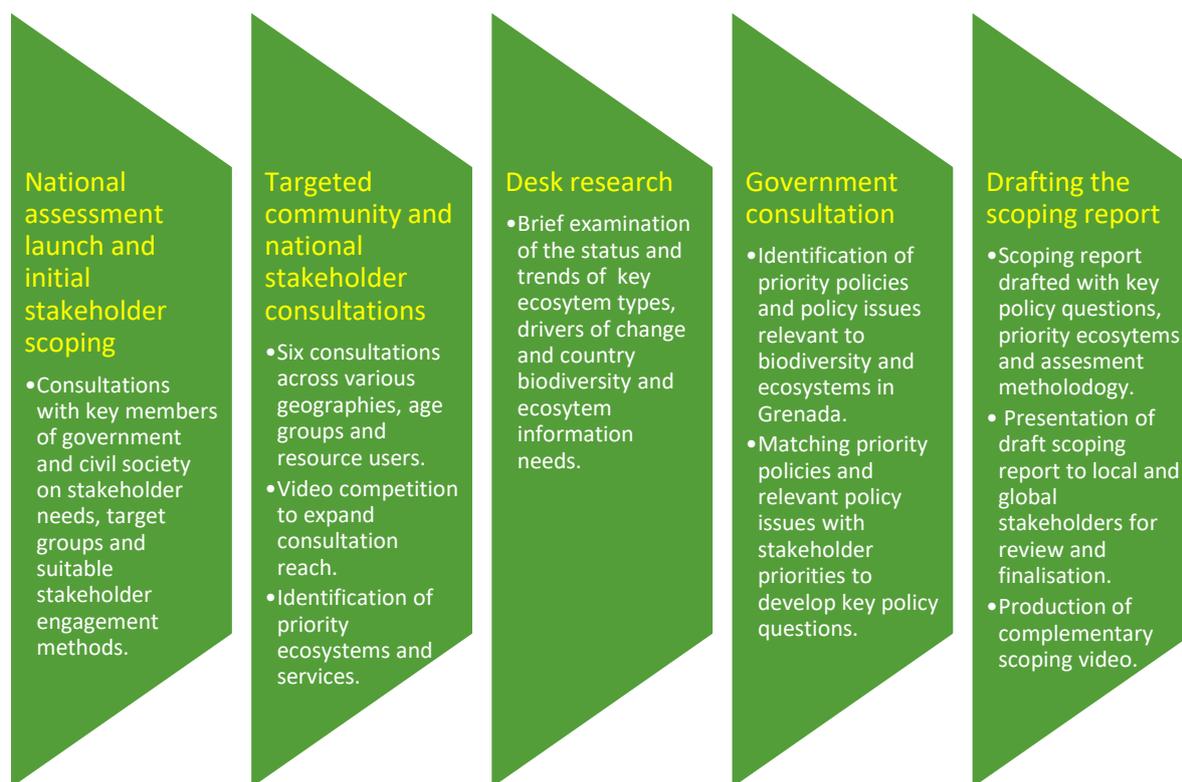


Figure 1: Scoping exercise methodology.

1.3.1 NATIONAL ASSESSMENT LAUNCH AND INITIAL STAKEHOLDER CONSULTATION TO PLAN THE SCOPING EXERCISE

On June 7, 2019 the NEA was launched at a monthly meeting of Grenada’s National Sustainable Development Council (NSDC). This national body has been in existence since 1996 and is the main platform discussions on contemporary economic and social and environmental issues in Grenada. The longest serving platform of its kind in the region (coming out of the Barbados Program of Action), this body has been identified to serve as the National Platform for the Grenada NEA.

Following the launch event, the project team held meetings with the Permanent Secretary, and the Head of the Environment Division of the Ministry of Climate Resilience, the Environment, Forestry, Fisheries, and Disaster Management, which is the national focal point for the NEA. A workshop with key members of civil society and other stakeholders was also held to discuss the project objectives, stakeholders needs and suitable methods of engaging Grenadian stakeholders. These detailed discussions clarified appropriate methods of mobilisation, facilitation and specific geographic areas of interest to include in scoping exercise consultations later that year. These ‘scoping planning meetings’ led to the following observations and recommendations:

- A series of community consultations and consultations with specific target audiences would be more effective than having a single national consultation. It would also provide a more accurate picture of how Grenadians benefit from and interact with biodiversity.
- Grenadian stakeholders are suffering from “consultation fatigue” thus methods of engagement had to be innovative and interesting.
- Lunchtime and evening consultations would maximise impact as many environmental resource users such as farmers and fishers have limited availability to attend long daytime workshops.

- Weekend consultations would be more effective for youth stakeholders, many of whom attend classes during the week.
- Capacity building for civil society was strongly expressed as a need and incentive for stakeholder engagement.
- While not directly relevant to the scoping exercise methodology, stakeholders emphasised that the outputs of the assessment should include products suitable for a wide range of stakeholders. In particular, a “Citizen’s Guide to the National Ecosystem Assessment’ was recommended.

1.3.2 TARGETED COMMUNITY AND NATIONAL STAKEHOLDER CONSULTATIONS

Following the planning workshop in June 2019, five community consultations and a youth national consultation were held across Grenada, Carriacou and Petite Martinique in November 2019. These meetings, facilitated by the assessment team from CANARI, were aimed at identifying priority ecosystems and services and associated information needs for the broadest possible range of stakeholders. Many of these stakeholders interact with and depend on ecosystems and ecosystem services on a day-to-day basis (see Appendix 1 for a list of stakeholders consulted during the scoping exercise).

Consultations were held across Grenada’s varied geography to ensure the scoping exercise was representative of resource users and one youth-focused consultation was held to generate perspectives from future resource users (Figure 2). Consultations were organised with the help of “local mobilisers”. These are community persons or members of non-governmental organisations (NGOs) with close ties to the target groups. Local mobilisers managed logistics and followed up directly with invitees to encourage participation. This approach was critical to ensuring stakeholder participation given the high level of stakeholder fatigue in Grenada.



Figure 2: Consulting Grenadian stakeholders on the benefits provided by key ecosystems. In this image, stakeholders are describing the benefits of one of the largest reefs around the island of Carriacou.

Consultations were also used to gather information on the status and trends in ecosystem service delivery observed by the population. Consultations followed the same general format. Participants were first introduced to key concepts on ecosystem services (definition, categories, valuation and use in decision-making). They were then divided into groups based on the major ecosystems or services applicable to their region and asked to work collectively on the following questions:

- How do you rely on ecosystems and their services?
- How have these changed in the last 10 years?
- How do you believe they will change in the future?

Group responses were presented in plenary for validation, inclusive of further discussion on key areas of ecosystem service production and key concerns about future change. In this regard, consultations acted as a rapid participatory scenario development exercise. They also provided an indication of priority ecosystems and services to include in the assessment, based on the ecosystems selected by the participants for discussion during group exercises.

A national cell phone video competition was used to supplement consultations, providing an additional vehicle for stakeholders to input data and showcase their views, indigenous knowledge and perspectives on Grenada’s ecosystems. The national video competition titled, “Ecosystems of Grenada – past, present and future”, was held between December 10, 2019 and January 10, 2020. This competition invited the public to submit videos explaining how one ecosystem has changed over the last 10 years, how they believe it will change over the next 10 years, and how these changes have affected or will affect communities and businesses.

To support this video competition, during three of the community consultations, participants were given a crash course in using cell phone videos for data collection and advocacy (Figure 3). Additional cell phone filming guidelines were provided on the video competition webpage¹.



Figure 3: Stakeholder from Petite Martinique filming a video describing causes and impacts of coastal erosion. Training on filming cell phone videos for data collection was provided as part of capacity building activities during the stakeholder consultations.

Perspectives presented in the competition videos were assessed and used to supplement information gathered through community consultation group exercises. The video competition and associated training were also the start of the environmental advocacy capacity building to be executed under the Grenada NEA. This training will build the capacity of civil society and other stakeholders to advocate for the use of the assessment’s findings within national decision-making processes.

1.3.3 DESK RESEARCH

Information from key national reports was collated and summarised within the scoping report, in particular, from Grenada’s NBSAP and Fifth National Report to the Convention on Biodiversity (NR). These documents provided background and context highlighting the country’s main ecosystem types. They also provided preliminary information on the status and trends of the Grenadian ecosystems inclusive of drivers of change. This information, coupled with stakeholder views, provided the rationale for the proposed NEA key policy questions and overall scope.

1.3.4 GOVERNMENT CONSULTATION

The final scoping exercise consultation was held in February 2020. The main target audience for this meeting was government officials (See Appendix 1). Participants were introduced to key concepts on ecosystem services, and how these services can be included in national decision-making with a focus on economic trade-offs. Following these introductions, participants were asked to outline and discuss policies, programmes and projects (existing, planned, in draft or implemented) which could impact on or be impacted by the country’s biodiversity and ecosystems. After these policies were identified, they were asked what biodiversity and/or ecosystem data and information could support the effective implementation of these policies.

¹ See <https://canari.org/grenada-ecosystem-assessment-cell-phone-video-competition>

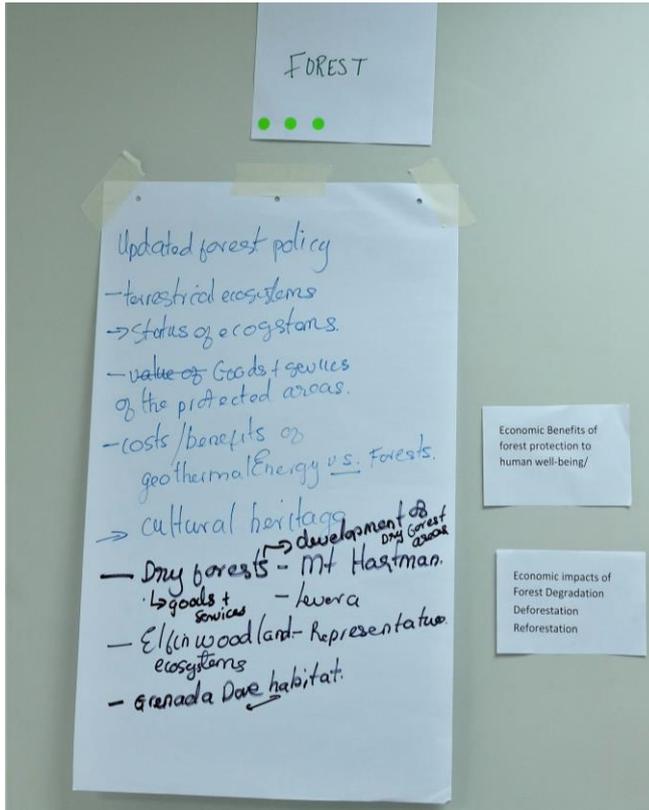


Figure 4: Example of priorities expressed by government stakeholders (written text) cross-referenced with priorities identified in community consultations (printed text). Government stakeholders voted on their priorities for the assessment by placing green stickers on the ecosystem, sector or policy question they believed to be most important for the NEA.

During this meeting, the assessment team also showcased the priorities (key areas of ecosystem service production and key concerns about future change) identified by stakeholders (civil society, youth and local communities) from the previous consultations held in 2019. These priorities were discussed in detail within the context of national government policy needs and development priorities. For the final session of the government consultation, priority themes, ecosystems and information needs from all governmental and non-governmental consultations were combined and utilised in a voting exercise to establish the final priority ecosystem types, data needs and questions of interest for the Grenada NEA (Figure 4). This sequence of consultations and methodology allowed the government personnel involved in policymaking to respond to and incorporate the needs expressed by a broad range of stakeholders into the final NEA design.

1.3.5 DRAFTING THE SCOPING REPORT

The information gleaned from the methodology above was incorporated into the findings of the scoping report. **Section 2** of this report introduces Grenada's general geographic characteristics and major ecosystem types. **Section 3** provides a brief overview of the ecosystem services and drivers of change of these ecosystems as derived from the literature and showcased during stakeholder consultations. **Section 4** synthesises information from Section 3 to provide the rationale for the scope of the NEA. The NEA scope, including geographic boundaries and key policy questions, is then presented in **Section 5** with the utility of the assessment, assumptions and requisite data sets highlighted in subsequent report segments (**Sections 6-8**). The report ends with an overview of the NEA operational framework including project roles and responsibilities, work schedule, project communication and engagement strategy and proposed capacity building activities (**Sections 9-12**).

The methodology and findings of the scoping report are also showcased in an accompanying participatory video produced by the assessment team². This video utilises cell phone footage taken during consultations combined with excerpts of footage from the video competition. The video will serve as an additional information resource as well as an engagement tool to showcase the intent and scope of the NEA to policy makers and other stakeholders.

² <https://www.youtube.com/watch?v=h-Hd9gsT1JI>

2 GRENADA: AN OVERVIEW

2.1 GEOGRAPHY

The tri-island state of Grenada is the most southerly nation of the Windward Islands, on the eastern edge of the Caribbean Sea. It is comprised of the main island of Grenada, the smaller, Southern Grenadine islands of Carriacou and Petite Martinique, and around 600 mostly uninhabited islets (World Atlas, 2017). The islands are located between 11°59' and 12°20' North latitude and 61°36' - 61°48' West longitude (Government of Grenada, 2000) (Figure 5).

The largest island of **Grenada** has an area of 312 km². The island is generally mountainous at the centre and ringed by reefs. Mount St. Catherine is the highest point of all the islands, situated on mainland Grenada and standing at 840 m above sea level.

Carriacou is situated 24 km to the northeast of mainland Grenada and has an area of 34 km² (Figure 6). Carriacou, known as the “Land of Reefs”, has its highest point of the island, High North Peak, standing at 291 m above sea level. The smallest inhabited island of Grenada, **Petite Martinique**, has an area of 2.3 km² and is situated northeast of Carriacou (Government of Grenada, 2000). Petite Martinique is conically shaped, with the highest peak, Piton, being 233 m above sea level. The rocky, high energy, eastern coast of Petite Martinique is completely uninhabited, with most residents occupying the western side (Government of Grenada, 2013).

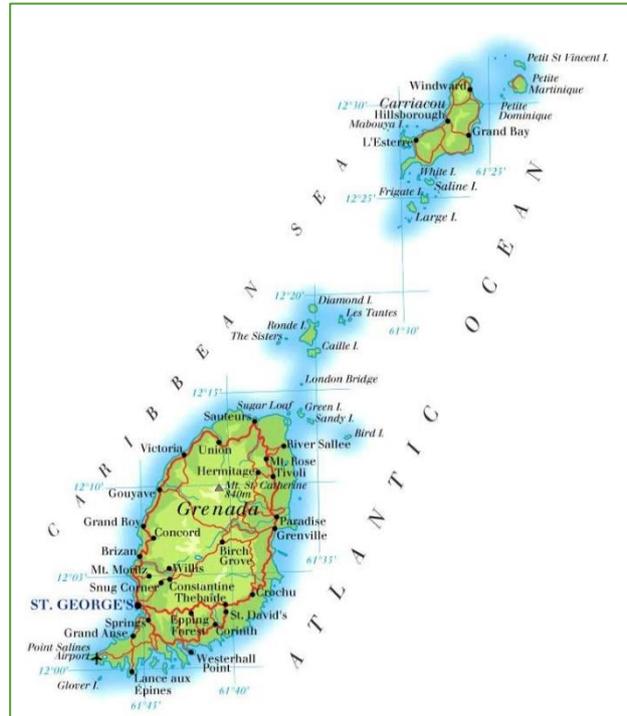


Figure 5: Tri-island state of Grenada, Carriacou and Petite Martinique (Mapland, n.d.).



Figure 6: Island of Carriacou viewed from Petite Martinique

Grenada has a tropical climate, with an average annual temperature ranging from 24 degrees to 30 degrees Celsius, and a small diurnal range modulated by its island nature and trade winds. There are two seasons, a dry and wet, with the dry season generally between January and May and wet season between June to December. Approximately 77% of the annual rainfall occurs in the rainy season, up to 4000mm annually. The coastal areas of Grenada, particularly the densely populated southern coastline, experience a lower annual average rainfall of 1125 mm (Government of Grenada, 2000). Grenadian soil types are largely clay loams, with smaller proportions of sandy loams.

The country's population is estimated at 113,094 (2020 est.) (United States Central Intelligence Agency World Factbook, 2020). The country's economy is largely based on the services sector, in

particular tourism. Grenada's main agricultural products include bananas, cocoa, nutmeg and mace. The island's agricultural emphasis on nutmeg and mace has resulted in Grenada being known as the "Spice Isle" (United States Central Intelligence Agency World Factbook, 2020).

2.2 COASTAL AND MARINE ECOSYSTEMS

Grenada's coastal and marine environment is dominated by three typical ecosystems: coral reefs, mangrove swamps and seagrass beds. These ecosystems are crucial to local fisheries, providing shelter, nurseries, spawning grounds and transitional shelter for a wide variety of marine life.

The island state has 12.5 km² of coral cover which supports 317 reef fish species. There are currently 23 IUCN Red Listed reef associated fish species, and 11 Red Listed coral species of which Staghorn and Elkhorn are listed as critically endangered. The presence of the invasive Lionfish (*Pterois volitans*) has resulted in a significant decrease of reef fish populations (Government of Grenada, 2014).

There is an estimated 284 ha of mangrove in Grenada, 172 of which is found on mainland Grenada and 112 around the shores of Carriacou (Government of Grenada, 2014). The primary species are white mangrove (*Laguncularia racemosa*), black mangrove (*Avicennia germinans*), red mangrove (*Rhizophora mangle*) and buttonwood (*Conocarpus erectus*) (Government of Grenada, 2000). The mangrove ecosystems in Grenada hold significant value, not just to the island itself, but regionally, as they represent the largest mangrove area in the Windward Islands.

The main species of seagrass found around the islands are paddle grass, halophila sea grass, cover grass, shoal grass, manatee grass (*Syringodium filiforme*) and turtle grass (*Thalassia testudinum*). These seagrass beds cover approximately 1,800 ha (Government of Grenada, 2014). Like coral and mangrove habitats, seagrass bed communities are also declining (Government of Grenada, 2014).

2.3 TERRESTRIAL ECOSYSTEMS

Grenada (mainland) has diverse forest ecosystems, including the follow forest types (Helmer *et al*, 2008):

- Deciduous, Evergreen Coastal and Mixed Forest or Shrubland, with or without Succulents
- Semi-Deciduous Forest
- Seasonal Evergreen and Evergreen Forest
- Sierra Palm, Transitional and Tall Cloud Forest
- Elfin and Sierra Palm Cloud Forest
- Mangrove (Forested Wetland)

Primary forested areas include Levera, Morne Delcie, Mt. St. Catherine, Grand Etang, Mt. Hope and Annandale. In Carriacou, the main forested area is in the High North Forest Reserve (Government of Grenada, 2014). Petite Martinique has primarily dry forest, cactus scrub and littoral woodland (Government of Grenada, 2000). Grenada has 450 species of flowering plants and 85 different types of trees. There are four endemic plant species.

Grenada's terrestrial animal biodiversity includes eight species of lizard, five species of snake, and four amphibian species, two of which are endemic. There are 150 species of birds (of which 18 are threatened or endangered) and there are 22 species of terrestrial mammals. Monkeys (*Cercopithecus mona denti*), the manicoú (*Didelphis marsupialis insularis*), the armadillo (*Dasyus novemcinctus hoplites*), the Ramier pigeon (*Columba squamosa*) and iguana (*Iguana iguana*) are the main terrestrial species hunted across the islands.

2.4 FRESHWATER ECOSYSTEMS

There are 71 watersheds in Grenada according to the National Report for Integrating Management of Watersheds and Coastal Areas (Department of Economic Affairs, 2001) (Figure 7). The upper reaches of a number of these watersheds are protected as forested crown lands and forest reserves. There are a total of twenty watersheds designated on Carriacou (Figure 8). Freshwater ecosystems on mainland Grenada include surface water streams, small springs, three volcanic crater lakes (Lake Antoine, Grand Etang Lake and Levera Lake) and a man-made lake (Palmiste Lake).

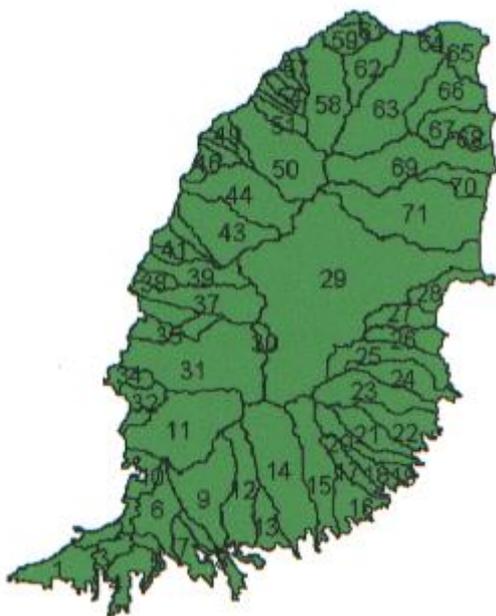


Figure 7: Watersheds on mainland Grenada (Land Use Division, 2000).

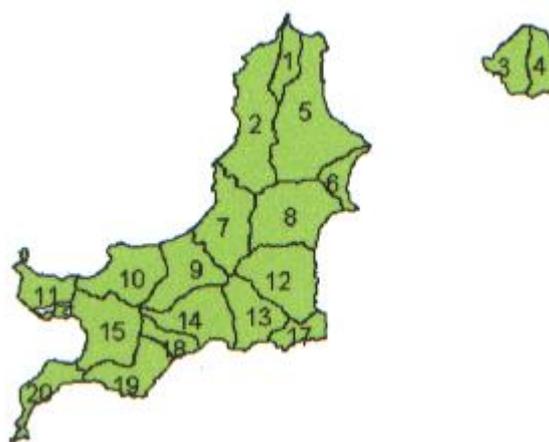


Figure 8: Watersheds on the islands of Carriacou and Petite Martinique (Land Use Division, 2000).

3 ECOSYSTEM SERVICES AND DRIVERS OF CHANGE

The information presented in the sub-sections below summarises stakeholder inputs from the various consultations on the ecosystem services that they depend on and what they identify as drivers of change/threats to these ecosystems and services. The sub-sections also draw on information documented within the country's NBSAP and NR.

3.1 MARINE AND COASTAL ECOSYSTEMS: SERVICES AND DRIVERS OF CHANGE

Grenada's coral reefs, mangrove swamps and seagrass beds provide spawning, hiding, recruitment and foraging habitats for assemblages of reef species, migrant pelagic and vagrant species.



Figure 9: Conch is a commercially important species in Grenada. This “beach” of conch has been created over years of conch harvesting.

Stakeholders from Carriacou emphasised the role of coral reefs in protecting their fishing boats and coastal infrastructure from sea surges. Similarly, they noted the use of channels within mangrove swamps as safe harbours during hurricanes. The importance of all these ecosystem types for livelihoods, for example, tourism, fisheries, recreation and cultural significance was highlighted at all consultations.

However, stakeholders noted that these ecosystems are under significant pressure and in particular that commercial fisheries species like Conch are overexploited (Figure 9). Coastal ecosystems are heavily impacted by tourism and associated activities, for example, marina construction leading to significant habitat destruction. Beach sand mining and pollution through dumping of solid and liquid wastes are other threats to the coastal and marine ecosystems. The

impact of lionfish (*Pterois volitans*) as the main invasive alien species affecting Grenada's marine and coastal ecosystems was noted. The lionfish was first sighted in Grenada waters in October 2011. The species is especially threatening because of its high fecundity, its short life cycle, its apparent isolation from known predators and its wide diet-breadth.

Grenada's mangrove swamps are generally considered to be in decline due to a combination of sediment mining, climate change-related impacts and coastal development. Sea level rise and coastal erosion encourage the inward migration of mangrove habitats; however, coastal development and steep topography inland hinder this inland migration and so mangroves are sandwiched by pressures from both directions.

3.2 TERRESTRIAL ECOSYSTEMS: SERVICES AND DRIVERS OF CHANGE

The role of forest ecosystems in underpinning the services of water supply, climate regulation and provider of timber and non-timber forest products was noted in consultations and in the literature. However, terrestrial ecosystems face several pressures and drivers of change that have resulted in declining health and extent of this ecosystem type. Overgrazing by small livestock, mainly sheep and goats, was identified as a major driver of change within forest ecosystems, particularly on the islands of Carriacou and Petite Martinique. The clearing of land for agriculture, housing and tourism development is another significant threat. Timber harvesting for boat building and construction was also a cause of deforestation on the islands of Carriacou and Petite Martinique. Poor coordination amongst government ministries and low levels of enforcement of existing policies to manage land use and the lack of implementation of the Draft National Forest Policy enables and exacerbates the conversion of forested land to other uses.

3.3 FRESHWATER ECOSYSTEMS: SERVICES AND DRIVERS OF CHANGE

Grenada's riverine and lake ecosystems are important in terms of water supply, eco-tourism and recreation. However, forest clearcutting, heavy pesticide and fertiliser use, and soil erosion negatively impact on freshwater quality and quantity available for human consumption. These activities also compromise riverine and lacustrine (lake) habitats, negatively impacting aquatic flora and fauna. Other drivers of change within freshwater ecosystems include encroachment on riparian (riverbank) habitats (Figure 10), illegal river damming and the introduction of the invasive fish, tilapia. Solid waste disposal in rivers is another concern. These drivers have resulted in reduction in water supply, degraded habitats and decline in populations of endemic species.



Figure 10: Encroachment of human development on riparian habitats.

High level of water abstraction from lakes for consumption is a significant driver of change. Runoff with high nutrient loads due to erosion and fertiliser use is another. Encroachment of vegetation enabled by low water levels has accelerated the decline of some lake ecosystems.

4 RATIONALE

The Government consultation, other stakeholder consultations and the video competition highlighted the following common priority ecosystems for inclusion within the NEA:

- Coastal and marine ecosystems
 - Mangrove swamps
 - Seagrass beds
 - Coral Reefs
- Forest ecosystems
 - All types with a focus on dry forests and elfin woodland
- Freshwater Ecosystems
 - Rivers
 - Lakes
 - Riparian zones

Among these ecosystem types, coastal and marine ecosystems emerged as the highest priority for consideration within the NEA as evidenced by the voting exercise during the Government consultation and the number of groups that focused on these systems during the other stakeholder consultations.

The consultation with government representatives additionally identified agricultural ecosystems as a focal area for the NEA given the importance of agriculture in the islands (Figure 11). Governmental officials also



Figure 11: Grenada is the world's second largest producer of nutmeg and agricultural ecosystems are a major part of Grenada's economy. Biodiversity enables this production through services such as pollination and water supply.

requested a focus on the value of genetic resources across all ecosystem types, but with an emphasis on agricultural ecosystems. An NEA focus on agricultural ecosystems is well-justified, given that Grenada is known as the “Spice Isle”, famous for its agricultural products, which are also a significant contributor to its economy. Agricultural output is in turn underpinned by the water supply and essential pollination services supported by adjacent forested areas.

Water security, climate resilience and disaster resilience were crosscutting themes highlighted across all consultations. As such, the assessment will reflect the fact that Grenada is a small island developing state which has been impacted by hurricanes, and that the majority of Grenada’s infrastructure, for example, ports, roads, hotels and other resorts, is located on the coast and threatened by climate change-induced sea level rise and coastal erosion. The assessment will focus on mangroves and coral reefs, given their critical role in protecting these assets, yet it will describe how they are also under pressure from climate change. The assessment will demonstrate that sectors such as tourism, agriculture and fisheries are all major contributors to Grenada’s economy and major employers of its people and that these sectors are underpinned by healthy and well-functioning ecosystems.

Overall, the NEA will focus on the aforementioned ecosystem types, and the variety of environmental and anthropogenic drivers of change that impact them. The NEA policy questions will also incorporate the cross-cutting themes highlighted above.

5 SCOPE OF ASSESSMENT

The Grenada NEA aims to assess the status and trends of Grenada’s ecosystems and identify the drivers and responses to these trends. This assessment will answer several related questions on the interactions between Grenadians and their ecosystems, based on the priorities identified throughout the scoping process highlighted in the rationale section above. These policy questions are:

- **What are the status, trends and threats to Grenada’s forest, coastal, marine, freshwater and agricultural ecosystems and ecosystem services?**
- **What is the current and projected value of coastal, marine, freshwater and agricultural ecosystem services for the Grenadian economy and human well-being?**
- **How do Grenada’s ecosystems contribute to climate resilience (food and water security, disaster resilience, climate change adaptation/mitigation)?**
- **What is the value of the genetic resources across the different ecosystem types, in particular, the agricultural landscapes of Grenada?**
- **What opportunities exist to support, enhance and amplify the delivery of ecosystem services for the economic and social well-being of Grenadians?**

These questions and the subsequent NEA are designed to mainstream the consideration of biodiversity and ecosystem services into Grenadian decision-making, focusing on the key issues highlighted above. Policy questions are also designed to strengthen the science policy interface for the government of the Grenada as well as civil society and the private sector.

Grenada’s relatively small size affords the assessment the opportunity of assessing general ecosystem status, trends and contributions to well-being and climate resilience at the national scale. Therefore, for the purpose of this assessment, the geographic scope will include the land, inland waters and marine space of the three inhabited islands of Grenada (Grenada, Carriacou and Petite Martinique). It should be noted, however, that while the geographic area of the assessment is national, certain policy questions and topics may be covered at the sub-national scale as detailed case studies. These case studies will be used to fill data and information gaps on ecosystem goods

and services and provide detailed information on ecosystem service value for future trade-off decisions.

It is anticipated that the assessment will use 2020-2035 as the time frame for scenario building activities. This temporal scale was selected to align with the Grenada National Sustainable Development Plan, to maximise the mainstreaming of the NEAs results with high level policymakers' goals. Scenarios developed for the NEA will articulate clearly how biodiversity and ecosystem services contribute to the achievement of this Plan.

6 UTILITY

This assessment will provide essential information to national decision-makers, policy makers and their supporting staff as they develop and implement policies and initiatives for the achievement of Grenada's National Sustainable Development Plan 2020-2035. By articulating the benefits of ecosystems and their services in economic terms and the close linkages to national well-being, the report will enable the mainstreaming of ecosystem goods and services values into government processes and thinking. In this regard, the assessment will articulate how biodiversity and ecosystem services contribute to non-environmental Goals #1 (Society) and #2 (Economy) of the country's Sustainable Development Plan (Figure 12).



Figure 12: Strategic Framework of Grenada's National Sustainable Development Plan 2020-2035.

Grenadian decision-makers need credible, authoritative and up-to-date information on biodiversity and ecosystem services that assess the complex interlinkages between humans and nature. More specifically, several plans, policies and regional/global environmental agreements need detailed and comprehensive supporting data to enable more effective enactment, application, enforcement,

monitoring and reporting. Key policies and plans that require targeted information to support decision-making include Grenada's:

- Protected Area Systems Plan
- Dry Season/Drought Management Plan (2019)
- Disaster Resilience Plan
- Water Policy (Draft)
- Land Policy (Draft)
- National Forest Policy and Strategy (Draft)
- National Environmental Policy and Strategy (2005)
- National Climate Change Policy (2017)
- Integrated Coastal Management Policy (Draft)

Furthermore, this report will support implementation of and reporting on regional and global multilateral environmental agreements and strategies such as:

- Convention on Biological Diversity (CBD), including the Cartagena Protocol on Biosafety and Nagoya Protocol on Access and Benefit-Sharing
- Ramsar Convention on Wetlands of International Importance
- United Nations Framework Convention on Climate Change (UNFCCC)
- The draft Caribbean Community (CARICOM) Biodiversity Strategy (2019-2030)
- The draft Organisation of Eastern Caribbean States (OECS) Biodiversity and Ecosystems Framework (in development)
- Sustainable Development Goals
- Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Area (Cartagena Convention) and its associated Protocols
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

7 ASSUMPTIONS

The assessment will be built on available scientific data sets, including remote sensing data where available. There will also be a strong emphasis on local and indigenous knowledge. The NEA will draw on the frameworks and guidelines provided by the IPBES regional, global and thematic assessments and information provided by supporting institutions such as the WCMC. Where significant data gaps exist, it is assumed that the expert and author groups will have the capacity to provide expert opinion to overcome these gaps.

The expert and author groups for the assessment will follow provided guidelines and collectively, represent a balance of inputs from the natural, social and economic sciences. Expert and author groups across chapters and thematic groups will interact and coordinate on their activities, enabling conceptual and methodological coherence across the assessment. Expert and author groups will work closely with the project team to ensure that local and indigenous knowledge are incorporated into the assessment in a participatory manner, particularly to support data gaps in ecosystem trends.

8.1 KEY DATA SOURCES

The assessment will be built on available data taken from both peer-reviewed and grey literature. An initial review of the literature indicates that government data and grey literature will play an important role in the assessment due to limited availability of up-to-date peer-reviewed literature covering environmental and biodiversity related topics in Grenada. The following are the key data sources that will be drawn on for the project:

Government datasets: State agencies and government ministries hold a valuable repository of data. The Ministry of Agriculture and Lands, as well as the Ministry of Finance, Planning, Economic Development & Physical Development, will be approached for relevant land use maps and agricultural data. For data on aquatic ecosystems, the National Water and Sewerage Authority will be a primary data source. Environmental impact assessment studies submitted to the government will also be considered as a data source. (Government of Grenada, 2017) (Government of Grenada, 2015).

National reporting to international agreements: Data from the country's national reports to agreements such as the CBD, UNFCCC and the Ramsar Convention on Wetlands of International Importance will be used in the assessment.

Project data: Data generated by national and regional projects, post-hurricane assessments and historical accounts will also act as an important data source. Examples of projects which can supply information for the assessment include:

- Implementing a “Ridge to Reef” Approach to Protecting Biodiversity and Ecosystem functions within and around Protected Areas in Grenada – Global Environment Facility (GEF)/United Nations Development Programme (UNDP) funded project with a focus on enhancing biodiversity, sustaining ecosystems and regenerating the landscape of Grenada.
- “Integrated Climate Change Adaptation Strategies (ICCAS)” project – funded by the German BMU within the scope of IKI.
- OECS Global Climate Change Alliance Project on Climate Change Adaptation and Sustainable Land Management in the Eastern Caribbean” – funded by the European Union.
- The Commonwealth Marine Economies Program in Small Island Developing States – in collaboration with the Centre for Environment, Fisheries and Aquaculture Science enabling safe and sustainable marine economies across Commonwealth small island developing states, including updated bathymetric data, benthic mapping and data collection, development of national maritime economy plans and identification of entry points for marine alien invasive species.

Regional data sets and policies: Due to the existence of strong regional political coordination mechanisms in the OECS and CARICOM, regional policies and datasets will also be drawn on for the assessment. Online data sources such as the Caribbean Protected Areas Gateway will be utilised.

Indigenous knowledge: Scientific data and information will be consistently supplemented by indigenous knowledge in a structured way. The NEA scoping exercise has already benefited from community stakeholder consultations and a cell phone video competition to gather indigenous knowledge. Other mechanisms for community engagement like BioBlitzes will be explored for the actual assessment.

8.2 ADDITIONAL DATA

In order to complete the assessment and maximise the report's use by policy makers, the report will seek additional data on the areas of focus listed below. Where data is not available, expert opinion, rapid assessments and remote sensing options will be considered.

Economic value of ecosystem services. Beyond provisioning services such as agriculture, fisheries and some cultural services such as tourism, there is limited data and information on the economic value of ecosystem services in Grenada. Further, non-use values and value of utilised genetic resources are largely non-existent yet an area of high interest based on consultations. Value transfer methodologies will be considered to fill these gaps. In addition, experts with socio-economic backgrounds will be part of the author teams for each chapter.

Temporal frequency. Many data sets are 'one and done' and if updated, often employ new methods or strategies, making the establishment of strong trend observation a challenge. Analysis of available remote sensing data will be explored to mitigate against this challenge.

Detailed downscaled climate change projections. Climate change is a major driver of change in Grenada and so detailed data on the potential physical impacts of climate change are essential to inform scenario building and back casting exercises.

9 REPORT OUTLINE FOR THE GRENADA NATIONAL ECOSYSTEM ASSESSMENT

The NEA will be broken down into the following seven chapters:

Chapter 1. Setting the scene: Why a National Ecosystem Assessment and how will it contribute to better decision-making? This chapter will outline key concepts and frameworks for connecting biodiversity and ecosystem services to the economic and social resilience of Grenada. It will articulate the challenge of making decisions while trying to balance social, economic and environmental needs, and the importance of tools such as the NEA in supporting decision-making by policy makers. The chapter will outline the NEA goal of equipping a broad range of stakeholders with increased knowledge and tools to promote the inclusion of biodiversity and ecosystem values in national decision making. Finally, the chapter will also describe the scope, rationale and utility of each of the subsequent chapters in the assessment.

Chapter 2. What are the status, trends and threats to Grenada's forest, coastal, marine, freshwater and agricultural ecosystems and ecosystem services? This chapter will assess the status, extent and health of forest, freshwater, agricultural, coastal and marine ecosystems across Grenada, Carriacou and Petite Martinique. It will include an outline of the spatial extent of these ecosystems and a description of how they are changing. This chapter will also articulate the major threats and pressures on Grenada's biodiversity and ecosystems and provide an overview of the existing policies and institutional frameworks that currently govern the management of Grenada's natural resources.

Chapter 3. What is the current and projected value of coastal, marine, freshwater and agricultural ecosystem services for the Grenadian economy and human well-being? The current and projected value of coastal, marine, freshwater and agricultural ecosystem services will be assessed in this chapter. The importance of these ecological resources to the economic and social resilience of Grenada will be highlighted, including an analysis of their importance for a range of sectors including agriculture and tourism. These data will in aid future trade-off decisions at the national scale.

Chapter 4. How do Grenada’s ecosystems contribute to climate resilience (food and water security, disaster resilience, climate change adaptation/mitigation)? Grenadians are particularly concerned about the current and future impacts of climate change on their tri-island state and economy. This includes the anticipated impacts of climate change on food and water security and the impacts of high intensity disaster events such as hurricanes. Given this concern, in addition to the economic, social and cultural values outlined in the previous chapter, this section specifically examines value of ecosystems and their services for climate resilience. This includes, for instance, the roles of ecosystems as green-blue infrastructure protecting coastlines during hurricane events or their importance in water security, given the drier conditions anticipated for the Caribbean due to climate change. If supporting data is available, the concept of resilience will be explored at multiple scales including the macro (national resilience) and micro (community resilience).

Chapter 5. What is the value of the genetic resources across the different ecosystem types, in particular, the agricultural landscapes of Grenada? Rich in biodiversity, the Grenadian government and people are aware of the untapped potential of the genetic resources housed in its biodiversity. This chapter will expand on the value of Grenadian genetic resources as both a resource to be directly utilised but also as a potential justification of broader biodiversity preservation to preserve genetic values.

Chapter 6. What opportunities exist to support, enhance and amplify the delivery of ecosystem services for the economic and social well-being of Grenadians? Incorporating science into policy requires the identification of not only negatives but also opportunities for positive change. This chapter will begin with the identification of opportunities and mechanisms for protecting ecosystems and ecosystem services, focusing on policy and financial instruments. Mainstreaming economic valuation into Grenada’s existing policy and plans will be explored. The chapter will then examine mechanisms to amplify the delivery of ecosystem services through ecological restoration, providing guidance as to where restoration would yield the greatest value for the economic and social well-being of Grenadians.

Chapter 7. Scenarios and pathways to a sustainable future.

This chapter advances each of the previous sections, articulating scenarios and pathways of the future based on different levels of biodiversity mainstreaming into decision-making, including deployment of the mechanisms outlined in Chapter Six. These scenarios will be directly followed by recommendations and conclusions on how best to mitigate the negative impacts presented in the scenarios and maximise the possibility of sustainable futures. The report will conclude with an articulation of the next steps to activate its recommendations based on consultation with all stakeholders.

These main research actions associated with each chapter are highlighted in Table 1 below

Table 1: Research actions for each chapter

Chapter	Main research action
Chapter 1. Setting the scene: Why a National Ecosystem Assessment (NEA) and how will it contribute to better decision-making?	<ul style="list-style-type: none"> • Highlighting the need for the NEA • Raising awareness of and buy-in for the NEA
Chapter 2. What are the status, trends and threats to Grenada’s forest, coastal, marine, freshwater and agricultural ecosystems and ecosystem services?	<ul style="list-style-type: none"> • Biophysical mapping of ecosystem services using data and models • Mapping of threats to ecosystems and the services they provide.
Chapter 3. What is the current and projected value of coastal, marine, freshwater and	<ul style="list-style-type: none"> • Valuation of key ecosystem services

agricultural ecosystem services for the Grenadian economy and human well-being?	
Chapter 4. How do Grenada's ecosystems contribute to climate resilience (food and water security, disaster resilience, climate change adaptation/mitigation)?	<ul style="list-style-type: none"> • Valuation of key ecosystem services for climate resilience
Chapter 5. What is the value of the genetic resources across the different ecosystem types, in particular, the agricultural landscapes of Grenada?	<ul style="list-style-type: none"> • Valuation of genetic resources
Chapter 6. What opportunities exist to support, enhance and amplify the delivery of ecosystem services for the economic and social well-being of Grenadians?	<ul style="list-style-type: none"> • Identification of policy and financial instruments to support the conservation of ecosystems and associated services • Development and application of an ecosystem restoration site prioritisation tool
Chapter 7. Scenarios and pathways to a sustainable future.	<ul style="list-style-type: none"> • Scenarios and pathways

10 OPERATIONAL FRAMEWORK AND KEY RESPONSIBILITIES

The assessment is operationalised by co-chairs, the Grenadian government focal agency (Environment Division) and the Technical Secretariat (CANARI). The chairpersonship of the assessment is shared among a government decision-maker from the Environment Division, a technical expert from the University of the West Indies and a civil society representative from a local NGO. This is to ensure that the report is responsive to policy maker needs, technically robust and reflective of broader stakeholder perspectives. The assessment team and the co-chairs take guidance from the National Management Committee which in addition to the co-chairs, CANARI and the government focal point, includes representatives from the Forestry and Fisheries Divisions of the Ministry of Climate Resilience, the Environment, Forestry, Fisheries and Disaster Management. The National Management Committee reports to the Permanent Secretary who convenes the Grenadian NDSC monthly meeting which serves as the National Science Policy Platform for the NEA.

11 ASSESSMENT WORK SCHEDULE AND PROCESS

The proposed workplan for the assessment is shown in the Gantt chart below.

12 PROJECT COMMUNICATION, STAKEHOLDER ENGAGEMENT AND CAPACITY BUILDING

Project outreach and training have already begun through the seven stakeholder workshops held across Grenada, Carriacou and Petite Martinique. These workshops hosted a cross-section of stakeholders who were apprised of the project, introduced to key ecosystem services and valuation concepts and given the space to share stories of their work and/or interactions with ecosystems. A short video was produced by CANARI as a communication product on the importance of the project itself, targeted at key stakeholders such as government ministries and decision-makers. The video also complements capacity building activities for both the government and general stakeholders on communicating ecosystem service values, which was explicitly requested during consultations. A full communication and engagement strategy will be developed in 2020, inclusive of a detailed stakeholder analysis.

Stakeholder training on the creation of cell phone videos was also conducted during the scoping exercise workshops. A subsequent video competition was launched for all nationals of Grenada to share their stories on ecosystem importance and ecosystem change over the years. The cell phone video training was the first step in the environmental advocacy capacity building thrust which will continue until the completion of the NEA. It is envisioned that by building the advocacy skills of civil society organisations, youth and private sector, that these stakeholder groups will advocate for the consideration of the assessment's findings in national decision-making processes. This approach will amplify any lobbying executed by the assessment team and National Management Committee towards this same goal.

In terms of assessment-specific skills, it is intended that a key activity in the early stages of the project will be to train and build local capacity in spatial analysis and economic valuation for the assessment team, authors and other interested stakeholders. Other capacity building efforts will be identified as the project progresses.

13 CONCLUSION

The Grenada National Ecosystem Assessment represents an important step in enhancing the management of the country's biodiversity and ecosystem services. With clearer information linking the national economy and human well-being to biodiversity, the government and various national decision-makers will be better prepared to make decisions that increase overall national well-being, not only in the short term, but looking into the future.

As an independent, developing island nation, Grenada faces numerous challenges related to its vulnerability to hurricanes and natural disasters during hurricane season, to climate change-related impacts on islands and susceptibility to global economic shocks due to its open economy. It is also the first island nation conducting an NEA under the guidance of IPBES and UNEP-WCMC as part of a commitment to a sustainable development pathway. This project and its NEA will produce information that can be used to support NEAs in other island states and states with similar geographies and environmental economic challenges. The assessment team and Government of Grenada hope to set a global example of how to conduct NEAs in this context through the mainstreaming of Grenada's NEA learnings into governance, policy, decisions to support sustainable living.

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APPENDIX 1: STAKEHOLDERS CONSULTED DURING THE SCOPING EXERCISE

Table 1. Consultation with representatives of Government ministries, national agencies and tertiary institutions- 4th February 2020

Name	Organisation/Occupation	Email	Phone no.
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Jody Daniel	Executive Director/GAEA Conservation Network	info@gaeaconservation.org	456 6110
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Table 2. Youth consultation-30th November 2019

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Table 3. St. Patricks Consultation- 28th November 2019

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Table 4. Grenville Consultation- 27th November 2019

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Table 5. La Sagesse Consultation- 27th November 2019

Name	Organisation/Occupation	Email	Phone no.
Benedict Newton	Ebenezer Pentecostal Pastors	benneict@hotmail.com	1 473 449 1507
Rev. Patricia Baptise	Rock Spiritual Baptist Church	-	1 473 406 0466
Rev. Thaddeus Baptiste	Rock Spiritual Baptist Church	-	1 473 414 8346
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Joy Peters	La Sagesse Farmer	-	1 473 404 4111
Lydia Bonaparte	La Sagesse Farmer	-	1 473 459 6167
Christopher Brizan	Wind Fresh Ltd.	-	1 473 449 6923
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Lingham Samuel	New Democratic Congress (NDC) St. David's	lingham.samuel@gmail.com	1 473 405 1157

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Jonathan Francis	Community member	-	-
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Ann Charles	-	-	1 473 419 1634
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Table 6. Petite Martinique Consultation- 25th November 2019

Name	Organisation/Occupation	Email	Phone no.
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Kioia St. Bernard	Farmer	-	1 443 9246/420 4861
Paula Clement	Palm Beach Restaurant	-	1 473 443 9103
Shadick Bethel	Parliamentary Consistency Support Officer	-	1 473 456 6096
Grace Benjamin	Lobster Alive	-	1 473 533 6728
Emmanuel O. Satt	Police Officer	-	1 473 443 9044
Cathy-Ann Bethel	Community	-	1 443 9002
Tobias Rock	Builder (house/boat), Fisherman	-	1 473 419 8021/443 9001
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Table 7. Carriacou Consultation- 22nd November 2019

Name	Organisation/Occupation	Email	Phone no.
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Kristy Shortte	Sustainable Grenadines Inc.	Kristyshortte@yahoo.com susgreninc@gmail.com	1 784 485 87779/ 434 1299
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Mich Sylvester	Sandy Island/Oyster Bed Marine Protected Area (SIOBMPA)	dr.pirate@hotmail.com	1 473 415 9468
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Richard Laflemme	Lumbadive Reef Foundation	dive@lumbadive.com	1 473 456 3474
Judith Charles Date	Delicious Tasty Hide Out/Carriacou Association of Small Agro Processors (CASAP)	-	1 473 406 2220
Michael Jeremiah	Royal Grenada Police Force (RGPF) Carriacou Police Station PC 589	jeremiahpcl@hotmail.com	1 473 456 0582
Renelle Romain	Ministry of Youth Imani Supervisor	renelleromain2gmail.com	1 473 405 1312
Camasha Thomas	Senior Assistant Youth Officer	ccoucamasha@hotmail.com	1 473 443 6026

Table 8. Miscellaneous meetings/virtual and face to face interviews with Grenadian stakeholders June 2019-February 2020

Name	Organisation/Occupation	Email	Phone no.
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