
## COAST Insurance:

# An Assessment of Grenada's Fisheries Sector

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# COAST Insurance:
# An Assessment of Grenada's Fisheries Sector

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ISSUE DATE: FEBRUARY 1, 2019

# Acknowledgements

This study was produced as part of the Caribbean Oceans and Aquaculture Sustainability faciliTy (COAST) project. COAST is a partnership between the U.S. State Department, the World Bank, the Caribbean Catastrophe Risk Insurance Facility (CCRIF SPC), and the Caribbean Regional Fisheries Mechanism (CRFM). Numerous organizations and experts engaged in the subject took part in the assessment, making it possible. The team is especially grateful for the guidance and leadership of Valerie Hickey (Latin America and the Caribbean Practice Manager, World Bank) and Tahseen Sayed (Caribbean Country Director, World Bank).

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We give special thanks to the Government of Grenada for invaluable technical contributions from the following agencies: Fisheries Division; Ministry of Finance, Planning, Economic Development & Physical Development; Ministry of Climate, Resilience, the Environment, Forestry, Fisheries, Disaster Management & Information; Ministry of Infrastructure Development; Ministry of Social Development Housing and Community Empowerment; National Disaster Management Agency. Additional help came from the Grenada Development Bank; Fishers Businesses and Insurance; Fisheries Cooperatives and Fish Markets; the Grenada Red Cross, and The Nature Conservancy.

Finally, invaluable support and guidance came from Moran Mitchell (Chief Fisheries Officer of Grenada), Isaac Crafton (former Chief Fisheries Officer), and Charene Bowen and Hermione Elcock (Data Management Supervisors at the Fisheries Division).

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# 1 Introduction: Why COAST?

Employing roughly 300,000 people directly and indirectly, the Caribbean Community's fisheries sector is a vital source of livelihood and development in the region. The sector makes major contributions to food security, poverty alleviation, employment, foreign exchange, culture, recreation, tourism, and the general quality of life in rural and coastal communities. Fisheries are an important contributor to Gross Domestic Product (GDP) in the region, accounting for up to 7 percent in some countries.

Direct employs consist of the people who go out on the boats and catch fish. A much larger group makes livings indirectly. These include people engaged in processing, preserving, storing, transporting, marketing, and selling fish and fish products. Others make nets, build and maintain vessels, or work in research, development, and administration linked with the fisheries sector. Many of the region's fisherfolk live in rural communities where their activities are a mainstay of the local economy.

Over the long term, Caribbean fisheries face many pressures. These include poor fishing practices and poaching; degradation of supporting habitats such as coral reefs, seagrasses, and mangroves; sargassum blooms, and invasive species such as lion fish. But in the long term, the list is topped by climate change. Already, studies show that it is modifying the distribution and productivity of fish stocks. Projections suggest that over time it will cause a series of profound biophysical and socio-economic impacts that could undermine the sustainability of fisheries and the livelihoods of the communities that depend on them.

Tropical storms and other major weather events, which are intensifying due to climate change, hit the islands' fishery communities disproportionately hard by preventing fishing before, during, and after the events. During the event itself, vessels and fishing gear are destroyed or damaged. Afterward, the harm is compounded by loss of public services such as electricity, fueling stations, piers, and roads. Fishery products stop flowing to market, causing special hardships in poor communities.

Yet at the same time, fisheries can play an important role in disaster recovery. While the sector is highly vulnerable to climate hazards, its people can get back out on the water as soon as they have good weather—and functioning boats and equipment. They can bring back fish to communities that would otherwise go hungry after a disaster. For this reason, a rapid bounce-back of the fishing industry after weather events can be critical for overall recovery and food security in the Caribbean.

Recent hurricanes and their devastating effects demonstrate the need for a climate risk insurance product to ensure that fishing communities can quickly rally after such events.

To meet this need, the Caribbean Ocean and Aquaculture Sustainability faciliTy (COAST) initiative was developed. COAST is an innovative climate risk insurance mechanism to promote food security, livelihoods of fisherfolk, fisheries resilience, sustainable management of coastal infrastructure, and disaster risk reduction in the Caribbean.

## 1.1 Objectives of the Report

This study has three main objectives:

- To develop a methodology to gather fisheries and disaster risk management information at the country level and incorporate it into the development of the COAST product;
- To apply the assessment methodology in Grenada; and
- To understand interest in COAST insurance in the fisheries sector and readiness to implement it.

# 2 COAST—The First-Ever Parametric Insurance for Fisheries

In traditional insurance, covered parties submit claims for specific losses that they have suffered. The insurer gathers information to confirm that the claims are justified, an often time-consuming process, then issues payment based on the size of the loss. Parametric insurance, in contrast, pays out automatically when a pre-agreed "trigger" event occurs—a Caribbean storm of such-and-such intensity over such-and-such geographical area, for example. Payments go to all covered parties within the affected zone, regardless of the details of their own losses. By its nature, parametric insurance gets money into the field much faster than the traditional variety with its delays and claims adjustment bureaucracy.

COAST insurance is parametric. As with all insurance of this type, COAST is based on a model of probability. CCRIF SPC, working with the World Bank, finalized a catastrophe model for COAST called SPHERA4COAST. It is based on regional databases as well as country-level data, including for Grenada. The model includes the two categories of losses that COAST covers:

- Adverse Weather (AW) Component. This evaluates losses that the rough seas and heavy rainfall of adverse weather cause to fisherfolk by preventing them from carrying out their usual activities.
- Tropical Cyclone (TC) Component. This assesses direct damage by tropical cyclones—typically due to high winds and storm surge—to fishing assets such as vessels, equipment, and infrastructure.

COAST was developed through a partnership of the U.S. State Department, which donated funds; the World Bank, which supported the product design and government readiness to implement COAST; CCRIF SPC, which developed and issued the actual insurance policies; the Caribbean Regional Fisheries Mechanism (CRFM), which supported implementation of COAST; and the Caribbean governments.

COAST is now offered in two countries, Grenada and Saint Lucia, on a pilot basis. The first phase of coverage began on July 1, 2019 and will run until May 30, 2020.

The national government and the fisherfolk of Grenada are both direct beneficiaries of the COAST product. The government benefits by transferring the huge liability of disaster recovery to CCRIF SPC and reducing volatility in its national budget. Fisherfolk—boat owners, captains, crew members, fish vendors, and fish groomers—gain from direct and quick pay-outs from the Ministry of Finance in the event of catastrophe.

## 2.1 COAST's Innovative Features

- First-ever climate risk parametric insurance developed for the fisheries sector—spearheaded by the Caribbean. Vulnerable fishing communities are getting access to insurance developed specifically for their needs.
- Promotion of resilience in the fisheries sector. COAST will foster a stronger blue economy in the region by reducing the harm of climate change to fisheries food security and by incentivizing policy reforms for climate-smart fisheries practices and coastal resilience.
- First-time insurance coverage for "bad weather" events, including tropical cyclones. COAST innovates in also covering potential losses that fisherfolk suffer due to high waves and heavy rainfall.
- Rapid pay-outs. CCRIF SPC will channel pay-out funds to the Ministry of Finance of participating countries within 14 days of the covered event, followed by a quick transfer to fisherfolk and other beneficiaries.
- First-time tracking of pay-outs down to the level of individual beneficiaries. A special financial management and auditing system will make this possible.
- Inclusiveness and participation of women. COAST is intended to cover all participants in the fisheries sector, including crew members, captains, and boat owners, but also fish vendors and processors, most of whom are women. The list of beneficiaries is predefined by the governments in a COAST Operational Manual.

In year one of the program, COAST is advancing the formalization of the fisheries sector by registering all stakeholders in the fisheries value chain, including the women who often go uncounted and unrecognized. The next step will be to promote better data management and reporting to improve ability to locate fisherfolk and fisheries assets. These measures will help strengthen nature-based resilience for coastlines and infrastructure.

# 3 Developing an Assessment Methodology for COAST

Development of the COAST assessment methodology was carried out in three phases, drawing on scoping visits, research, data-gathering visits to Grenada, and stakeholder discussions and feedback.

- Phase 1 included reconnaissance visits to three case-study countries (Grenada, Jamaica, and Belize) to consult government officials and key stakeholders. We introduced our team and project purpose to local officials. We explored the fisheries management systems of each country, including data collection and monitoring. We gathered information on how fisheries are organized, and what commitments the countries had made towards the Caribbean Community Common Fisheries Policy (CCCFP).
- Phase 2 involved reviews of published literature and stakeholder-team discussions to identify indicators for exposure, hazard, vulnerability, and adaptive capacity. We developed a data assessment checklist with key topics and variables to assess the need and readiness of the countries' fisheries sectors for COAST insurance.
- Phase 3 included week-long visits to Grenada to hold discussions with government authorities in finance, fisheries, natural resources, and disaster risk management and with key stakeholders such as fisher cooperatives, non-governmental organizations, and banks. The purpose was to:

    1. assess local interest in COAST and understand current insurance gaps;
    2. understand preparations to use COAST insurance to protect the fisheries sector; and
    3. identify and collate fishery, environmental, and disaster risk management data and information for use in constructing a risk transfer model for the fisheries sector.

Risk is a term in everyday use that is difficult to define in practice due to the complex relationships between its components (Baas et al. 2008 and Clement et al. 2018). Risk is the combination of the likelihood (probability of occurrence) and the consequences of an adverse event such as a hurricane. The three major elements of risk are exposure, hazard, and vulnerability (Baas et al. 2008). These elements can be applied in various ways depending on factors such as the level of uncertainty, the focus of an assessment (such as broad or specific), and the direction and emphasis of the approach used.

Briefly, hazard refers to the likelihood and intensity of a potentially destructive natural phenomenon, while exposure refers to the location, attributes, and value of assets that are important to the fisheries sector that the hazard threatens (Clement et al. 2018). Vulnerability, on the other hand, is the reaction of the assets when exposed to forces produced by a hazard event (Clement et al. 2018). A wide range of data is required to assess each of these components. At a national level, some of these data are held by government agencies while others are in the hands of non-governmental stakeholders.

During development of COAST, the World Bank and CEFAS created a checklist (Table 1) and used it to gather data and information for a range of variables grouped by key fisheries assessment and management topics. The variables were carefully selected to ensure that the data could address the three key components of risk. Other variables such as institutional capacity were included to gather information on how COAST could be implemented in the case-study countries.

**Table 1:** Data Assessment Checklist of Key Topics (numbered) and Variables to Assess Need and Readiness of Fisheries Sectors for COAST.

| *Topic* | *Variables* |
|---|---|
| **1. Information and data management concerning fisheries:** | Boat and engine registration (including ownership)<br>Fisherfolk registration/licensing process and systems<br>Are data disaggregated by gender, age, other metrics such as demographics?<br>Are data on license registration for individuals, boat owners, actual users aggregated or individualized?<br>Are data disaggregated by part-time, full-time, and operational site?<br>What is the process for registration?<br>How and when are licenses renewed?<br>What are the barriers/incentives to individuals becoming licensed?<br>Why are more fishers not registering??<br>What proportion of total fishers is registered?<br>Fishers' telephone numbers and addresses<br>How can fishers be reached in the event of a storm?<br>Is information on next of kin/alternative beneficiary collected?<br>Number and types of boats and gear<br>Landing site from which the boat operates<br>Value of boats<br>Value of gear<br>Landings—weight and value<br>Are data disaggregated between commercial vs. artisanal/subsistence fisherfolk?<br>What criteria are used to distinguish commercial from artisanal fishers—catch yields, access to markets/export, sales values?<br>Are data disaggregated by geographic areas such as parishes?<br>Are data disaggregated temporarily (monthly, weekly etc)<br>Catch size limits<br>Foreign fishing agreements<br>Fish stocks monitoring and assessments<br>Information on maximum sustainable yield<br>Fishing monitoring, control, and surveillance (MCS) systems<br>Season and area closures<br>How are these agreed upon—seasonal yields, breeding times, timing of policies?<br>Is the fisher/data registry deposited with CRFM?<br>Is access to fishery resources effectively managed? |
| **2. Fisher organization and capacity:** | Type and level of fisher organization<br>How do cooperatives operate?<br>Where do fisher cooperatives get their funding?<br>Percentage of fisherfolk associated with a cooperative/organization<br>Are fisheries organizations representative with regards to total number of fisherfolk (direct and indirectly employed)?<br>Do individual fishers have access to financial services (credit, loans, insurance)?<br>What type of services are these and where do they come from?<br>Do associations and cooperatives have the capacity to manage financial resources?<br>Are they involved in co-management of fisheries or marine protected/managed areas?<br>What is the structure of the cooperative system?<br>Do members (fishers) trust cooperative leaders to receive funds on their behalf?<br>What do cooperatives offer to fisherfolk?<br>Do individual fishers benefit from cooperatives? |

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**Table 1:** Data Assessment Checklist of Key Topics (numbered) and Variables to Assess Need and Readiness of Fisheries Sectors for COAST.

| | |
|---|---|
| **3. Supply chain information:** | Landing sites number, capacity, location, and conditions (frequency of maintenance<br>Fish markets number, capacity and location, and conditions (frequency of maintenance)<br>List of assets and their value for each landing site and fish market<br>Employees of fish markets, including their gender<br>Fish processors number, capacity, location, and conditions (frequency of maintenance) |
| **4. Environmental, climate, and socio-economic data sets:** | Mangroves, coral reefs, and seagrass beds location and extent<br>Mangroves, coral reefs, and seagrasses historical monitoring information (in order to evaluate health condition)<br>Climate/weather monitoring systems—identification, number, location, and frequency of data collection/ reporting<br>Climate/storm hazard assessments in coastal areas—availability, latest assessment, how often, what does it map (which hazards, infrastructure assets, ecological assets, population, and vulnerabilities?)<br>Population dependent on fisheries for livelihoods and food<br>Livelihoods diversification in the fisheries communities<br>Monthly or seasonal fisherfolk income estimation |
| **5. Damage to fisheries infrastructure:** | Methodology followed to estimate damage<br>Value of the assets<br>The extent to which a built asset was damaged or lost during a hurricane/storm/inundation<br>Historical data on post-disaster assessments of needs, damage, and losses in the fisheries sector<br>Separate direct and indirect damage (e.g., separating damage to infrastructure and boats from loss of income to the fisheries sector, business interruption, etc<br>Time of recovery or rebuilding after a hurricane/storm/inundation<br>Use of disaster relief grants in the sector (if available) |
| **6. Institutional capacity:** | What is the status of implementation of fisheries policy, national plans, species-specific management plans?<br>Management of fishing effort<br>Disaster risk management and climate change planning tools for risk preparedness, reduction, response, and recovery (what and who's responsible)<br>Human, technical, and financial capacity for monitoring and assessing fisheries management (how many people, technical background, frequency)<br>Human, technical and financial capacity for disaster preparedness and response (how many people, technical background, frequency)<br>Embracing adaptive management, decision-making under uncertainty, and the precautionary approach |
| **7. Current disaster coping mechanisms of fisherfolk:** | Which ones do they use?<br>Do coping mechanisms vary according to age, gender, and others factors such as demographics?<br>What is the existing insurance penetration in the country's fisheries sector?<br>In past events, how did the cooperatives support people in need and what were the gaps?<br>What were the other government interventions in the past or other systems of support used after natural events?<br>How much of a fisherfolk recovery was individually driven vs. externally supported? |

The data collected during this process enabled the team to understand the sector's readiness and baseline to implement COAST at the institutional, and fisher community level. This information was also used to identify existing challenges and gaps to be filled by COAST from the design to the implementation stage.

In addition, it provided valuable information to characterize the exposure of the fisheries sector, which is a critical piece for the development of the catastrophe model in each country. In particular, the data was employed as follows:

- Location of assets: Specific georeferenced information about landing sites, and other fisheries assets was used to evaluate potential impacts of climate events (tropical storms, excessive rainfall).
- Vessel inventory: Number and type of vessels (size, engines, etc), was used to estimate the potential impact to fishers and the whole sector at the time of a climate event.
- Fish catch landings data: Fisheries production (quantity and value) per month, landing site, and species was used to understand the potential loss of income during a climate event.
- Fisherfolk registration: demographic information about registered fisherfolk was used to estimate the number of full-time and part-time fisherfolk at each landing site, and to assess their unit revenue (i.e., the average income of one person in one day, variable in time and space).

# 4 Assessment of Data in Grenada

## 4.1 Fisheries Sector Data

Grenada has a digitized register of fishers, boats, and gear. It contains demographic data on fisherfolk by age, address, gender, and contact in case of emergency. To register a fishing boat, its owner visits the Fisheries Division to fill in a form with relevant information including vessel length and width, size of engine, and type of fishing to be conducted. A photograph is also submitted. Boat registration is done just once in a vessel's lifetime, unless it changes ownership. Every November, a boat inspection is carried out with the goal of ensuring that all vessels in use are registered. However, discussions with fisheries stakeholders indicate that only about 75 percent of vessels are registered. Of these, about 30 percent are owned by women (see Table 2). Women are keen participants in Grenada's fisheries. In some cases, women boat owners come from families that have a strong tradition of fishing.

**Table 2:** Registered owners of vessels in each parish, male and female

| *Parish* | *Male* | *Female* |
|---|---|---|
| **Carriacou & PM** | 9 | 10 |
| **Saint Andrew** | 75 | 8 |
| **Saint David** | 2 | 2 |
| **Saint George** | 41 | 25 |
| **Saint John** | 17 | 14 |
| **Saint Mark** | 5 | 6 |
| **Saint Patrick** | 6 | |
| **Total** | 155 | 65 |

Grenada also has a system by which individual fishers register. As part of that process, they receive licenses to fish, which must be renewed annually. For some new fishers, registration takes place when their vessels are being registered. Grenada's fishers fall into two groups: primary fishers who are usually full time (defined as spending more than 70 percent of their work time fishing) and secondary fishers, who are usually part time (less than 70 percent of time). Almost all of Grenada's registered fishers are commercial, but small-scale in operation. Subsistence fishers (people who fish for home consumption) generally do not register.

Fisheries data collectors record the weight and value of landings daily at Grenada fish markets. Landings data are collected based on boat name, species, effort, crew size, area fished, and type and quantity of gear used. Usually, a data collector approaches each vessel that lands to take the landing details. To capture the weight and price, the fish are separated by species. Fishers receive concessions (i.e. duty and tax) and other incentives for complying with the data collection process.

Landings in Grenada are dominated by pelagic fish species (80 percent), followed by reef fish (18 percent). Shellfish make up 2 percent (Table 3). The fisheries sector is Grenada's largest exporter, with tuna, lobster, and conch as the key species sent abroad. Fishers catch other inshore pelagic and reef fish species using beach seines, but data on these are not collected because they are not landed at the primary sites. Official landings data therefore underestimate actual landings. It is difficult to work out what proportion of landings eludes the current data set. Given that only 75 percent of fishers are registered and some of their landings are not captured, it can be inferred that a substantial proportion of landings go unrecorded. The Fisheries Division is aware of these shortcomings and therefore uses raising factors for some species, such as conch, to estimate the full volumes. The division is working with FAO to assign a statistician to help develop a more accurate raising factor.

**Table 3:** Landings per Year in Grenada, by Pelagic, Reef Fish, and Shelfish

| | *Weight* | | *Value* | |
|---|---|---|---|---|
| *Species* | *kg per year* | *% of total catch* | *EC$ per year* | *% of total value* |
| **Large pelagics** | 1,723,018 | 73 | 21,684,093 | 74 |
| **Reef fish** | 429,379 | 18 | 5,402,037 | 19 |
| **Small pelagics** | 165,127 | 7 | 1,188,810 | 4 |
| **Shellfish** | 49,079 | 2 | 907,767 | 3 |
| **Total** | 2,366,603 | | 29,182,707 | |

*Source:* Government *of Grenada, 2018*

Grenada has size limits for lobsters, turtle, and conch but none for finfish. The Fisheries Division is working closely with the International Commission for the Conservation of Atlantic Tunas (ICCAT) to manage tuna effectively. This work focuses on data improvement and regulation compliance. Grenada's fisheries data are usually passed onto CRFM upon request but are not deposited there. Discussions have occurred on developing a central repository for the region, but data sharing remains restricted. It is widely perceived that certain countries do not like sharing their data.

Discussions with the Fisheries Division and managers of fish markets indicate that Grenada has three basic categories of markets: (1) primary sites (nine in total) that have staff, permanent buildings, storage, and ice facilities, and known economic value; (2) secondary sites (16 in total) which are mainly beaches and have no buildings; and (3) tertiary sites (three in total), which are the main facilities for fish processing and export. These have permanent buildings and their value is known. It is here that landings data are usually collected. Under a project with FAO, data collection from the tertiary sites is being entered directly into a digital device at the site, which electronic transmission directly to the Fisheries Division.

After previous catastrophic floods and hurricanes, fish markets have been back up and running within months, a considerable delay but generally sooner than other economic facilities. Grenada is seeking better resilience in future disasters. Today's market buildings are government-owned and insured by the government. Built after the devastation of Hurricane Ivan in 2004, the main markets in St George's, Grenville, and Gouyave are physically strong and are being made climate-resilient and able to stand sea-level rise. Still, they are within the surge zone and so may be vulnerable.

Regarding employees of fish markets, the Fisheries Division maintains a registry for vendors and fish cleaners. According to the division, this includes many women who work in the markets. Some are linked to certain boats, having invested heavily in them, as well as nets, and other fishing assets.

Information on the location and types of fishing infrastructure and their economic value are available through post-disaster assessments and the Land Use Department. Discussions with local stakeholders suggested that the total investment in infrastructure three years ago was about EC$250 million. As for boats, most fishers use small wooden ones. Such a boat with no gear would

typically cost EC$600,000-EC$800,000. Data limitations make it impossible to break down fisheries investment into categories in a systematic way.

An assessment after Hurricane Emily in 2005 estimated that direct damage to fisheries totaled EC$398,000 and indirect damage C$435,321, for a total of EC$833,312 (OECS 2005). Boat hulls, communications systems, fish markets, and UHF and VHF antennae were among common losses. Nineteen fishers lost income because their vessels were put out of commission for an estimated six months after the hurricane. After the much more destructive Hurricane Ivan in 2004, EC$3,176,000 in direct damages to fisheries and EC$2,556,500 in indirect were estimated—a total of EC$5,732,500 (OECS 2004). Boats, engines, gear, safety equipment, housing, and communications devices suffered widespread damage.

## Weaknesses of Grenada's Fisheries Sector Data

- While data are collected daily at all primary sites, the data clerks do not weigh all the fish, so official information relies heavily on estimates. The clerks could use additional training, as some have no understanding of why the data are collected and why data need to be accurate and high quality.
- Data collection is focused on primary sites, resulting in data gaps at the secondary sites. For instance, study team members were told that the Fisheries Division may lack data for about 80 percent of shellfish catches, because these are usually landed at the secondary sites.
- Beach seine fishers are highly vulnerable to natural disasters because they fish in areas hit hardest by storm surge, yet data are not collected from them at all.
- The fisher and gear registers are not updated regularly due to capacity problems, so it is difficult to know what quantity of gear is used and how many fishers are out at sea at any given time. The Fisheries Division has only has four technical officers, a number insufficient for the job. With support from the FAO's CC4FISH project (Climate Change Adaptation in the Fisheries Sector in the Eastern Caribbean), the Fisheries Division has started to update boat and fisher registration.
- Although landings data are collected daily, lack of staff at the Fisheries Division means that data are not entered onto computers in a timely way. Many data sheets pile up unprocessed.
- Effort data (hours fished, number of crew, gear used) are collected but are not digitized.
- Stock assessment is not conducted.
- In general, Grenada's documentation of fisheries data and information needs improvement. For instance, data collected from many short-term projects are not held in a central system, disaggregated, or made available for future use. Other issues concern where data are stored, their ownership and accessibility. Table 4 summarizes fisheries sector data in Grenada.

**Table 4:** Summary of Fisheries Sector Data in Grenada

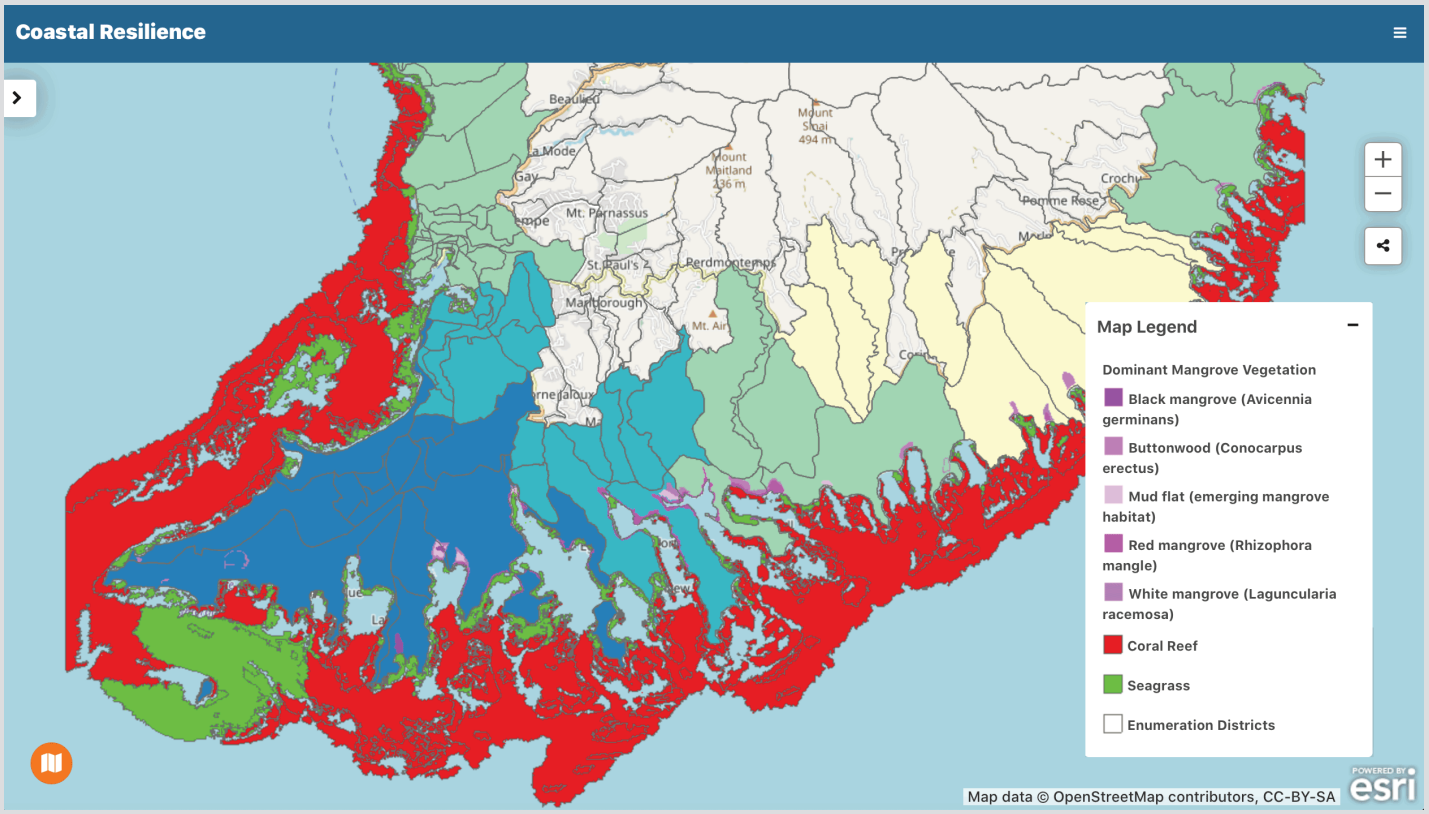
| *Key variable* | |
|---|---|
| **Boat and engine registration** | There is a clear process for registration and licenses.<br>Has digitized information on boat, engine, fishers, and gear<br>Has annual inspections to identify people who are not registered<br>Difficult to tell from the data which vessels are active and which no longer operate |
| **Fisherfolk registration / licensing** | There are some incentives for fishers to register such as better fuel prices.<br>Approximately 75% of fishers are registered.<br>Fisher and gear registers are not regularly updated.<br>Has a registry for vendors and fish cleaners |
| **Fishers' telephone numbers and addresses** | Holds demographic data on fisherfolk in terms of age, address, gender, and contact in case of emergency. |
| **Data on fishing effort** | Effort data (hours fished, number of crew, gear used) are collected but are not digitized. |
| **Landings** | Weight and value of landings are captured daily at nine primary landing sites<br>Data are collected daily from all vessels that land.<br>Data clerks do not weigh all the fish, so official data are based mainly on estimates.<br>Data collection is focused on primary sites, with data gaps at the secondary sites.<br>Long time lag (months) between data collection and entry onto the computer. |
| **Fisheries management practices** | No catch limits. Size limits used for lobsters, turtle, and conch but none for finfish species |
| **Fish stocks monitoring and assessments** | No stock assessment |
| **Fishing monitoring, control, and surveillance (MCS) systems** | Low monitoring, compliance, and surveillance concerning rules and regulations |
| **Data storage and access** | Data are electronically stored and held at the Fisheries Division and Central Statistics Office.<br>Data shared with CRFM upon request<br>Users (students, project staff, etc.) need permission to access data |
| **Data quality** | Data for many variables are collected (number of crew, fishing duration, gear used, fishing depth, etc.) but only weight and value of landings are reported on official data.<br>Emphasis of data collection is to report on total annual production. Other objectives, such as to inform management decisions, are secondary.<br>Minimal assessment of data quality. Data are mainly cross-checked when being entered into computer. Data collectors not well trained. Only landings of major species are weighed. |

## 4.2 Environmental, Climate, and Socio-Economic Data

### 4.2.1 Mangrove, Coral Reef, and Seagrass Data

The Nature Conservancy (TNC) has produced habitat maps for Grenada, including seagrass, mangroves, and coral reefs. Location point data are included for ports. These can be viewed online on the Coastal Resilience website,[1] along with the metadata and the GIS data. An Excel spreadsheet listing the variables is included in the dataset submitted with this report (Grenada Habitat Mapping TNC). The geodatabase is also included (Grenada Habitat Mapping TNC. gdb). Figure 1 presents an example of the mapped data for seagrasses, coral reefs, and mangroves.

**Figure 1.** Ecological information Available for Grenada on the Coastal Resilience Website, Showing the Southwest of the Island. Taken from http://maps.coastalresilience.org/gsvg/.



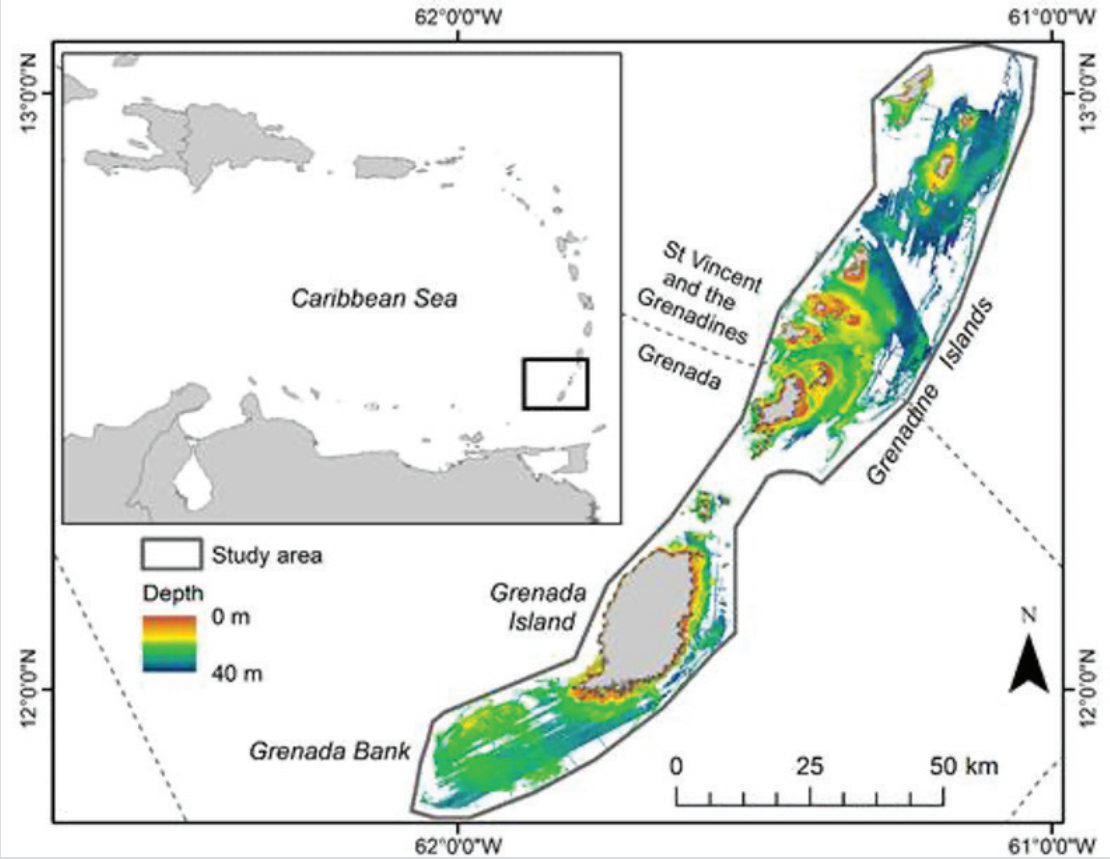

*Source:* Coastal Resilience website.

The metadata description on the Coastal Resilience website is drawn mainly from satellite imagery. It is not clear if the description has been ground-truthed in any areas.

Recent physical surveys have allowed creation of another set of habitat maps, some of them high-resolution, around the coasts of Grenada, Carriacou, and Petite Martinique. Produced by CEFAS as part of the Commonwealth Marine Economies (CME) Programme, the maps depict seabed habitats for all areas up to 35 meters in depth (Figure 2) and to a maximum depth of 60 meters around St. Georges Bay and Grand Anse Bay. These are based on Lidar studies, multibeam echosounder surveys, and video tows conducted in 2016-18. The maps have been presented to the Government of Grenada and are included in this report's dataset (Grenada CME Lidar data). The mapping also contains confidence values. Figure 3 and Table 5 show the biotope maps for Grenada, while Figure 4 shows the high-resolution map for Grand Anse Bay. The bathymetry data associated with these maps are presented in Figure 5.

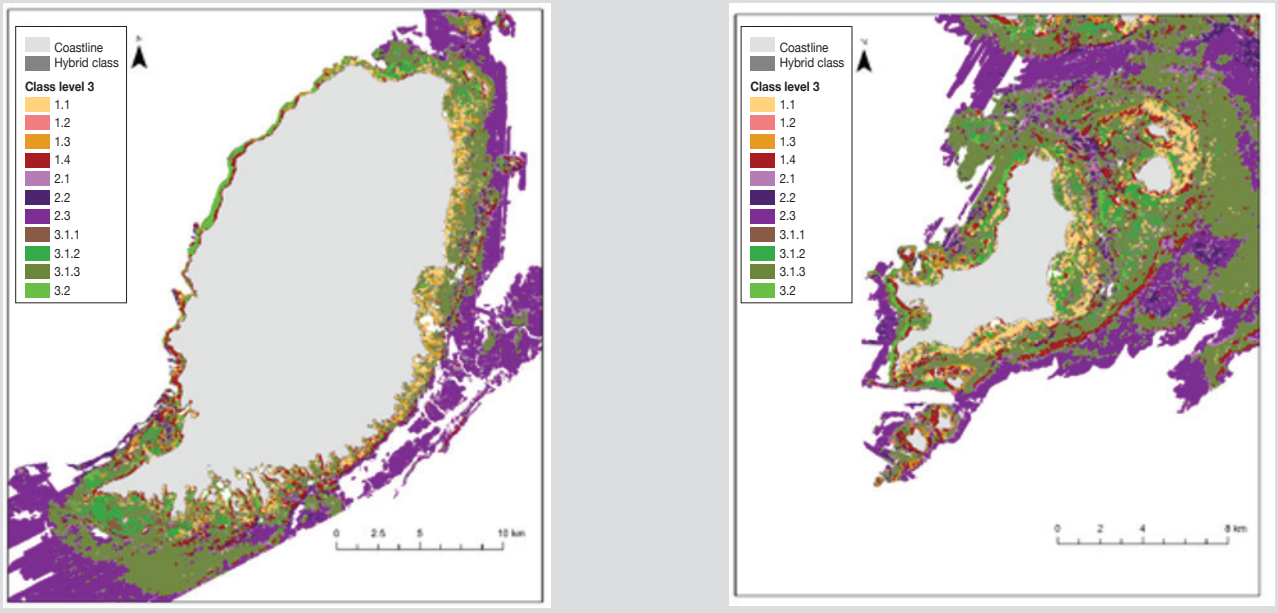
1 http://maps.coastalresilience.org/gsvg/

**Figure 2.** Commonwealth Marine Economies Programme Survey Area for Grenada and St Vincent and the Grenadines.




*Source:* Commonwealth Marine Economies Programme.

**Figure 3.** Level 3 Habitat Maps of Grenada (left) and Carriacou and Petite Martinique (right), Produced under the Commonwealth Marine Economies (CME) Programme.

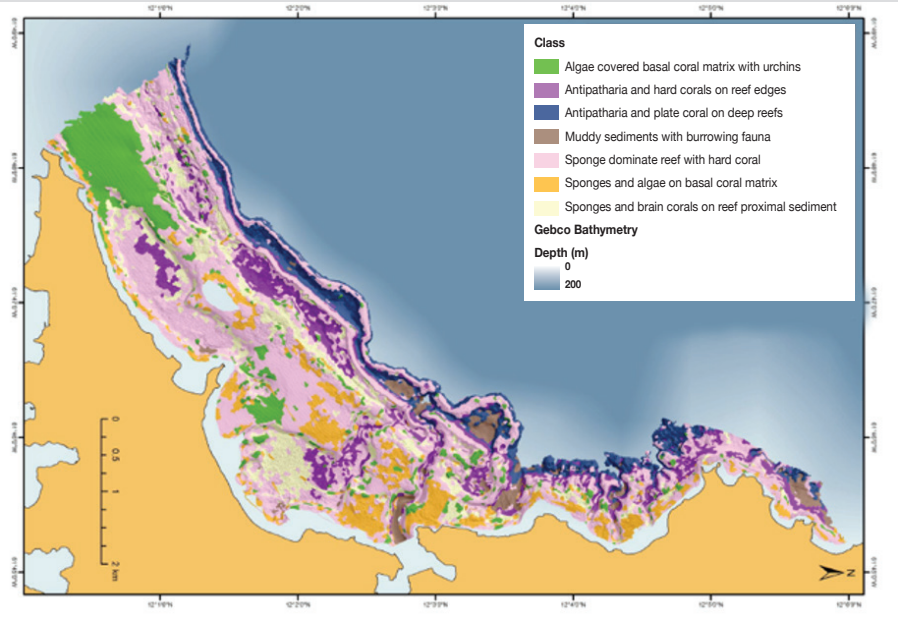



*Source:* Commonwealth Marine Economies Programme.

**Table 5:** Key to Habitats Shown in Figure 3

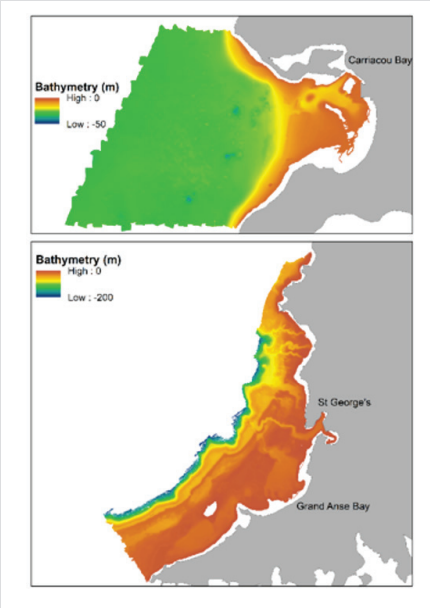
| | | | | | |
|---|---|---|---|---|---|
| 1 | **Complex coral reef assemblages** | 1.1 | Coral reef assemblages with a higher abundance of gorgonian sea rods and sea plumes | | |
| | | 1.2 | Sparse coral reef assemblages with a higher abundance of cup-like sponges and non-calcareous macroalgae | | |
| | | 1.3 | Complex coral reef assemblages with a higher abundance of hard corals | | |
| | | 1.4 | Sparse coral reef assemblages with a higher abundance of cup-like sponges and non-calcareous macroalgae | | |
| 2 | **Coral reef assemblages dominated by sponges, commonly associated with deeper water depths** | 2.1 | Sponge-dominated coral reef commonly associated with deeper water depths, with a higher abundance of erect sponges | | |
| | | 2.2 | Sponge-dominated coral reef assemblages | | |
| | | 2.3 | Sponge-dominated coral reef commonly associated with deeper water depths | | |
| 3 | **Sedimentary habitats dominated by seagrasses and bioturbation (the disturbance of sediments by organisms)** | 3.1 | Sedimentary habitats with seagrasses and bioturbation | 3.1.1 | Sedimentary habitats dominated by bioturbation |
| | | | | 3.1.2 | Mixed hard substrate and sedimentary habitats dominated by macroalgae |
| | | | | 3.1.3 | Sedimentary habitats with variable abundances of seagrasses, cyanobacteria, regular urchins, and dwelling traces (mounds) |
| | | 3.2 | Sedimentary habitats with seagrasses | | |

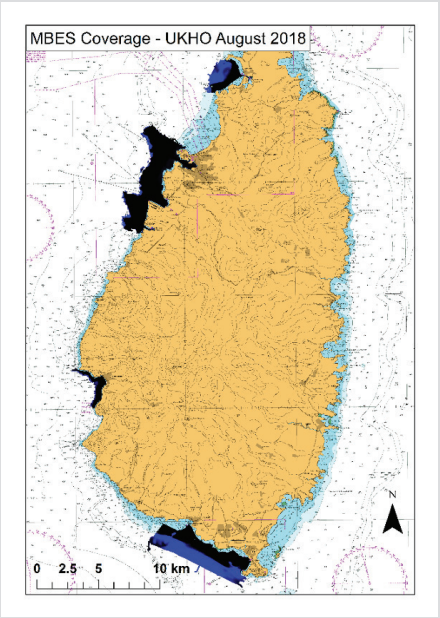
**Figure 4:** High-Resolution Habitat Map of Grand Anse Bay in Grenada Produced under the Commonwealth Marine Economies (CME) Programme.




*Source:* Commonwealth Marine Economies Programme.

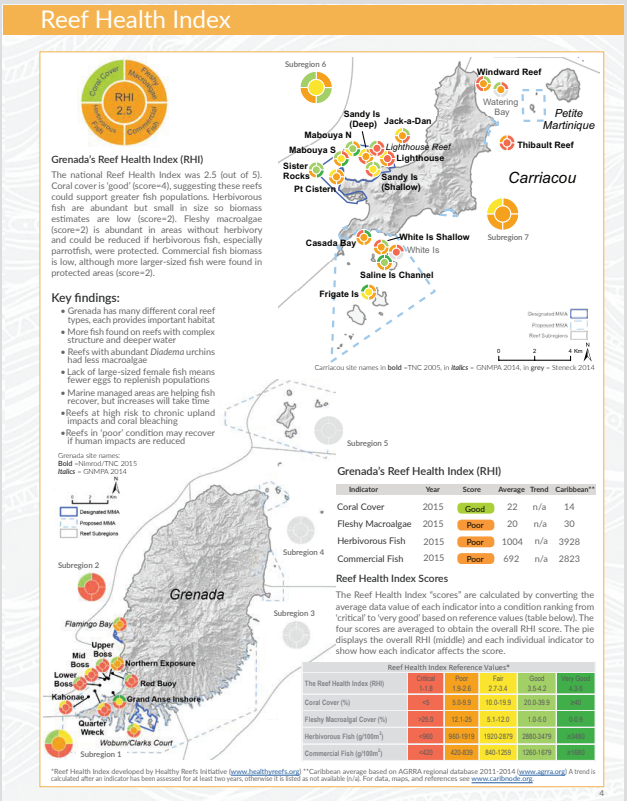
**Figure 5:** Bathymetry Maps around Grenada and Carriacou for Areas Up to 35 Meters in Depth.




*Source:* Commonwealth Marine Economies Programme

**Figure 6:** Page 4 of the Grenada Coral Reef Report Card, Showing Reef Health Index for the Islands of Grenada.




*Source:* The Nature Conservancy.

Coral reef health reports for some Caribbean countries, including Grenada, are also available at the CaribNode website.[2] The Grenada report is included in the dataset (TNC 2016a). Figure 6 shows the reef health index for Grenada, with coral condition considered "critical" in many places, and "poor," "fair," and "good" elsewhere. The index's authors state that coral in poor condition can recover if human impacts are reduced, and that marine managed areas are helping fish to recover.

### 4.2.2 Climate Data

Grenada has a number of manual rain gauges in operation. The resulting data are stored in monthly totals. As of 2017, there were also three automatic weather stations, which recorded hourly data. The study team has requested these data from the Land Use Division of the Ministry of Agriculture.

Grenada has produced an Integrated Coastal Zone Management Policy for 2018-21 (Government of Grenada 2015). It is included in the current study's dataset, along with a briefing document (Government of Grenada 2017a). The policy lays out goals and strategies for how to achieve the vision of a "coastal zone that is well-managed, sustains livelihoods, supports

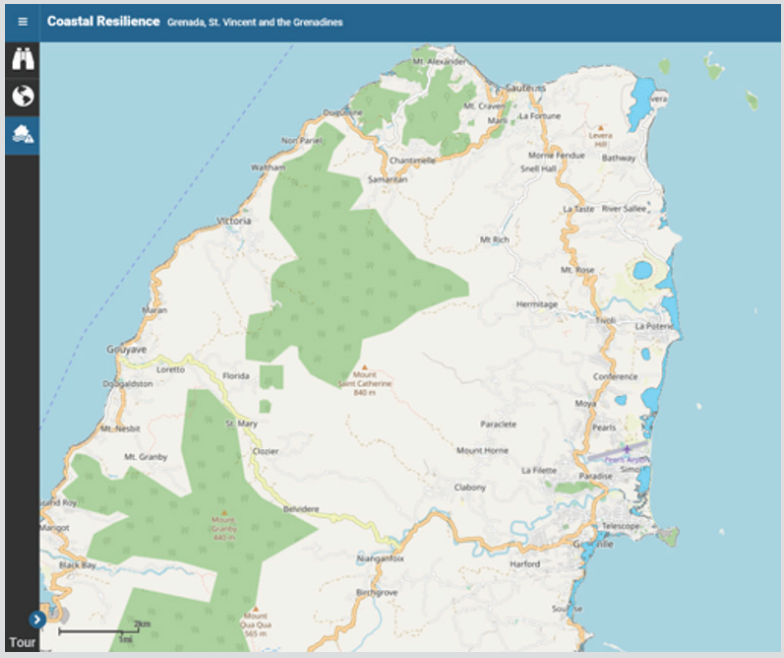
2 http://caribnode.org/documents/?category=health

**Figure 7.** CHARIM Flash Flood Risk Map, Grenville Bay Area.

*The map assumes four rainfall events, based on rainfall data for 5, 10, 20, and 50 years.*


*Source:* Caribbean Handbook of Risk Information Management

**Figure 8.** The Northeast of Grenada with a One-Meter Sea Level Rise Shown in Blue




*Source:* Coastalresilience.org

the country's socio-economic development, contributes to ecological sustainability, and is resilient to environmental risks." Grenada also has a National Climate Adaptation Plan (NAP) 2017-21 (Government of Grenada 2017b) and a National Climate Change Policy 2017-21 which describe the country's priorities for adaptation (Government of Grenada 2017c).

Elements of the NAP have relevance to fisheries, including action steps on food security, ecosystem resilience, and integrated coastal zone management. The priorities of the climate change policy, meanwhile, are to address current gaps in mitigation and adaptation. Of relevance to fisheries are steps to provide climate data and access to them, increase awareness of climate change, conduct budget calculations for capacity building, and produce reliable estimates of revenues from ecosystem-based adaptation. COAST could bolster NAP action programs, increasing the adaptive capacity and resilience of the fisheries sector and reducing its vulnerability to extreme events and climate change. The NAP lists a number of species-focused project examples which COAST could consider undertaking.

Another data source for hazard mapping is the Caribbean Handbook of Risk Information Management (CHARIM 2016a), which includes topographic, land cover, and flood risk maps for Grenada. A section of the flood risk map is shown in Figure 7. The handbook's dataset includes a report on the mapping methodology (Jetten 2016).

Along with the habitat maps that The Nature Conservancy has produced, the Coastal Resilience website details inundation scenarios based on sea level rise of either one or two meters, and flood levels from a 100-year rainfall event and storms of the same magnitude as Ivan and Lenny. These scenarios can be viewed online at the Coastal Resilience website.[3] An example sea level rise map is shown in Figure 8.

3 http://maps.coastalresilience.org/gsvg/

### 4.3.3 Socio-Economic Data

In 2013, The Nature Conservancy and the Grenada Red Cross Society undertook a vulnerability capacity assessment in the Grenville area of Grenada (The Nature Conservancy and Grenada Red Cross Society 2013a and Agostini et al. 2013). The assessment aimed to document the most important dangers facing the communities and identify coping strategies and resources available to them to minimize risks. The study used focus groups and interviews. The report and accompanying data (The Nature Conservancy and Grenada Red Cross Society 2013b and c) contains detailed information about the Grenville communities, including total population, number of fishers, where they fish, and their adaptive capacity.

The study asked participants how reliant on fishing they were for their livelihood, and whether they had alternative livelihoods. It found that 60 percent of people relied on fishing as their main livelihood in Telescope, about 25 percent in Marquis, and 40 percent in Soubise. The report concluded that although the communities had diverse livelihoods, many fishers had no alternative income (The Nature Conservancy and Grenada Red Cross Society 2013b and c). Table 6 shows selected other results from these surveys. The full results are provided in the dataset.

**Table 6:** Selected Data from The Nature Conservancy and Grenada Red Cross Society (2013b and c) Household Survey.

**Question 18c:** *How long did you take to recover from a natural disaster in terms of livelihood? Based on 56 respondents.*

| **Length of time** | Immediately | Less than 1 week | 1 week-1 month | 1-6 months | 6 months-1 year | 1 year-2 years | More than 2 years | Still haven't recovered |
|---|---|---|---|---|---|---|---|---|
| **Percentage of respondents** | 0 | 0 | 0 | 7 | 11 | 25 | 55 | 2 |

**Question 47:** *Percentage of your household food that comes from fish or other marine resources. Based on 165 respondents.*

| **Proportion of food coming from seafood** | 0% | 1-25% | 26-50% | 51-75% | 76-99% | 100% |
|---|---|---|---|---|---|---|
| **Number of households** | 4 | 36 | 12 | 18 | 23 | 8 |

**Question 51:** *Do you or anyone in your house fish for:*

| **Fishing category** | Family food | Livelihood | Recreation |
|---|---|---|---|
| **Percentage of respondents** | 50 | 31 | 19 |

**Question 54:** Based on 207 respondents.

| **Household owns a boat** | No | Yes |
|---|---|---|
| **Percentage of respondents** | 93 | 7 |

**Question 55:** Based on 200 respondents.

| **Belong to a fishers' cooperative or organization** | No | Yes |
|---|---|---|
| **Percentage of respondents** | 95 | 5 |

*Source:* The Nature Conservancy and Grenada Red Cross Society (2013b and c) Household Survey.

The Coastal Resilience website[4] also presents relevant information from Grenada's 2011 census. It shows the sensitivity indicators[5] across Grenada, vulnerability,[6] and adaptive capacity,[7] with full metadata available. Some fisheries infrastructure is also presented, including markets and certain landing sites. It is not clear if the landing sites are primary, secondary, or tertiary.

Under the Grenada Integrated Climate Change Adaptation Strategies (ICCAS) program,[8] fishers in Grenville were trained in making and using ice boxes to assure that their catches don't spoil, can fetch the highest possible prices, and potentially be exported. Another ICCAS project[9] is training fishers to catch the invasive lionfish both to help supplement their income and reduce numbers of the predator. In Telescope, a project is underway to train coastal communities in beekeeping as a potential new livelihood and to help protect and enhance the mangrove forests.[10]

## Weaknesses in Grenada's Environmental, Climate and Socio-Economic Data (summary in Table 7)

- Grenada has some preliminary habitat maps for its marine environment, more detailed in some areas than others. There is, however, little ongoing monitoring of ecosystems or habitats or assessments of how fishing, climate change, or other disturbances affect these habitats. This appears to be due mainly to low staff levels in government. Most mapping and habitat or biodiversity assessments are undertaken by externally funded projects, and in some cases without any capacity building within government or means of repeating the study or investing in further monitoring of these areas. The coral reef health report states that some of Grenada's reefs are in poor condition.
- Grenada has made much progress in developing National Adaptation Plans, but lack of government resources limits capacity to implement the plans.
- Grenada has a small number of rainfall monitoring stations and wave height and tide gauges. Through government and externally funded projects, their numbers are increasing.
- Projects are underway in Grenada to build resilience within coastal communities, but these appear to be piecemeal, limited in time, and based on external funding.

4 http://maps.coastalresilience.org/gsvg/

5 The Coastal Resilience website describes these as a suite of variables that describes characteristics of a community that influence its likelihood to experience harm under a given stressor scenario, such as storm, drought, or sea level rise.

6 The Coastal Resilience website describes these as the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes such as storms.

7 The Coastal Resilience website describes these as a suite of variables that describes the ability of a system to anticipate, respond to, cope with, and recover from climate impacts.

8 http://www.iccas.gd/?q=community-projects/176/Ice%20Box

9 http://www.iccas.gd/sites/default/files/project_files/2014-144-Lion-fish.pdf

10 http://www.iccas.gd/sites/default/files/project_files/RECCOMM%20FACT%20SHEET_April%2017.pdf

**Table 7:** Summary of Environmental, Climate, and Socio-Economic Data in Grenada

| | | |
|---|---|---|
| **Environmental** | Marine habitats | Habitat and bathymetry maps available from satellite data, Lidar surveys, and video tows. High-resolution maps available for some areas.<br>Reef health report 2016 finds that coral is "critical" in many places.<br>No ongoing habitat monitoring plan<br>Some marine managed areas |
| **Climate** | Policies and plans | Coastal Zone Management Policy, National Adaptation Plan, and National Climate Change Policy |
| | Monitoring systems | Manual and automatic weather stations collect rainfall data. |
| | Hazard assessment | Caribbean Handbook of Risk Information Management (CHARIM) has flood risk maps. Coastal Resilience website includes sea level rise and scenario inundation maps. |
| **Social and economic** | | Vulnerability capacity assessment undertaken in 2013 in Grenville<br>Coastal Resilience website includes sensitivity indicators for communities. GIS data includes fisheries infrastructure.<br>Some examples of training to provide alternative livelihoods |
| **Data quality** | | Habitat maps and flood assessments appear robust and of good quality. Socio-economic study is detailed in one location. A limited number of weather stations provide detailed rainfall data. |
| **Data quantity** | | Apart from rainfall data, studies are mostly one-off projects. No ongoing monitoring program for habitat quality, social studies, or climate data. |
| **Data storage and access** | | Data stored by various government departments, NGOs, and international organizations. Difficult to access or to find out what information exists. |
| **How data is updated** | | Projects mainly ad hoc and reliant on external funding. |

## 4.3 Disaster Risk Management

The National Disaster Management Agency (NADMA) has produced a general Disaster Risk Reduction Plan for Grenada (NADMA 2014). It includes fisheries, but the country has no plan that is specific to the sector. The Fisheries Division agrees it would be good to have one, but for now it lacks capacity to draw it up.

NADMA acts as a repository of disaster-related information, but each sector is meant to gather its own information. The agency's plans call for integrating all sectors into a sole disaster risk management strategy. NADMA indicated to study team members that its priority is to enhance mechanisms of communication before, during, and after an event. To date there is no clear organizational path that links the fisheries sector and NADMA. Similarly, the Met Office provides forecasts, but NADMA recognizes that it is important to develop a regular communication network, to improve disaster preparedness.

The organizational structure for disaster risk management in Grenada consists of the National Emergency Advisory Council, which makes recommendations to the cabinet. The Permanent Secretary in the Ministry of Climate, Resilience,

the Environment, Forestry, Fisheries, Disaster Management & Information sits on this council. Under the Permanent Secretary there is NADMA and under it are 17 district committees. All district directors are volunteers, so their time and money are limited.

NADMA also has two community program officers. Fishers can talk directly to the district directors or the program officers. For now, fishers have only limited awareness of focal points/ responsible people for warnings and how to get help in an emergency. Grenada has a tsunami smart readiness project, in which fishers are taking part. Experience from this project suggests a need for new communication equipment to enhance disaster preparedness by fishers. Discussions on disaster coping mechanisms indicate that the fisheries sector usually is the first to bounce back after a hurricane. For instance, after Hurricane Ivan fishers who target large pelagic species went back to sea immediately. The only limitation was storage, due to failure of refrigeration facilities, so they had to sell the whole catch on the day of capture. Protein-rich fish that the industry provided was very important to recovery efforts until farms resumed production. Fishers dropped the price of fish to ensure food security in the population after a disaster, until the country got back to normal. Ice and refrigeration facilities at fish markets got special use as storage for medications and other types of food.

Experience shows that catastrophe mobilization like this is usually organized by fishers' cooperatives. But most cooperatives lack ability to offer financial assistance to their members. Individual fishers have typically been on their own as they seek to rebuild their livelihoods.

About 60 percent of vessels that Grenada fishers use are under five meters in length. Though these types of small craft are at high risk in a storm, owners find it hard to get insurance. For example, to get coverage from the Grenada Development Bank (GDB), fishing captains are asked for their official accreditation as captains. However, accreditation for fishing captains simply isn't available in Grenada. Captains therefore turn to the laborious process of getting a reference letter from the Fisheries Division, which usually takes three months or so because the division is short-staffed.

Before a weather event, some boats are hauled out of water, while others are put in mangroves, lagoons, or other hopefully safe places. There is not always space in the marinas. In any case, fishers may not learn that a storm is coming. They often don't receive weather warnings, especially if they are at sea. Warnings typically are transmitted over VHF radio, but some fishers say they may miss these messages. Discussions with NADMA indicate that the agency does not have contact information for all fishers, so is unable to reach many of them directly.

Going forward, it is vital that fishers and government put in place well thought-out rules and procedures to prepare for future hurricanes. These rules must recognize the realities of the fishing life. In 1999 after Hurricane Lenny, the Red Cross worked with fishers in the Gouyave community. They built 20 houses to relocate the fishers away from dangerous coastal areas in future storms. But afterward, fishers rented the houses out because they felt them to be too far from the beach. Table 8 summarizes the linkages between DRM and fisheries in Grenada.

**Table 8:** Summary of Disaster Risk Management in Grenada

| | |
|---|---|
| **Main agency** | • NADMA<br>• Has only two full-time staff. Has district directors and community program officers to provide liaison with communities but most work on a voluntary basis. |
| **Early warning systems** | • Warnings transmitted over VHF radio. Some fishers say that they usually do not get this information.<br>• Not currently trialing the FEWER app, which delivers warnings and other information to fishers' smartphones. |
| **Where boats are stored** | • Some are hauled out of water, some are put in mangroves, lagoons, or other safe places. |
| | • Post-disaster mobilization organized by fisher cooperatives |
| **Coping mechanisms** | • Fisheries sector usually is the first to bounce back after a hurricane.<br>• Individual fishers rely on themselves to regain their livelihoods. |

# 5 Using the Data Assessment Checklist

## 5.1 Evaluating Grenada's Progress toward the CCCFP

Grenada needs a framework to evaluate national progress toward meeting the commitments of the region's common fishing policy, CCCFP, and for specific climate-smart food security strategies that involve COAST and the Caribbean Regional Fisheries Mechanism (CRFM). A good evaluation framework would identify the intervention logic, key evaluation questions, and the means to answer these questions, and act as a guide for setting up processes for monitoring and evaluation. A draft evaluation framework for COAST was developed in an earlier part of this project. It was structured around core themes including the fundamental principles of CCCFP and country-led climate-smart food security strategies. Below (table 9), we briefly demonstrate how the data assessment checklist, applied in the later stages of this project, could quantify progress towards CCCFP. The illustration is based on a set of questions for each principle. The answers to each question lead to a 1-4 score, with 4 as the best. The score is assigned based on the available data and information and other evidence including expert opinion.

## 5.2 Assessing Exposure, Hazard, and Vulnerability

### 5.2.1 Exposure

The tropical cyclone loss assessment using the SPHERA4COAST model consists of a geo-referenced exposure database that includes buildings and other types of major infrastructure. The buildings part of the database comprises residential, commercial, and industrial buildings; hotels; and public, educational, healthcare, and agricultural buildings. The infrastructure part covers airports, ports, power plants, and roads. Data about each asset includes location and characteristics of the asset relevant to assessment of cyclone-induced losses. For instance, for buildings, each entry includes asset type, material, height, age, and replacement cost. Depending on the level of disaggregation and timeframe required for the SPHERA model, information and data on the location and types of fishing infrastructure and their economic value is available in each of the case-study countries. Data points are available for location of emergency shelters, ports, boats, land use, areas of coral reef, mangrove, seagrass, and census data including occupation of households.

### 5.2.2 Hazard

The hazard module in SPHERA4COAST provides daily estimates of precipitation over a large area that includes the Caribbean and Central America. The daily estimates are derived in near-real time through a combination of climatic-meteorological models, which compute the amount of rainfall based on climate conditions, and a low-orbiter satellite-based precipitation model.

### 5.3.3 Vulnerability

Vulnerability analyses identify the likely consequences to the built environment when a storm dumps excess rain. The consequences are modelled by means of vulnerability functions, which are relationships that estimate losses that will result from different amounts of precipitation. The vulnerability module in SPHERA4COAST is based on an archive of historical losses induced by rainfall in the Caribbean. This includes detailed information both on the severity of losses and their distribution in time and geographical area. Information gathered during the field visits using the data assessment checklist includes reports on assessments conducted after past events.

**Table 9:** How the Data Assessment Checklist Can Create a Scorecard to Assess Progress towards the CCCFP.

*This illustration uses a five-point index to measure how the CCCFP's fundamental principles are used in national fisheries action plans.*

| | CCCFP Principle | 1. Steps towards meeting the principle begin. | 2.Implementation begins. | 3 Implementation is at an advanced stage. | 4 Benefits of implementation are being realized. | Grenada's score |
|---|---|---|---|---|---|---|
| 1 | **Countries must increase registration of fishers, gear, and vessels.** | A national program is being put in place and **trailed** in **some areas**. | **Some** registration of fishers but not consistent in time or space | Country has a national registry in which fishers, gear, and vessels are reported **systematically**. | **All fishers, gear, and vessels** are registered and there are effective ways to monitor and update the lists. | 2. There is registration but it does not include all persons who are fishing |
| 2 | **Data must be collected to provide a full monitoring dataset for evaluating change in four areas of interest:**<br>**Fisheries**<br>**Mangroves**<br>**Coral reefs**<br>**Climate** | **Very little** data collection, many gaps exist, **no** continuous monitoring dataset | **Some** data collection at key landing sites that have a **reasonably good** monitoring dataset. | **Comprehensive** data collection focused on **industrial** fisheries. Good monitoring dataset and **trialing** a program of management-oriented survey and research | **Comprehensive** data collection across **industrial** and **artisanal** fisheries. Good monitoring dataset and **ongoing** program of management- oriented survey and research work. | 2 for fisheries sector data, 1 for mangrove data, 1 for coral reef, and 2 for climate data |
| 3 | **Countries must strengthen cooperatives and associations of fisherfolk to promote co-management of fisheries resources.** | **Low proportion** of fishers belongs to cooperatives. Most are not involved in co-management of fisheries resources. | Government is **making efforts** to develop fisher cooperatives and to bring fishers into a role of co-management. | **All fishers** belong to a cooperative and there is an **active framework** of co-management by cooperatives and fisheries ministry. | All fishers belong to a cooperative and there is effective engagement and **binding procedures** for co-management by cooperatives and fisheries ministry. | 2 |
| 4 | **Fishing effort should be balanced to fishing opportunities, so as to assure sustainable levels of resources.** | Capacity balancing is **being introduced** but programs lack appropriate tools. | Capacity balancing tools are appropriately applied to **some** key stocks. | Capacity balancing tools are appropriately applied to **most** key stocks. | Capacity balancing tools are appropriately applied to **all** key stocks. | 1 |
| 5 | **Fisheries management decision-making should be based on scientific information.** | There is **no evidence** that decision-making processes are based on scientific understanding of resources and their habitats, or environmental, economic, and social factors. | **Some** decision-making processes are based on scientific understanding. | **Most** decision-making processes are based on scientific understanding. | **All** decision-making processes are based on scientific understanding. | 1 |

# 6 Implementation of COAST Insurance

## 6.1 Interest in COAST

Grenada government officials, NGO representatives (The Nature Conservancy and Grenada Red Cross), and fisher cooperative members expressed keen interest in COAST and said they would welcome the opportunity to pilot test it. At the CRFM forum, participants suggested that to make the COAST initiative succeed, the fisheries sector will need to work with small businesses and other key stakeholders such as tackle shops, dive companies, and credit unions. Participants saw a critical link between COAST and the efforts of their country's disaster management agencies.

Government officials expressed the need to think about how government will pay the premiums for COAST. Officials indicated they would like to find a way for the fisheries sector itself to cover this cost. However, the premium is very large compared to the revenue the sector generates. This raises questions as to how and whether Grenada will be able to afford such a fee. The country may need support from international donors.

Forum participants also indicated desire to revisit the fees that fishers pay for licenses. Other options suggested during discussions included categorizing license fees for inshore and offshore fishing areas and charging a set price for each category. Many subsistence fishers are not registered but nearly all commercial fishers are. This could generate new revenue sources for the Fisheries Division that could be used for the COAST premium coverage.

## 6.2 Capacity of Institutions and Fisher Cooperatives to Administer COAST Payouts.

### 6.2.1 Institutions

Grenada's Ministry of Finance has long experience and expertise in receiving and administering grants. In general, in a catastrophe situation, the ministry takes in grants and then allocate the budget for the National Disaster Management Agency (NADMA) to conduct a post-event assessment.

The key agencies that would have a role in COAST are the Fisheries Division, Ministry of Finance, NADMA, and Ministry of Climate, Resilience, the Environment, Forestry, Fisheries, Disaster Management, and Information. In all of these, current staff are stretched. For example, the Fisheries Division has only a Chief Fisheries Officer plus three active fisheries officers. It has several data collectors (clerks) but these are junior employees and most are not formally trained for data collection. Staff turn-over is frequent.

If they are to function as conduits for insurance pay-outs, Grenada government agencies may need help in upgrading technical skills, finance, and staffing. Another institution suggested for pay-outs is the Grenada Development Bank. It is keen to play this role.

### 6.2.2 Fisheries Cooperatives

Grenada has a diverse set of fisher organizations. Some, the cooperatives, are for-profit while others are simple associations—they do not exist to generate income but mainly to advocate on issues of interest to fishers.

There are nine fisher cooperatives across the country and one umbrella body for all fishers. Not all fishers are members of cooperatives. Most members are boat owners, generally owning small, uninsured boats. In meetings and interviews, study teams' members were told repeatedly that if cooperatives are going to receive COAST pay-outs, then most fishers would join.

Cooperatives often have a board of directors made up of fisherfolk, as well as a supervisory committee. Most cooperatives have sufficient funds to function with just fisherfolk as members, but others need consumers to join as well to provide additional financial support. Discussions with representatives of cooperatives suggest that most of these organizations lack the strength and staffing capacity to fulfil even their current duties. For instance, many lack technical training on how to capture data, report it, and keep accurate books. Making the cooperatives the conduit for COAST pay-outs would require significant improvements in their ability to handle money.

**Table 10:** Summary of Institutional and Fisher Cooperative Capacity in Grenada

| | |
|---|---|
| **Implementation of fisheries policy** | • Fisheries Policy was reviewed by FAO and will be passed on to cabinet soon.<br>• Grenada is in the process of mainstreaming climate change and disaster risk management in fisheries. |
| **Management of fishing effort** | • Effort is not well recorded because of lack of technical capacity.<br>• There's a lot of staff rotation at Fisheries Division. |
| **Human, technical, and financial capacity for monitoring and assessment** | • Critical staff limitations result in slow updating of data, data digitation, and haphazard enforcement. |
| **Link with fisher cooperatives** | • Fisheries Division does not have a specific officer tasked with contacts with cooperatives. |
| **Percentage of fisherfolk associated with a cooperative** | • Currently only a small number are members of fisher organizations. |
| **Capacity of cooperatives to manage financial resources** | • Lack of institutional strength, technical, and financial capacity to manage funds |
| **Towards COAST** | • The Grenada Development Bank has capacity and keen interest to deliver COAST funds to fishers. |

# 7 Recommendations for Future Work

In addition to completing this assessment, the Government of Grenada would do well to conduct additional sector-specific and general work for the successful implementation of COAST insurance Table 11.

**Table 11:** Ways that Grenada Can Improve Its Data

| | |
|---|---|
| **Fisheries sector data** | Strengthen the data collection and management system. Use weight scales, record and digitize effort data, and monitor more areas and fishing methods, including beach seines.<br>Improve speed of data entry.<br>Develop a clear roadmap to monitor and manage fishing effort. |
| **Fisher organization and capacity** | Build technical and financial capacity of fisher cooperatives.<br>Increase effort to register more fishers—more incentives/demonstration of benefits. |
| **Supply chain information** | Start collecting data on fish-processing equipment. |
| **Environmental data** | Increase staff for regular data collection on coastal ecosystems. Implement regular monitoring of marine habitats, including reef and seagrass surveys, to monitor ecosystem health and recovery. |
| **Climate and weather monitoring data/information** | Continue to operate weather stations and install more where possible. Install tide gauges. Establish a data repository for all environmental information, to make it easy to access and update, and prevent repetition of studies. |
| **Social and economic data** | Conduct regular monitoring of fishing communities, such as The Nature Conservancy and Red Cross study. Continue projects which help diversify livelihoods and aid climate adaptation. |
| **Data on damage to infrastructure** | Start collecting, analyzing, and storing data on damage to fisheries infrastructure. |
| **Coping mechanisms** | Trial and use the FEWER app.<br>Create a regular communication network between Met Office and NADMA.<br>Implement a DRM protocol or action plan for Fisheries Sector. |
| **Institutional capacity** | Build capacity for data collection and evaluation.<br>Add staff to Fisheries Division and NADMA . |

## Future work should consider:

- Improving data gathering and analysis, and increasing data sharing among different organizations to help link day-to-day fisheries data sets with national plans and instruments such as COAST.
- Developing a systematic approach to understanding basis risk and especially how to closely relate pay-outs with actual losses experienced by the fisheries sectors. Local stakeholders questioned heavily use of proxy or satellite data for modelling. Applying participatory approaches that consult members of the fishing communities in the design of COAST would help ensure the mechanism has a low basis risk.
- Providing financial management training to some cooperatives, to qualify them to distribute pay-out funds. The feedback in Grenada was that some cooperatives were currently up to this task, while others were not. The Grenada Development Bank indicated that it is keen to offer such training. It could cover such skills as how to distribute funds, priorities pay-outs, and assess whether the money reached the intended parties.
- Setting up similar program assessment if funds are sent directly to the Ministry of Finance. During the country visits, team members heard concerns that the money must be spent on the fishing sector specifically and not on general recovery efforts.
- Preparing a country-led COAST Operational Manual to provide guidance and procedures to public servants for putting the insurance program in action in the event of a pay-out. The manual would specify the role of government agencies, with a goal of ensuring the quick and transparent delivery of pay outs to the beneficiaries.
- Helping to assure that COAST capacity-building reinforce broader efforts to strengthen ecosystem resilience and adapt to climate change. Grenada has a sectoral adaptation strategy for fisheries. Ultimately, meeting COAST's goals would reduce the vulnerability of the fisheries sector.

In sum, COAST will require in the short, medium and long-term thorough preparation at a national level, including a general improvement of fisheries data collection and registration, and the creation of quick and reliable channels for distributing pay-out funds after an emergency. But these efforts will pay dividends for years to come. Fisherfolk will get rapid help when disaster strikes their islands, allowing them to get quickly back to sea and assist in general recovery efforts. Governments will be shielded from debilitating one-time outlays for recovery aid. More than that, meeting COAST's standards will help Caribbean nations in long-term efforts to protect marine ecosystems that sustain fisheries, and cope with climate events. COAST is a vital investment for the future.

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## Grenada datasets and reports

| *Folder* | *File name* | *Report Reference or Dataset* | *Source* |
|---|---|---|---|
| **Fisheries data** | GND Fish exports | Dataset | Grenada Fisheries Division |
| | GND Fisher register | Dataset | Grenada Fisheries Division |
| | GND Grenville vulnerability assessment_TNC GRCS 2013b | The Nature Conservancy and Grenada Red Cross Society. 2013b. Vulnerability capacity assessment of Grenville Area (Marquis, Soubise, Grenville, Telescope). Household Survey Results Summary. March 2013. | Grenada Red Cross |
| | GND Grenville vulnerability assessment_TNC GRCS 2013c | The Nature Conservancy and Grenada Red Cross Society. 2013c. Vulnerability capacity assessment of Grenville Area (Marquis, Soubise, Grenville, Telescope). Household Survey Results Summary for Marquis. March 2013. | Grenada Red Cross |
| | GND Landings data | Dataset | Grenada Fisheries Division |
| | GND Vessel register | Dataset | Grenada Fisheries Division |
| **Environment and climate data_Grenada** | Grenada Habitat Mapping TNC.gdb | Dataset (associated with Grenada Habitat Mapping TNC.xls) | TNC, via CEFAS |
| | Grenada CHARIM Flood Methodology Report_Jetten 2016 | V. Jetten. 2016. CHARIM Project Grenada National Flood Hazard Map Methodology and Validation Report. Draft version. May 28, 2016. | Online |
| | CME_Programme_Lidar_Maps | Dataset | CEFAS |
| | Grenada Coral Reef Report Card_ TNC 2016a | The Nature Conservancy (2016a) Grenada Coral Reef Report Card. Online. Available at http://caribnode.org/documents/?category=health | Online |
| | Grenada Disaster Risk Reduction_ NADMA 2014 | NADMA. 2014. Country Document on Disaster Risk Reduction for Grenada, 2014. National Disaster Management Agency). November 2014. | Online |
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| | Grenada Habitat Mapping TNC.xls | Dataset (associated with Grenada Habitat Mapping TNC.gdb) | TNC, via CEFAS |
| | Grenada TNC Fisheries Vulnerability Assessment_Agostini 2014 | V.N. Agostini, L.M. Roth, and S.W. Margles. 2013. Assessing the vulnerability to climate change of small scale fisheries: The Grenada example. | TNC |
| | Grenada ICAAS Brief_GoG 2017a | Government of Grenada. 2017a. Coastal zone management in Grenada, Carriacou, and Petite Martinique. A brief from the Integrated Climate Change Adaptation Strategies (ICCAS) Program. April 2017. | Online |
| | Grenada Topographic Map_CHARIM 2016 | CHARIM. 2016a. Caribbean Handbook on Risk Information Management: Grenada. Online. Available at http://www.charim.net/grenada/maps | Online |
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| | ICZM Policy_GoG 2015 | Government of Grenada. 2015. Integrated Coastal Zone Management Policy 2018-2021. | Online |

# Appendix 2: Glossary of Abbreviations

| | |
|---|---|
| **CARICOM:** | Caribbean Community |
| **CCCFP:** | Caribbean Community Common Fisheries Policy |
| **CCRIF SPC:** | Caribbean Catastrophe Risk Insurance Facility Segregated Portfolio Company |
| **CDEMA:** | Caribbean Disaster Emergency Management Agency |
| **CEFAS:** | Centre for Environment, Fisheries, and Aquaculture Science |
| **CHARIM:** | Caribbean Handbook of Risk Information Management |
| **CME:** | Commonwealth Marine Economies Programme |
| **COAST:** | Caribbean Oceans and Aquaculture Sustainability faciliTy |
| **CRFM:** | Caribbean Regional Fisheries Mechanism |
| **DRM:** | Disaster Risk Management |
| **FEWER:** | Fisheries Early Warning Emergency Response app |
| **GDB:** | Grenada Development Bank |
| **ICCAT:** | *International Commission for the Conservation of Atlantic Tunas* |
| | *MBES: Multi-Beam Echo Sounder* |
| **MCS:** | Monitoring, Control, and Surveillance |
| **NADMA:** | National Disaster Management Agency |
| **NAP:** | National Adaptation Plan |
| **NGO:** | Non-Governmental Organization |
| **OECS:** | Organisation of Eastern Caribbean States |
| **SASAP:** | Sectoral Adaption Strategy and Action Plan |
| **SIDS:** | Small Island Developing State |
| **SPHERA4COAST:** | System for Probabilistic Hazard Evaluation and Risk Assessment for the Caribbean Oceans and Aquaculture Sustainability faciliTy |
| **TNC:** | The Nature Conservancy |
| **UKHO:** | United Kingdom Hydrographic Office |

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