



CARRIACOU

Local Early Action Plans

LEAP

2018

ACKNOWLEDGEMENTS

Sustainable Grenadines Inc. (SusGren) will like to express sincere thanks to the LEAP consultant, facilitators, core team members and the Ministry of Carriacou and Petite Martinique Affairs for providing support towards the implementation of the project.

The Local Early Action Plan (LEAP) document was developed by facilitators: Ms. Kristy Shortte (SusGren Project Officer), Ms. Kisha Mc Farlane (Sandy Island/Oyster Bed Marine Protected Area [SIOBMPA] Outreach Officer) and Ms. Genevieve Renaud Byrne (SusGren Intern from Dalhousie University). It was written by Ms. Meghan Gombos (LEAP consultant) and designed by Ms. Christabelle Andrews (Graphic Design Consultant).

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The SusGren Inc. will like to further recognise other important contributors who made the completion of the LEAP document possible. This includes the Carriacou Farmers Association, Sandy Island/Oyster Bed Marine Protected Area adjacent community members (L'Esterre, Lauriston, Harvey Vale) and the marine stakeholders of Carriacou.

Special thanks to all for the successful implementation of the project in Carriacou, Grenada by the Sustainable Grenadines Inc. (SusGren).

Planning Team and Approach

This document was developed during a series of meetings that took place over a five month period in Carriacou. The methods used were modified from ‘*Adapting to a Changing Climate: Guide to Local Early Action Planning (LEAP) and Management Planning in the Caribbean*’.

The guide was developed to support facilitators in community-based processes and includes; outreach material, key messages, and instructions for group exercises that support awareness and planning for climate change and other threats to natural resources. The guide is organized into Four Steps that cover getting your team organized, raising awareness about climate change, collecting information about your community, and adaptation planning. Each step helps guide communities through a series of sessions, exercises and discussions in order to develop a Local Early Action Plan that identifies activities that can help lessen the impacts of climate change on their natural resources and social systems.

In May and September 2017 trainings were held to teach climate change concepts and how to conduct participatory approaches to develop a Local Early Action Plan. Meghan Gombos of Sea Change Consulting LLC and lead author of the LEAP guide conducted the trainings and supported facilitation of some community meetings. Trainings targeted a small group of NGO and government partners as “Lead facilitators” as well as a “Core Team” made up of Carriacou community members.

Lead Facilitators

Responsible for organizing trainings, community meetings, leading facilitation of meetings, and developing written documents



Ms. Kirsty Shortte
SusGren program officer and LEAP project coordinator



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LEAP Core Team Members

Provided support to SusGren in spreading the word to the communities about opportunities for participation in the planning process. They also helped facilitate community meetings and share outreach materials.

- **Ms. Reann Martineau** - *IMANI program participant and agricultural studies graduate*
- **Mr. Darnelle Coy** - *IMANI program participant*
- **Mr. Jahshaka Andrew** - *President of the Carriacou Farmers' Association*
- **Mr. Henry Stiell** - *Retired school teacher and principal*
- **Mr. Bryan Prince** - *President of the Carriacou and Petite Martinique Water Taxi Association*
- **Mr. Davon Baker** - *Communications Officer, Local Co-management Board for the Sandy Island/Oyster Bed Marine Protected Area (SIOBMPA). Representative of the Ministry of Carriacou & Petite Martinique Affairs.*

A variety of outreach activities and focus group discussions were conducted from June through September 2017 to share information about climate change and collect information about community experiences, concerns, and interests including:



The results from the LEAP process for Carriacou are presented in this document. All results presented here are qualitative and based on perceptions of community members.

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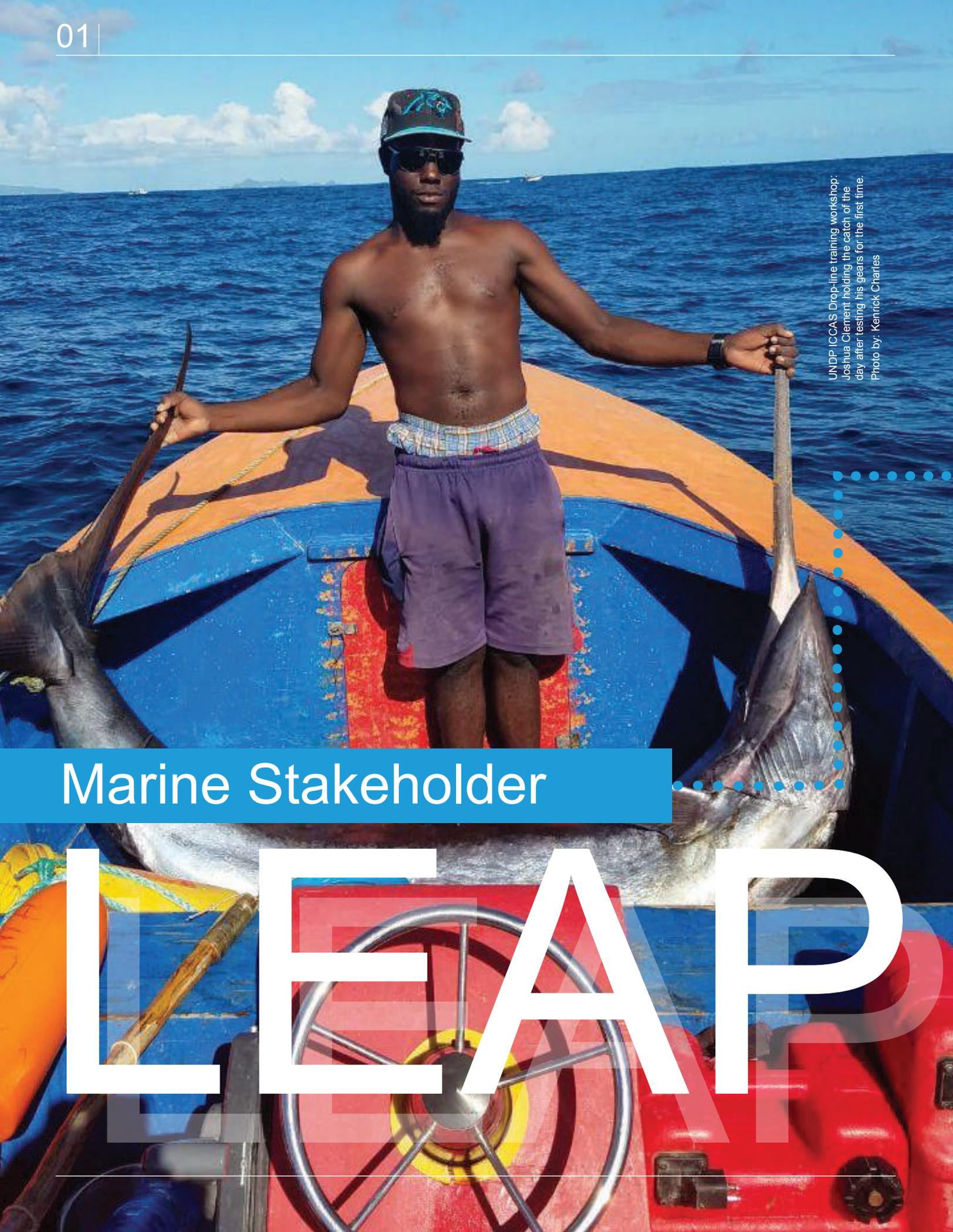
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UNDP ICCAS Drop-line training workshop: Joshua Clement holding the catch of the day after testing his gears for the first time. Photo by: Kenrick Charles

Marine Stakeholder

LEAP

CLIMATE STORY



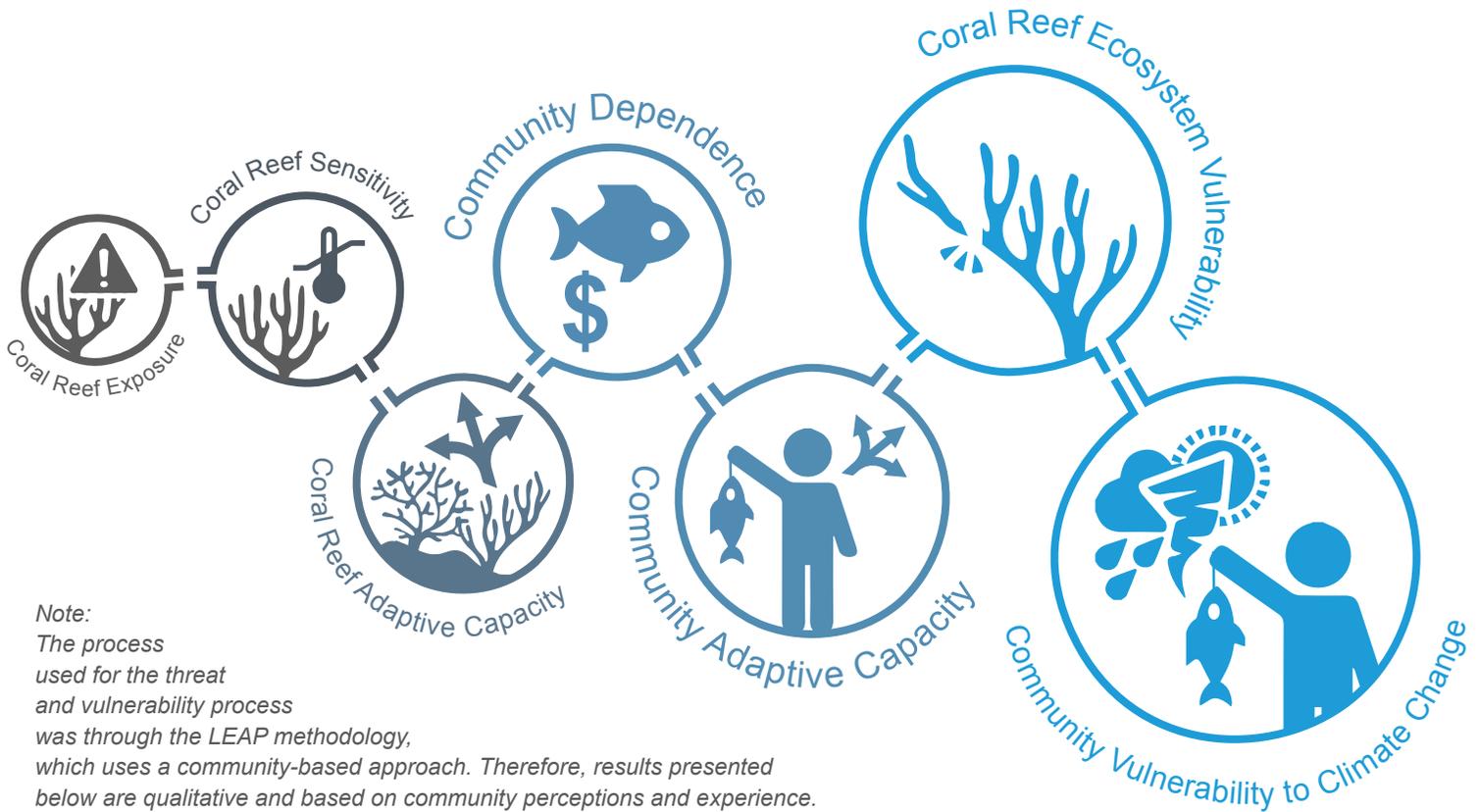
Carriacou has experienced droughts, hurricanes, tropical storms, flash floods, coral bleaching events, locust infestation, chikungunya outbreaks, sargassum seaweed blooms and storm surge events in the past. These events have had severe impacts on our communities. Impacts included loss of lives, livestock, property, and crops, as well as damage to homes and infrastructure. They also caused flooding, landslides and soil erosion. Socio-economic impacts of these events included loss of income and a lack of access to local resources such as food and water, and health impacts such as increased vector borne diseases. To cope with the impacts of these events, local community members came together to help each other. Aid was also provided through donations from those not impacted. Together, structures were rebuilt better and stronger, using information on how to prepare for future natural disasters.

Marine resource users such as fishers in our community are noticing changes in our normal seasons. More fishes are coming closer to the shore during the rainy season, which now starts later in the year and also influences planting times for crops. They have also noticed that temperatures are getting hotter, and have seen more coastal erosion than in the past. If these changes continue they could negatively impact fishing patterns and planting seasons, threatening food and income sources. A loss of beaches due to further erosion could also negatively impact tourism, recreation, and local livelihoods.

As climate change continues, Carriacou's marine resource users will experience further impacts. Most notably, is coral bleaching and mortality from increased sea surface temperatures, ocean acidification and changing weather patterns. This will cause a loss of crucial habitat, and negatively impact fish and other important marine species such as lambi, lobsters, and whelks. If these marine resources are damaged due to climate change and other threats, it will cause severe impacts to the income of fishers and tour operators. It will also cause a loss of some of our main food resources, and create an increased reliance on food imports. We are also very concerned about the loss of our beaches and mangroves from sea level rise combined with wind and waves. This will negatively impact nursery areas and marine habitats for fish, birds, and other wildlife, and cause a decline in tourism generated income. Finally, we are concerned about these impacts because they cause a loss of identity, culture, and resources for future generations.

Threat and Vulnerability Assessment

for Marine Resources and Fisheries Livelihoods



Resource Trends and Existing Threats

The “coral reef ecosystem” includes mangroves, seagrass beds, coral reefs and associated fish, and invertebrates. Fishers have noticed changes in the coral reef ecosystem over time and perceived the condition of the resource as only fair. Changes being noticed include a general decline in reef health, even within the Marine Protected Area (MPA). Fishers believe that this decline was caused by bleaching events from climate change and warming seas, and increased lionfish populations. Other threats to the coral reefs include direct damage from anchoring, mainly due to lack of awareness and adequate mooring systems. Boat operators therefore anchor anywhere and damage corals. This is further exasperated by lack of enforcement of MPA legislations for foreign and local boats, due to a lack of political will to enforce anchoring and other best practices.

Lionfish are another major threat to reef ecosystems and are not harvested by local fisheries. It is the perception that there is a lack of appreciation for natural resources by fishers as well as a lack of awareness of the harm lionfish can do to reef ecosystems. Additionally, there is currently no market for lionfish meat in Carriacou, and fishers are concerned about toxins in the fish, preventing the capture and cleaning of lionfish.

Fishers believe that fish populations are improving within certain parts of the MPA due to restricted fishing. Outside the MPA however, there is a perceived decline in fish populations due to higher fishing pressure, especially for export to French islands. Mangrove conditions are also perceived to be declining, mainly because large areas have been cleared and converted to developments such as marinas. Seagrass beds have remained the same over time and the turtle population has increased.



Coral Reef Exposure

All reef ecosystems will be exposed to several climate hazards including increased sea surface temperatures, increased storm intensity, ocean acidification and sea level rise.



Coral Reef Sensitivity

Reef ecosystems are naturally sensitive to slight changes to the environment, especially to sea temperatures and ocean acidity. However, a major factor affecting the sensitivity of a reef ecosystem is its current health.

A degraded system experiencing severe human-related threats (i.e. sedimentation, pollution, destructive fishing, overfishing, etc.) will be much more sensitive than a healthy one that has few threats and has high biodiversity. The current condition of much the reef ecosystem used by Carriacou fishers is “fair”. However, the trend is declining. Causing this decline are severe threats such as large development projects that clear/destroy mangrove habitat, heavy fishing pressure outside the MPA, invasive species such as lionfish which are not managed, and anchor damage from lack of a regulated mooring system.



Coral Reef Adaptive Capacity

While the adaptive capacity of reef ecosystems to keep up with changes caused by climate change (such as increases in sea surface temperature and ocean acidification) is fairly low, effective management can improve the ability of systems to adapt. There are some management efforts underway in Carriacou to reduce the threats on reef ecosystems, most specifically the Sandy Island Oyster Bed Marine Protected Area open and closed seasons for specific fisheries such as lambi, lobsters, and turtles.

Fishers believe that the management of our marine resources should be classified as “fair”, with some management activities working well while others are not. For example, fishers feel the closed and open seasons (e.g. lobster, conch, sea turtle and sea urchin) are working well. They are self-regulating and voluntarily not taking as many turtles and sea urchins even in the open seasons, contributing to their perceived increase in populations. They also like that there is access and use of the MPA by seine fishers to catch bait or pelagic species as this protects traditional practices. They believe the management of the MPA is helping to improve fish populations inside the MPA, and reducing anchor damage through zoned snorkeling areas and mooring systems.

While fishers believe the management is designed to help minimize impacts of climate change, and believe the open and closed seasons are effective, they also noted several threats that are not being addressed by management due to a lack of political will to prioritize management actions, and a more general lack of awareness at all levels (community, fishers, government) of the value of natural resources. Management of lionfish is not happening both inside or outside the MPA and are perceived as one of the main threats to the ecosystem. There is a lack of management outside the MPA so some of the main threats continue to increase the vulnerability of these systems. The biggest of these is large development like the construction of a marina which destroyed critical habitats such as mangroves and the oyster beds, and also had negative impacts on fishers. Another area of concern is high fishing pressure caused by a lack of alternative income and food sources.



Community Dependence

Carriacou residents depend highly on coral reef ecosystems and fisheries for food and income. Approximately 80% of the residents depend on fishing as a main source of income and nearly the entire population is dependent on fishing as their main source of food.



Community Adaptive Capacity

The adaptive capacity of the community includes all of the information, knowledge, skills, and resources that the community can access to adapt to changes in the target resource.

If the coral reef ecosystem is negatively impacted by climate hazards, fishers feel that they will be displaced. Meaning they would need time and training to be able to adapt to a new way of generating income. However, fishers on Carriacou already feel this sense of displacement and need for new ways of generating income due to the MPA. While they believe the MPA is improving fish populations inside the boundaries, current zoning negatively impacts their livelihoods, as they can not trawl for pelagic species within the MPA. They feel the social impacts were not considered and alternatives were not provided to fishers who depend on this area for fishing.

While some young fishers are able to find part-time employment in the construction industry as an alternative source of income, older fishers are unable to explore options and are truly dependent on what they know. Many fishers also raise livestock as a supplemental source of income and food. These food sources may become more important if marine resources are negatively impacted from future changes in climate. Fishers also noted a problem with theft of their gas, engines, and gear from the beach. This adds an extra financial burden to them when these items need to be replaced and they are unable to work. Theft occurs because there are no facilities for fishers to lock up their belongings before or after a day of fishing.

Fishers generally feel they need skill development to seek other job opportunities. Often times, training support has been carried out by sending 1-2 fishers off island to receive training for alternative livelihoods or other skill building. This has been perceived as unfair, as the knowledge is typically not transferred to a larger group. On-island skill building is preferred. For example, they are interested in fishing offshore for pelagic species such as tuna and dolphinfish. While local fishers are able to build boats for near shore, their boats are not designed for high sea conditions and their safety is at risk. Fishers do not have the skills and knowledge required for pelagic fishing and would like to receive training on off-shore fishing.

To help minimize long term impacts from climate change, some organizations have been working with fishers and provided support through training and projects. These include The Nature Conservancy (TNC), the United Nations Development Programme (UNDP), and the Global Environment Fund (GEF) Small Grants Programme. Support from these organizations include providing safety equipment (e.g. life jackets, radios, flares) for off-shore fishing, and the implementation of new fish aggregation devices (FADs) to help attract pelagic fish closer to the island.



Coral Reef Ecosystem Vulnerability

The coral reef ecosystem is highly vulnerable to negative impacts from climate change and other threats. The health of marine resources including coral reefs, mangroves, and fisheries outside the MPA are already declining. Declines of these resources are due to local threats and will worsen with changing climatic conditions. All reefs will be exposed to higher sea temperatures, ocean acidification, and extreme weather events as climate change continues. Local actions that weaken these resources include damage to habitat from development and anchoring, and invasive species such as lionfish. While fishers feel marine resource management is designed to help minimize impacts of climate change, they feel it is not addressing all of the threats and ignore social impacts. This is mainly due to a lack of political will to share benefits with fishers who lost important fishing grounds with the establishment of the MPA, while other important habitats are converted into developments (negatively impacting fish nurseries).

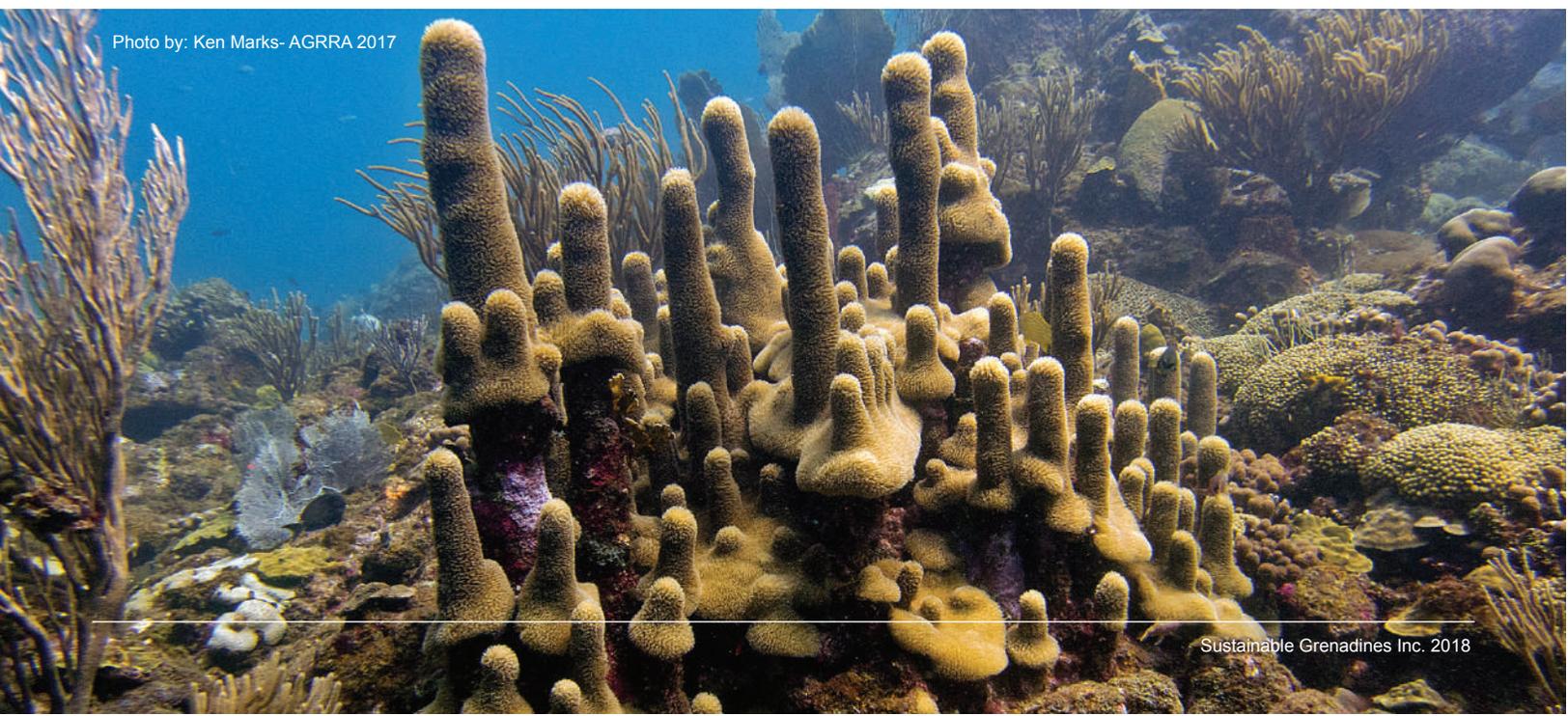


Community Vulnerability to the Impacts of Climate Change on Coral Reef Ecosystems

Carriacou's fishers are also highly vulnerable to the negative impacts climate change will have on marine resources. Most residents are highly dependent on fishing as a main source of food and/or income. Alternative options for income are scarce in the slow economy of Carriacou, especially for the older generation of fishers. Alternative food sources would require a higher dependence on imported foods and cost more money. Food costs are already the number one expense of most households so the loss of fisheries would make this expense even higher. However, many fishers also raise livestock, which could provide food sources in times of need if livestock can be managed to withstand changes in climate conditions.

Opportunities to learn new skills for developing alternatives are also lacking. In the past, many trainings have been carried out off island where only a few fishers from Carriacou were given the opportunity to attend, limiting the transfer of skills to the larger group of stakeholders. However, some support is being provided from regional NGO's to help local fishers adapt to changes and reduce fishing pressure on reefs.

Photo by: Ken Marks- AGRRA 2017





EARLY ACTIONS

Identified by Carriacou fishers

The threat and vulnerability assessments were used to help further understand the degree of, and reasons for, the vulnerability of natural systems and social systems to the impacts of climate change. With that information, community members explored actions that could reduce the vulnerability of natural and social systems.

For natural systems, they explored ways to reduce exposure and sensitivity (through threat reduction), and increase adaptive capacity (through improved management). For social systems, they explored ways to reduce dependence on vulnerable natural systems, and improve their adaptive capacity, partnerships, and resources.

Based on the discussions, fishers identified the following actions as important steps to building natural and social resilience to climate change:

1. Equipment for Pelagic Fishing

Equipment needed to fish further out at sea include VHF radios and iceboxes.

Fishers are interested in fishing offshore for pelagic species to take pressure off of reef fishing and as an alternative to fishing in the area of the MPA which is no longer accessible to them. However, they expressed the need for different equipment than they currently own that would enable them to go beyond the MPA boundaries.

Fishing offshore would help to reduce the threat of high fishing pressure on near-shore reef systems, which was noted as one of the reasons for the apparent decline in fish stocks outside the MPA. It would also help with the adaptive capacity of fishers to cope with negative impacts to reef fisheries over time from climate change, as well as improve alternative food sources for communities that are highly dependent on the sea as their main food source. This would help reduce the impacts of high fishing pressure, outside of the MPA, on coral reef ecosystems. It would also help increase the adaptive capacity of fishers to cope with negative impacts to reefs from climate change and other threats.

2. Alternative Livelihoods Training

Fishers are seeking skill-building opportunities to be able to generate other sources of income and reduce reef fishing.

Fishers affected by the MPA also need skill-building opportunities, especially to change some practices that harm the reef ecosystem (e.g. harvesting too many parrot fish for foreign export) and to fish in pelagic waters. This would help reduce the impacts of high fishing pressure, outside of the MPA, on coral reef ecosystems.

Alternative sources of income would also help to build the adaptive capacity of fishers to cope with negative impacts of climate change on reef systems, and also reduce the dependence of fishers on these highly vulnerable ecosystems. Fishers expressed interest in training/skill-building on the following topics:

a. The use of Fish Aggregating Devices (FADs) and pelagic fisheries

Including training on fishing methods, target species and best management practices.

b. Education on marine life

For example species-specific catch sizes.

c. Boat building

Fishers have the skills to build boats for near shore fishing but the design is not safe for offshore purposes. They therefore require the skills to build boats that are able to safely travel into pelagic waters. They believe that they have the resources to build these boats once they have acquired the appropriate boat design skills.

d. Engine Repair

Fishers expressed interest in training/skill-building to repair their own boat engines or the engines of their peers. This will help to lessen repair costs and may lessen the number of days that they are unable to work.

In addition to the training and skill-building opportunities listed above, fishers also expressed the need for safe places to lock up their gas tanks, engines, and fishing gear before and after fishing to prevent theft and loss of equipment. This action would help fishers convert to alternative sources of fishing by reducing the expenses needed to keep equipment safe and eliminating the cost to replace stolen equipment.

3. Awareness

Outreach should be carried out at all levels (i.e. community, fishers, government) to build a great sense of value for natural resources.

Fishers noted that contributing factors to destructive environmental behaviours included a general lack of interest about the importance of natural resources by stakeholders and a lack of political will to prioritize funding and actions to protect natural resources. They would like to see increased levels of awareness generated about climate change and the benefits of healthy natural resources, as well as the need to share the benefits of management with the fishing community.

This action would help to improve the adaptive capacity of the community to cope with negative impacts of climate change by helping people to understand climate change, why it is happening, and how they can be prepared. Additionally, if effective, it can reduce the vulnerability of the resources over time by improving environmental stewardship to reduce threats and improve management of threatened resources.

4. Improved Governance

Fishers would like to be more actively involved in management decisions and implementation.

The ability to organize and plan is one of the main indicators of adaptive capacity for social systems. This action would help improve the adaptive capacity of the fishing community by providing more opportunities to organize, plan, and be directly involved in management actions.

Improved governance of marine resource management through the involvement of fishers includes:

- a. Involving fishers in monitoring and enforcement of the MPA
- b. Re-visiting the co-management agreement of the MPA to include fishers as a direct part of the management structure.



Photo by: Ken Marks- AGRRRA 2017

SUMMARY

EARLY ACTIONS

Identified by Carriacou fishers

IMPROVE CAPACITY TO FISH PELAGIC SPECIES

to reduce fishing pressure on reefs.

1



IMPROVE ALTERNATIVE LIVELIHOOD TRAININGS

to reduce dependence on fishing .

2



IMPROVE GOVERNANCE

by organizing and planning for the future.

4



IMPROVE AWARENESS

of the benefits of healthy natural resources at all levels to increase stewardship .

3



5

IMPROVE PARTICIPATION OF FISHERS

in management decisions and activities.

Sandy Island - Oyster Bed MPA Adjacent Communities

LEAP

CLIMATE STORY



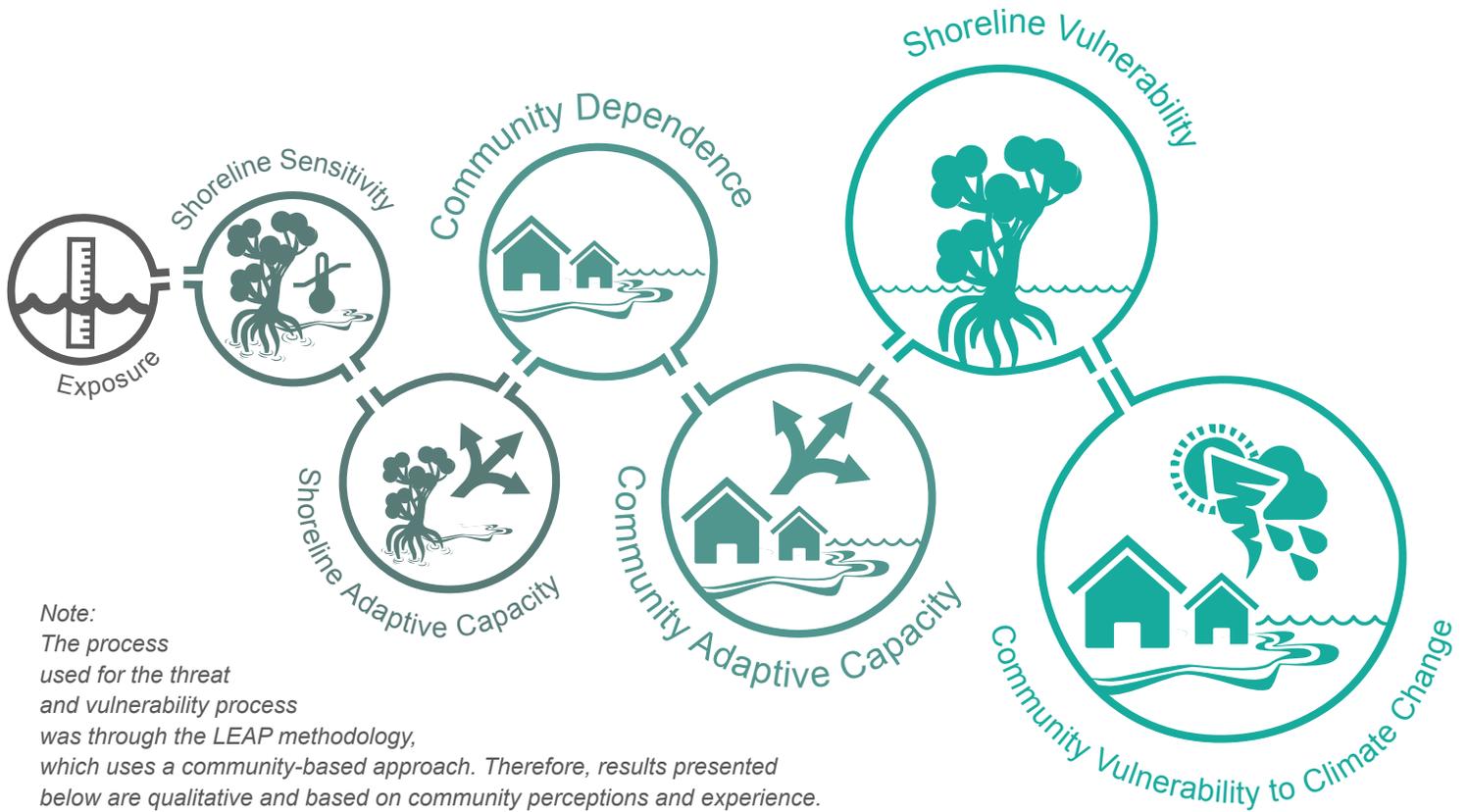
The communities of L'Esterre, Lauriston, and Harvey Vale have experienced droughts, hurricanes, tropical storms and depressions, and storm surge events in the past. These events caused damage to homes, livestock, infrastructure, and a loss of water for drinking and livestock. To cope with these events, the communities shared and recycled water when needed, used alternative water sources such as wells, and used hurricane shelters. They also re-built stronger infrastructure and stored extra food and water for emergencies.

Community members have begun to notice changes in the 'normal' seasons. The most significant change noted was longer dry and wet seasons that cause periods of extended rain or extensive drought-like conditions at various times of the year. If these changes continue there will be a loss of crops leading to food shortages and loss of income for farmers. Extensive rains would cause flooding and swamp-like conditions that cause damage to roads and property, and an increase the presence of water borne and mosquito borne diseases.

As climate change continues, community members are concerned about the many impacts it can bring. Most notably are impacts of sea level rise in combination with wind and waves that can cause a loss of beaches or shorelines - causing damage to, or loss of, homes and property, loss of tourism income, and loss of plant and animal life in mangroves. Higher air temperatures and changing weather patterns can cause future storms which may become more intense and cause damage to houses, beaches, reefs, mangroves, and tourism sites. Drought conditions can lead to a loss of vegetation and forests. In addition, higher sea surface temperatures and ocean acidification can cause fisheries and livelihood losses. Damage to reefs and mangroves will cause further impacts to coastlines.

Threat and Vulnerability Assessment

for Shoreline and Nearby Buildings and Infrastructure



Exposure

The shoreline of L'Esterre, Lauriston, and Harvey Vale are made up of mangroves (fringing and sheltered basins), six beaches of varying sizes, some rocky shores, and offshore islands. The outer reef ecosystem including corals, fish, and invertebrates provide most of the sand on the beaches and protection from waves. Some siltation from the land and upland forest also provides sediment to the shoreline area.

As the climate changes, all of the shoreline areas will be exposed to rising seas, increased storm intensity (wind and waves), and changes in weather patterns which includes less general rainfall and increased extreme rain events.

Based on past experience and current trends, increased sea level rise will cause more and faster rates of erosion when associated with storms or certain seasonal winds. Additionally, extreme rain events cause flooding of low lying swamp lands.



Shoreline Sensitivity

A healthy shoreline ecosystem is made up of “natural defenses” (i.e. coral reefs, seagrasses, beaches, mangroves, wetlands, and upland forests) that in combination can slow the rate of shoreline change and limit the amount of coastal flooding and erosion, as well as provide other socioeconomic benefits to communities (e.g. food, income). Healthy natural defenses will reduce the impacts of climate change to shorelines.

Human alterations to natural defenses may increase climate changes' negative impacts to shorelines. Human alterations include: sand mining; placing buildings, roads, and hard structures (e.g. seawalls, groins, piers) on active shorelines; clearing mangroves or forests; damage to reef systems from pollution and over-fishing.

The condition of the existing mangroves and wetlands in the area is perceived to be healthy but is anticipated to decline over time due to massive changes in the mangrove ecosystem following the conversion of a large portion of mangroves into a marina in Harvey Vale. The marina development destroyed the mangrove forest, which served as an oyster bed and fish nursery. The area was previously covered in oysters which are now mostly gone. It is believed that the construction of the marina caused a change in the water circulation in the area, trapping the water inside the bay where it remains stagnant and uninhabitable for oysters and other marine organisms. Current plans are also in place to expand the marina to include a port, which would destroy even more of the remaining mangrove ecosystem. The reason for this development, is perceived to be due to **1) A lack of proper planning and legislation to protect natural resources due to no political will to develop sustainably, 2) The ineffectiveness of community group leaders to organize and rise up to challenge the development, and 3) A lack of cultural identity by the community and value for natural resources.**

Beaches and seagrass beds are perceived to be in fair condition. Sandy Island, which was once a large island with a lot of beach area, has now been reduced to a spit or sand bar. This change was mostly due to Hurricane Leny in 1999 which killed all the trees on the island. It also piled a large amount of rubble behind the island providing some protection but that rubble is now mostly gone. Trees were replanted on the island and vegetation is now growing again. However, some erosion is still occurring.

Community members have periodically noticed high seaweed deposits (not Sargassum) on Paradise Beach. Though the reason for these blooms is unknown, they may be associated with changes in water quality.

Some local activities also threaten beaches - including a breakwater placed in Lauriston, which has caused some shoreline erosion, and sand mining of beaches for housing/construction. It is perceived that there is a lack of awareness on the importance of beaches on all levels and no political will to stop sand mining or prevent hard structures such as breakwaters. Laws that prohibit sand mining are in place but not enforced so community members do not have anyone they can call to report this type of activity. Additionally, in a small community, reporting to the authorities can be hard for residents because it is often a friend or neighbor doing the activity. Dry forests are also being degraded due to their clearing for housing developments.

Coral reefs that provide natural protection to shorelines are perceived to be in degraded condition; threatening their ability to provide protection. While community members have noticed an increase in corals and fish within the MPA, they have noticed a depletion of fish outside its boundaries, which is attributed to the removal of too many fish (especially parrotfish), many for export to Martinique through a legal and available market. This is done because people need livelihood opportunities, and also because there is a lack of awareness on the value or importance of reef fish.

Community members also perceive that there is limited enforcement due to a lack of political will, and poor governance structures to manage fisheries. Fishers are consulted a lot but they do not have any power as a body and are not included in management activities or decision-making, which creates tension between them and resource managers.



Shoreline Adaptive Capacity

The adaptive capacity of many low-lying shorelines is generally low. However, mangroves are more adaptable than sandy beaches and may be able to cope with sea-level rise if nothing is blocking them from moving inland and they have access to sufficient sediment to vertically accrete to compensate for sea-level rise.

Strong and effective management that considers long-term climate scenarios and resilience principles will improve adaptive capacity. The management of ecosystems along Carriacou's shoreline is considered to be poor because although sustainable development plans have been developed, they are not implemented. For example, to develop the marina, mangroves, which are important habitat for oysters and fisheries as well as shoreline protection, were destroyed. The Sandy Island Oyster Bed Marine Protected Area is addressing some of the threats to natural defenses but it is perceived to place too much emphasis on government management with little inclusion of the community in implementation.



Community Dependence

Approximately 10% of homes in the community are in the active shoreline area. While these properties do not currently experience coastal flooding or erosion, it is likely that as sea levels rise and storm surges intensify this may happen. Another roughly 10% of homes are in low-lying areas near wetlands. These homes have experienced inland flooding from rain events and erosion. Improved drainage systems have reduced flooding in some areas but flooding has not been addressed in other areas. Extreme rain events are expected to get worse with climate change, and may further threaten these homes.

There are bars and a public restroom on Paradise Beach, as well as bars and a hotel along L'Esterre Bay that will be impacted by coastal flooding events in the future with higher seas and storm surges. Some erosion on Paradise Beach has been noticed but the cause is unclear and may be due to sand mining. This area is very important for both tourism and recreation by local residents. Additionally, there is major infrastructure that lies within the active shoreline of the area. These include the Carriacou Airport, the Tyrell Bay Marina, the proposed port, the fuel depot, coastal roads, and restaurants on Harvey Vale's main street. Currently, this infrastructure has not experienced any flooding or erosion. However, it is likely that as sea levels rise and storm surges intensify, this may occur. Planning for these future events is critical in order to ensure that major losses of property and lives are avoided.



Community Adaptive Capacity

The adaptive capacity of the community includes all of the information, knowledge, skills, and resources that your community can access to adapt to changes in the target resource. Community members of L'Esterre, Lauriston, and Harvey Vale noted that some measures have been implemented that will help communities deal with changing climate conditions. The flooding of low-lying areas during and after intense rain events, for example, has been addressed by local government with the building of drainage systems that allow water to drain out of the area. Road workers continue to help maintain and clear these drains, which are working well. Additionally, the National Disaster Management Agency (NaDMA) has developed plans to ensure communities are aware of what to do in times of natural disasters and provides public service announcements on the radio. The Carriacou government is also talking about relocating the islands' airport. If this were to happen it would displace farmers so livelihood impacts would have to be considered.

However, community stakeholders feel that the government is not addressing long-term impacts of climate change through awareness programs or development planning. For example, there are no outreach programs in place to help people understand specific impacts of climate change when building homes. For example, flood zone mapping, or the identification of safe lands where people who are impacted by future sea level rise, storm surge events, or extreme rainfall could move to has not been done. Most people do not have bank loans and therefore are not required to have insurance, also limiting their ability to recover their investments if damage occurs. A national climate change policy exists but its implementation is unclear.



Shoreline Vulnerability

The shoreline of L'Esterre, Lauriston, and Harvey Vale is low-lying and much of it is in its natural state (made up of mangroves, beaches, and rocky shoreline). None of these areas are currently experiencing coastal flooding or severe erosion. However, the entire low lying shoreline area will be exposed to future flooding and storm surges as sea levels rise and storm intensity increases with climate change. The natural defenses such as seagrass beds and beaches are in fair to healthy condition, however the reefs and upland forest are degraded.

While the existing mangroves are healthy, large areas were degraded over time for development purposes. Local threats to these natural defenses include: the development of the marina and a new port that degrade mangroves, the development of homes that degrade upland forest and beaches through sand mining, and high fishing pressure that degrades reef ecosystems. While there are currently some management actions to reduce these threats, they are not sufficient and laws are not enforced. For these reasons, the shoreline of the area has a moderate to high vulnerability to future climate change conditions.



Community Vulnerability to the Impacts of Climate Change on the Shoreline

A small proportion of the population lives along the active shoreline - an area prone to coastal flooding and erosion. Most of the roads in this area do not provide access to important facilities, such as health clinics. However, there are no flood zone maps, rules, or awareness programs to ensure that future building in unsafe areas does not occur and there are little resources available to help those impacted by future events. Therefore, while most residential properties are considered to have a low vulnerability to climate change there is a small percentage of residents who live along the shoreline who are considered to be highly vulnerable to the negative impacts associated with climate change.

Additionally, there are some businesses and critical infrastructure in low lying areas that are highly vulnerable to future coastal flooding and erosion as sea levels rise and storm surges become more intense. These include local restaurants and bars important for tourism and local recreation, the airport, marina and future port, and fuel port. There is little discussion and planning about impacts to these structures from future climate change, or actions to address these problems. The exception is a plan to relocate the airport. However, this could displace farmers and should be taken into consideration as this may impact food security, as discussed in the next section. Given that these commercial buildings and infrastructure are very important for the tourism and economy of Carriacou, planning for these changes is critical.



Photo by: Gren Snaps



EARLY ACTIONS

Identified by Community Members from L'Esterre, Harvey Vale, and Lauriston

Threat and vulnerability assessments were used to help further understand the degree of, and reasons for, the vulnerability of natural systems and social systems to the impacts of climate change. With that information, community members explored actions that could reduce the vulnerability of natural and social systems. For natural systems, they explored ways to reduce exposure and sensitivity (through threat reduction), and increase adaptive capacity (through improved management). For social systems, they explored ways to reduce their dependence on vulnerable natural systems, and improve their adaptive capacity through knowledge, skills, partnerships, and resources.

Based on the discussions held during the threat and vulnerability assessment, community members of L'Esterre, Harvey Vale, and Lauriston identified the following actions as important steps to building the resilience of shorelines and nearby buildings and infrastructure to climate change:

1. Awareness

[Well designed awareness campaigns supported by the Ministry of Environment.](#)

Community members discussed the threats to natural defenses such as coral reefs, mangroves, and beaches. They felt many of the threats to these natural defenses were due to a lack of awareness about the value of these systems in protecting shorelines. They would like strategic outreach and social marketing activities carried out to help people understand climate change and its impacts and to foster stewardship of community members and fishers to care about resources (e.g. stop littering, sand mining, and poaching). This action would help to improve the adaptive capacity of the community to cope with the negative impacts of climate change by helping people understand climate change, why it is happening, and how they can be prepared. Additionally, if effective, over time it would help reduce the resources' vulnerability by improving environmental stewardship to reduce threats and improve management of these resources.

2. Implement Local Governance

Well designed awareness campaigns supported by the Ministry of Environment.

Part of the Grenada constitution includes the development of local government arrangements such as building capacity for local communities to organize and make decisions (e.g. through mayors, town councils, etc). However, there has not been the political will at the national level to develop these local governance structures, which are highly desired. Community members feel it is critical to be able to identify community champions, discuss issues, and decide on ways to address issues at a local level. This would include their involvement in the management of the natural resources within their communities. The ability to organize and plan is one of the main indicators of adaptive capacity for social systems. This action would help improve the adaptive capacity of the community and reduce their vulnerability over time. The following are ways to improve local governance:

a. Use community champions.

Use community champions to generate change such as increasing awareness, and participation in activities. These could be voluntary positions by people who are actively involved in community activities. Support to this group to help them organize and plan is desired.

b. Increased community consultations.

Hold more open forums for community users to present problems and actions. Improve dialogue and places where local community members can share ideas and ways to address local problems.

3. Alternative Livelihoods Training

Provide alternative livelihood programs for people affected by local area management (i.e. MPA) and development (i.e. the marina and port).

Fishers affected by the MPA also need skill-building opportunities especially to fish in pelagic waters, and to change some practices that harm the reef ecosystem (e.g. taking of too many parrot fish for foreign export). This would help reduce the sensitivity of the first line of defense to the shoreline (i.e. the reef ecosystem) by reducing the threat of high fishing pressure on the reefs outside the MPA. Alternative sources of income would also help to build the adaptive capacity of fishers to cope with negative impacts of climate change on reef systems, and also reduce the dependence of fishers on these highly vulnerable ecosystems.

For more details, please refer to the section on marine stakeholders.

4. Rules and Technical Information

There are currently no laws or tools to prevent community members from building in areas prone to flooding or erosion in the face of climate change. This includes zoning rules, flood zone mapping and managed retreat plans that identify alternative sites (e.g. government lands) where landowners who are in unsafe areas can be relocated to. Access to this information would help improve the adaptive capacity of the community members by helping them make climate smart decisions for development.



5. Enforcement

Improve enforcement of rules that protect natural defenses.

Existing rules are in place to protect beaches and prohibit sand mining. However, sand mining still occurs with little to no enforcement. Community members find it hard to stop people violating laws because they often know violators and do not have enforcement authorities to call. Ways to improve enforcement presence and programs that enable community members to report violations are needed. Stopping sand mining would reduce the sensitivity of beaches to climate change threats.

6. Re-vegetation

Plant vegetation along the shoreline to trap sand/sediment and help minimize erosion.

Planting vegetation along the shore line. Persons in the group suggested that trees should be replanted along shoreline, particularly in areas where vegetation has been removed. Areas suggested included Paradise Beach and along the coastline in Lauriston. They felt that by replanting trees it would help to hold the remaining land in place, trap sediments and reduce erosion.

7. Protection of Natural Defenses

Protecting mangroves, reefs, and beaches are the most cost effective ways to protect shorelines.

Rules to prevent destructive practices such as the clearing of mangroves or building hard defenses such as seawalls and breakwaters are desired.

8. Monitor Beaches Over Time

Continue beach profiling to monitor changes in the beach over time.

In the past, the government has conducted beach profiling in order to monitor shoreline changes. However, that no longer occurs. There is interest in undertaking this activity in order to demonstrate and communicate any changes observed on beaches. Volunteer groups or school groups could do this on popular beaches such as Paradise Beach with support from an agency or organization that could manage and analyze the data. Monitoring the beaches builds adaptive capacity of the community as it can help to raise awareness about changes occurring to the natural shoreline.

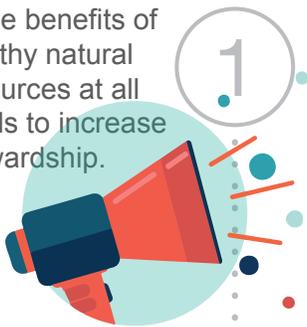
SUMMARY

EARLY ACTIONS

Identified by Community Members from L'Esterre, Harvey Vale, and Lauriston

IMPROVE AWARENESS

of the benefits of healthy natural resources at all levels to increase stewardship.



IMPROVE ALTERNATIVE LIVELIHOOD TRAININGS

to reduce dependence on fishing.



IMPLEMENT LOCAL GOVERNANCE

to organize and engage citizens and plan for the future.



IMPROVE TECHNICAL INFORMATION

and rules to ensure development happens in safe areas.



IMPROVE ENFORCEMENT OF RULES

that protect natural defenses.



MONITOR CHANGES

in the shoreline over time.



RE-VEGETATE THE SHORELINE

to help trap and hold sand.



IMPROVE RULES

to protect natural resources from poorly planned development.

Agriculture and Food Security

LEAP

CLIMATE STORY

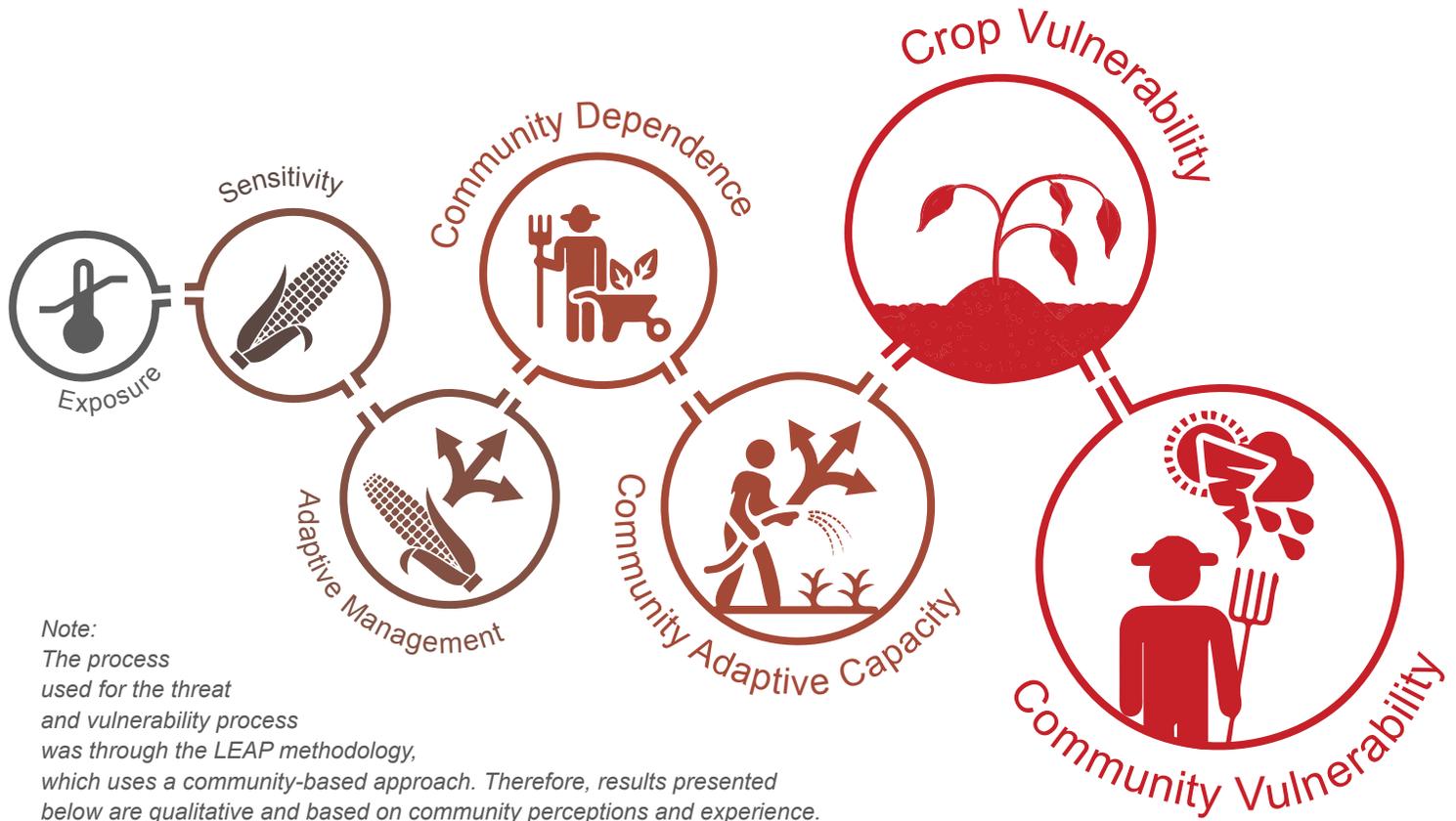


In the past Carriacou farmers have experienced droughts, hurricanes, tropical storms and storm surge events. These events have resulted in a loss of livestock, damaged infrastructure and threatened livelihoods. To cope with these events, farmers have received financial aid to rebuild. In the case of droughts they have conserved water to ensure it lasted longer. Farmers have also planted wind-breaks to provide protection to crops from storm events. Based on these impacts, farmers are most concerned about future hurricanes.

Farmers have noted many changes in their normal seasonal patterns. Their greatest concern is that rain is not consistent. Planting is sometimes delayed to late July, and overall there is less rain. If this trend continues, food security (crops and livestock) will be threatened and people will be more dependent on imports than on local foods. This will impact the way of life on Carriacou where growing local foods is important for daily sustenance.

As the climate changes, farmers are concerned that increases in air temperature will prolong dry weather, requiring more water to keep products growing over a period of time. If water is not available crops will die causing food shortages, loss of markets, and loss of income. Farmers will need to find ways to protect crops from these conditions such as green houses, but that will not work for all crops. Farmers are also concerned that with a rise in sea level, low lying farms will be flooded or eroded causing farmers to move inland. Farmers may also have to plant more economical trees and not leave grounds bare which can allow erosion to take place. Heavy winds also cause salt to blow onto the land and this may burn and damage crops. On a positive note, El Niño caused more showers in 2017 and farmers enjoyed reaping the crops that resulted from the heavy rains.

Threat and Vulnerability Assessment for Agriculture and Food Security



Exposure

Important crops include corn, peas, cassava, sweet potato, melon, and cantaloupe. Livestock include mostly ruminants (i.e. goats, sheep, and cattle). Some people also grow tomatoes, peppers, and lettuce in backyard gardens.

Most crops and livestock will be exposed to increased air temperatures that may stress crops that need additional water due to increased evapo-transpiration. Changes in temperature can also change growing season length, timing and optimal crops. They will also be exposed to changes in rain frequency and/or intensity (e.g. droughts, flooding) and increased storm intensity that can damage crops from wind and heavy rains.

Additionally, some coastal farms and gardens already experience water logging with extreme rain events, salt-water intrusion in wells used for watering, and burning from salt spray. It is expected that these issues will get worse with sea level rise especially in combination with high wind and wave events.



Sensitivity

The sensitivity of agricultural resources to climate events is dependent on the specific type of crop and the severity of local threats that can weaken the crops. Some important crops are more sensitive than others to the extreme weather conditions associated with climate change. Corn and peas are sensitive to extensive sun and wind. Melon and cantaloupe are sensitive to too much rain and drought conditions. Sweet potatoes grown on flat land are sensitive to water logging and therefore require a bank to grow in during periods of heavy rain. All of these crops may be threatened as air temperatures rise, seasons become less predictable, and precipitation patterns become more erratic (less rain and more extreme rain events). Cassava is perceived to be a good crop that can withstand different climate conditions, as people will change growing approaches based on the weather patterns (for example, people will not harvest if there has been too much rain, and will leave crops in the ground for the next season). All crops are sensitive to salt water, which can burn or kill crops that are flooded or sprayed by saltwater.

There are several local threats to crops on Carriacou that degrade its agricultural systems. These include trampling of crops from roaming animals, pests, diseases, and lack of adequate water storage to withstand extended periods of dry weather. These threats make agriculture more sensitive to future changes in climate.

Many people allow livestock to graze openly when their land has been completely grazed. No laws are in place to ensure livestock is kept fenced in. This causes severe problems as free roaming animals trample and eat crops, and drink from water sources in nearby farms and gardens. Even fenced in farms and gardens are not effective in keeping out free roaming cattle as they also trample fencing. Cattle herds are growing in population and are not slaughtered for meat. Proper veterinary services are not available to maintain safe meat production so there is no longer a market for beef as islands that previously purchased beef from Carriacou are no longer buying it due to health concerns.

Pests and disease are also threatening crops including iguanas (which feed on young plants), white flies, and fungus. More iguanas are present because people hunt them less than in the past. It is unclear why white flies and fungus have gotten worse over time. Free roaming dogs also present a problem as they chase and harm livestock. This is mainly due to a lack of veterinary services to keep populations down, and a lack of control over dogs by owners to ensure they do not roam onto other people's properties.



Adaptive Management

The adaptive capacity of crops is based on management practices that the community uses to ensure plants maintain conditions that they need to survive. This includes planting in areas that are less prone to hazards, using methods that protect plants such as shade-cropping or agro-forestry, or using species that are more tolerant to environmental changes. Good management practices that maintain healthy crops, diversify crops, and reduce exposure to sunlight/strong winds/flooding (e.g. by planting away from vulnerable areas, shade-grown crops), can help crops adapt to changes in climate.

Current methods being used to help crops survive further climate extremes include mulching with cut grass around plants to retain water, and shade netting in the dry season and in drought conditions to protect plants from extreme sunlight and prevent evaporation. Methods used by fewer people include adding organic matter to soil to make it more porous, which allows soil to drain in heavy rain events, and intercropping which can help with shading plants from sunlight.

A lack of adequate water storage and watering methods is one of the main threats to both crops and livestock. While farmers know drip irrigation systems are better for conserving water, few farmers can afford these systems. As such, most farmers will pay for additional water and use conventional water methods (e.g. hose and sprinkler). In times of drought they will try and conserve the water as best as possible. Because many people have backyard gardens and do not mass-produce crops, they are less inclined to spend the money for irrigation and instead pray for rain. A lack of adequate water storage also threatens livestock causing them to roam and seek water sources elsewhere, and potentially be harmed in the process. Less projected rainfall conditions will likely worsen this threat to crops and livestock.

One way farmers are adapting their agricultural methods to cope with extreme weather events is by collecting seeds from their most resilient crops for use in upcoming seasons. However, this is done only by some farmers, and there is no collective seed bank to share these resilient seeds among the broader community.



Community Dependence

While only about 20% of Carriacou residents generate their main source of income from full time farming, nearly the entire population has backyard gardens and farms including crops and livestock that they use as a main source of food for their families. Therefore, there is a high dependence on local agriculture for Carriacou's food security.



Community Adaptive Capacity

Alternative sources of income were historically more available in the private sector if farmers required additional income or had a bad season. These alternatives included construction, masonry, fishing, or government positions. However, these job opportunities are harder to find these days. Farmers identified poultry rearing as a possible alternative food and income source (i.e. there is a local market for chicken). However, start-up investment costs to raise poultry are often beyond the reach of local farmers and there are no programs to help them develop or invest in poultry farming.

Food preservation methods (e.g. drying), which could help utilize crops that are often grown in excess, and are not used very often. Reasons given for no longer preserving food include the belief that younger generations are not being taught to do this and/or are not interested as it is seen as something to do only "in hard times". Additionally, there is no market research conducted to analyze appropriate harvest amounts for particular markets, often causing excesses or shortages.

Current efforts to improve the knowledge, skills, and resources available to local farmers include an effort by the Farmers Association to build a meat processing facility and farmers' market. The building will include necessary sanitary conditions such as wash areas, and freezers for safely processing meats. This effort is to help farmers realize the benefits they can receive from effectively managing and growing livestock. It will also have a farmers' market for crops. This project may help support food security over time as livestock can be properly processed for consumption in safe conditions.

There is a small amount of potential external resources for funding support that farmers can access including GEF and Australian Aid, but there are no on-going funding sources or technical support from government. Caribbean Agriculture Research Development Institute (CARDI) provides seeds and some technical assistance but it has not focused on addressing impacts of climate change. Farmers are also not getting support from local marketing boards or governments to help with loans, equipment, or on-going technical support to ensure there is food security in the face of climate change.



Crop Vulnerability

Many local farmers' staple crops are sensitive to changing weather conditions and extremes (e.g. heat, extreme rains, drought conditions) that are projected to worsen with climate change. Additional non-climate threats to these crops; such as trampling from free roaming livestock, pests, and inadequate water storage, place additional stress on these crops. While there are known management methods to reduce these threats, costs of these methods (e.g. drip irrigation) and common local behaviors (e.g. allowing livestock to roam) prohibit good management from happening. New climate smart approaches to management are not being offered to local farmers. For these reasons, the agricultural sector in Carriacou is highly vulnerable to climate change. This is especially true for low lying crops that will be exposed to sea level rise, as well as crops that are sensitive to extreme weather conditions such as corn, peas, melon and cantaloupe.



Community Vulnerability

Local crops play a critical role in ensuring food security for almost all of Carriacou's residents. Farming is a main source of income for only about 20% of Carriacou residents, however alternative income sources are hard to find in the slow growing economy of Carriacou. Additionally, farming and gardening are a main source of food for nearly the entire population. If crops and/or livestock were damaged with changing climate conditions, many residents would not have alternatives sources of food as they are highly dependent on their crops for daily consumption. Most people do not store food such as grains like full time farmers, or preserve excess crops. Alternative food sources would come at a high cost, as there would be a high dependence on imports.

People are knowledgeable about some of the methods used to prepare for certain weather conditions like less rainfall/drought. However, most people can not afford the equipment needed to implement these methods. Therefore, they conserve water as best as possible in times of drought, which may not be sufficient as the climate changes. While there are some efforts to improve resources to farmers, most of these do not focus on ensuring long-term knowledge and skills are developed (e.g. on-going training and technical support) that would ensure food security in the face of climate change. There are also few opportunities for funding support to subsidize alternative agriculture methods that build resilience. Local farmers are highly vulnerable to these changes for these reasons, especially in regards to food security.





EARLY ACTIONS

Identified by the Farmers of Carriacou

Based on the discussions during the threat and vulnerability assessment, farmers identified the following actions as important steps to building resilience to climate change:

1. Implement Drip Irrigation Systems

Drip irrigation would help plants withstand the extended dry seasons or drought conditions.

Drip irrigation systems conserve water by delivering a slow moving supply of water at a gradual rate directly to the soil. This allows for plants to absorb water at a slow rate and therefore prevents the loss of excess water to drainage or evaporation. Drip irrigation includes a network of pipes, tubing valves, and emitters. This method is understood by Carriacou farmers but most find it cost prohibitive. Drip irrigation would improve the resilience of crops by ensuring sufficient water resources were available during periods of drought.

2. Reforestation

Reforest cleared areas, plant wind-breaks, and develop regulations to protect trees.

Planting trees around crops can protect them from high wind conditions and also keep the ground shaded, cool, and protected from sunlight. Re-planting trees on government lands that once had trees but now only have scrub brush could also attract rain and retain soil. There is also interest in the development of regulations to prevent the cutting of large trees that shade the land, and improve the enforcement of regulations that determine which trees can be removed. This action will improve the adaptive capacity of crops to cope with changing weather conditions, by providing some protection from high winds, excess sun and rain.

3. Storage and Food Processing

Develop storage for products and food processing equipment.

Food processing equipment that can be shared amongst farmers around the island will ensure that any crops that exceed market demand, such as okra and mango, will not go to waste. Understanding which crops grow in excess is the first step to developing appropriate methods for food processing. Developing shared facilities can reduce expenses by individual farmers to buy this type of equipment. Food preservation is a way to build community resilience by improving access to resources that allow them to store food over longer periods which can help in times of shortages.

4. Increase water storage

Improving water storage can help farmers cope with times of drought.

Currently, there are abandoned water tanks around the island that could be restored. Increasing water storage capabilities will reduce crop and livestock vulnerability since the tanks can be used during emergencies, such as droughts, which may worsen because of climate change. One tank that could be restored is in the Vespree Bogles area.

5. Climate Smart Agriculture Training

On-going technical support to help farmers understand climate change impacts and adopt methods to cope with changes are needed.

Farmers are interested in learning methods that improve the resilience of crops to climate change conditions. They noted that trainings often only involve one workshop and follow up support is not provided to ensure that methods are being carried out correctly and to make corrections where needed. They should also be re-visited to ensure that the introduced methods are successfully implemented.

Farmers also suggested that the government should improve their extension services in order to provide equipment, materials and technical support on different climate smart farming methods. Improving resources and technical assistance to farmers would improve the adaptive capacity of farmers and crops to cope with climate change impacts.

Some of the methods that farmers expressed an interest in learning more about include:

- Composting to improve soil health and improve water retention
- Raised garden beds to protect crops during extreme rainfall events
- Development of a seed bank on Carriacou for farmers to share seeds that come from their most resilient crops such as plants that tolerate dry conditions.

6. Fence in livestock

This would prevent damage to crops and water sources from trampling and consumption.

Currently, there are no laws that require that livestock be fenced in. There is interest by farmers in the development and enforcement of regulations to reduce the problem of free roaming animals. However, one of the reasons people do not fence in their animals is because of the cost of fencing materials, and over-population of some animals due to a lack of market for their meat. Funding for fencing, the development of alternative markets for meat products and/or support for the rearing of other animals, could help farmers address these issues. Fencing in animals would decrease the sensitivity of crops as well and improve food security.

7. Rent abandoned lands to farmers

Some abandoned lands could be utilized to increase crop production on the island. Increasing areas for production can help support food security by increasing food production.

8. Support the Farmers' Association Facility

Improve the new farmers' association market and meat processing building by providing needed equipment such as freezers, digital scales and office supplies.

9. Install proper drainage or raise garden beds

Some crops, especially in low-lying farms, can be flooded during extreme rainfall events. The frequency of extreme rainfall events is projected to get worse with climate change. Farms that flood now, will flood more in the future. Options to address this include moving farms to higher ground, raised garden beds, and installing proper drains which will remove excess water.

10. Improve veterinary services

Insufficient veterinary services have been unable to control dog populations and maintain the health of livestock. There is a need to improve veterinary services to help maintain the health of animal populations around the islands. For example, dogs should be tagged, neutered or spayed, and vaccinated. Additionally, veterinarians can help with sick livestock and help prevent hazardous conditions that reduce the value of livestock. Regular access to veterinarian support would help to reduce threats from stray animals on crops, and improve the quality of livestock.



SUMMARY

EARLY ACTIONS

Identified by the Farmers of Carriacou

1 PLANT TREES AND INSTALL WIND BREAKS

to protect crops from high winds and sun.



3 INCREASE WATER STORAGE

with community tanks.

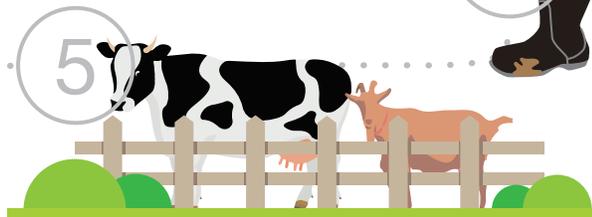


4 USE CLIMATE SMART FARMING PRACTICES

- Install drip irrigation systems to conserve water for times of drought.
- Install proper drainage or raise gardens to prevent flooding of crops.

2 IMPROVE FOOD PRESERVATION

methods and capacity to save extra crops for times of low abundance.



5 FENCE-IN LIVESTOCK

to protect nearby crops and water sources.



9 IMPROVE VETERINARY SERVICES

to keep livestock healthy.

6 CREATE A SEED BANK

to store crops that resist harsh conditions.



7 IMPROVE FARMERS' ASSOCIATION BUILDING

to improve food production.

8 RENT ABANDONED LANDS TO FARMERS



Photo by: Gren Snaps

NEXT STEPS

and Follow Up Recommendations for SusGren

The following recommendations are provided to SusGren Inc. and other support organizations so that they can continue to support the resilience of Carriacou's natural resources, and its community stakeholders. Because the local communities that buffer the MPA do not directly manage the marine resources, organizations that manage these resources such as SIOBMPA management (with support from SusGren) will also need to consider directly implementing actions for reducing the vulnerability of the resources and the associated communities, which are intricately linked. Some of the immediate actions SusGren and SIOBMPA can consider integrating into their existing work-plans and activities include:

- Coordinate with existing community meetings and initiatives to present the LEAPs back to stakeholders. This should be considered a starting point to continue dialogue about climate change impacts and ways to improve natural and social resilience. For example, a brief presentation at a farmers' association meeting could be arranged through core team member Shaka. Additionally, it is important to consistently relay that these plans are for stakeholder groups to use directly. They are their plans and were developed directly from their input. While support organizations such as SusGren will share them and help identify resources for implementation, stakeholder groups (e.g. the fishers' association, farmers' association, etc) should also use them to guide activities that do not require funding support (e.g. outreach activities), and/or to develop proposal requests to governments and funding organizations for priority activities.
- Provide direct follow up to support the implementation of activities in the LEAP documents. To keep up the momentum of the LEAP, it is important to provide stakeholders with a review of the outcomes as well as carry out some activities that show direct support is happening due to the plan development. All activities that happen as follow up should review and/or reference the LEAP as the plan by which the action was developed to reinforce the bottom up nature of the activities. Opportunities for short-term follow up include:

Utilize NOAA/GCFI funds in year 2 to complement UNDP's Drop Line Gear Training being held on November 14-17 in Carriacou. SusGren has the opportunity to participate in, and share costs for, the handing over of gear to fishers. This provides an ideal opportunity to present the LEAP results back to fishers and show that immediate results are being taken to support actions identified in the plan regarding training support and resources for alternative livelihoods.

This would support the marine stakeholder LEAP actions.

Work with Shaka to identify funding opportunities and develop grant proposals to implement agriculture projects that support resilience. The GEF Small Grants program, which has focused on agriculture, can be a great opportunity to support the development of a proposal with the farmers' association that builds the resilience of farmers.

This would support the agriculture LEAP actions.

- Working with SIOBMPA to develop a communications plan that integrates climate change outreach and fosters stewardship of natural resources. Outreach that directly focuses on some of the impacts from climate change, the benefits of natural resources in mitigating these impacts, and activities people can take to build resilience could be developed. A longer-term approach could be to develop a social marketing campaign aimed at changing specific behaviors to improve environmental stewardship. For example, to reduce the taking of herbivorous fish, such as parrotfish. Further funding could be sought for a social marketing campaign.

This would support the SIOBMPA communities and marine stakeholder LEAP actions.

- Holding a workshop to organize community leaders to develop feasible actions they can take to improve the local governance structure. Helping them develop a realistic framework that they could work on together would be a low cost approach to supporting their interest in improving local governance. Ideally, one workshop could be supported with some smaller support for them to carry out an activity or continue to meet on a regular basis.

This would support the SIOBMPA communities and marine stakeholder LEAP actions.

- Meet with national government ministries to share the process and outcomes of the LEAP. The LEAP process and many actions identified in the LEAP documents support national goals as identified in the *National Climate Change Adaptation Plan for Grenada, Carriacou and Petite Martinique (2017-2021)*. Specifically they support the following Programs of Actions²:

PoA	Goals	Indicator(s)
PoA04: Food Security	5 Foundation is laid for food availability, stability, access, and safety amidst increasing climate.	5.1 60% of agriculture officers are advising farmers to implement climate-smart agriculture (CSA) practices.
PoA05: Ecosystem Resilience	6 The management and conservation of protected areas and other key ecosystems areas has improved.	6.1 Protecting and sustainably managing 20% of Grenada's marine and coastal ecosystems by 2021.
PoA06: Integrated Coastal Zone Management	7 The institutional, professional and technical capacity for integrated coastal zone management is built.	7.1 A Coastal Zone Management unit is established by 2020.
PoA07: Resilient Infrastructure and Sustainable Land Management	8 Selected infrastructure is located, planned, designed and maintained to be resilient to climate change, including increasingly extreme weather events and land is managed sustainably.	8.1 All ministries and government agencies with the mandate for land management have the capacity to use spatial data to inform decisions on sustainable land management. 8.2 Climate variability and change is mainstreamed into policies and guidelines for physical planning and development.
PoA10: Sustained Public Education and Participation	12 An informed public that will demand and support public policies aimed at building national resilience to climate change.	12.1 Compared to the 2013OECS survey, results of a repeated KAP (Knowledge, Attitudes and Practices) survey on Climate Change demonstrate improved results for Grenada by 2021.

²Government of Grenada, 2016, National Climate Change Adaptation Plan (NAP) for Grenada, Carriacou and Petite Martinique 2017-2021, Ministry of Education, Human Resource Development & the Environment

- Meet with various organizations involved in the management of resources or that provide resources to Carriacou. Review the LEAP process and outcomes to encourage collaborations amongst other organizations in order to build on the information collected through this effort. This includes Carriacou local ministries, TNC, UNDP, FAO, and 5C's, etc. For example, the FAO Regional CC4FISH Project -Component 2 of the project "Fisherfolk, aquaculturist and coastal community resilience to climate change and variation" and may provide opportunities for support.

- Integrate climate change messages into various outreach programs. Now that some SusGren and SIOBMPA staff are trained on climate change communications, they can begin to integrate climate messages into various programs to foster long term planning and considerations that can improve resilience. On-going messaging and discussions should be continued with communities and stakeholders. Using core team members who were involved can also be a great asset in communicating messages as peer-to-peer exchanges.

- Creative communication approaches to carry out climate outreach can also be explored to improve message dissemination to different audiences. This can include activities such as storytelling, video development, theatre groups, music, art, etc. Specifically, SusGren can explore the option of depicting the climate story and adaptation strategies visually through a poster or some form of graphic material that can be shared around the community.

RESEARCH

