

3.0 CURRENT COASTAL AREA MANAGEMENT ISSUES

This section will focus on current coastal management issues and will attempt to fill the existing gaps not covered in the previous section as it relates specifically to coastal zone management.

3.1 Definition of the Coastal Area

The regional project defines the Coastal Area as a geographic entity of land and water affected by the biological and physical processes of both the terrestrial and the marine environments. The area of land affected by its proximity to the sea and that is unavoidable within a small island system setting. For the purpose of the climate change project, which is ongoing in Grenada, the landward limit of the area of influence of the marine environment is taken as that area which falls within the 150 feet contour and the coastline.

3.2 Coastal Habitats and Ecosystems

According to the Draft Sectoral Report (2000): The Environment, prepared by the PPU, Grenada's shoreline is 121 km long, with rocky geomorphology and diverse ecosystems, including mangrove swamps, coral reefs, sea grass beds, beaches and lagoons (Figure 6). At present only two of these areas were declared to be protected areas by the Fisheries Division, which are the coral reef of Molinere and the sea grass beds of Woburn. In fact, an official from the Ministry of Agriculture referred to them as 'paper' protected areas since there are no management infrastructure or regulations in place for their protection.

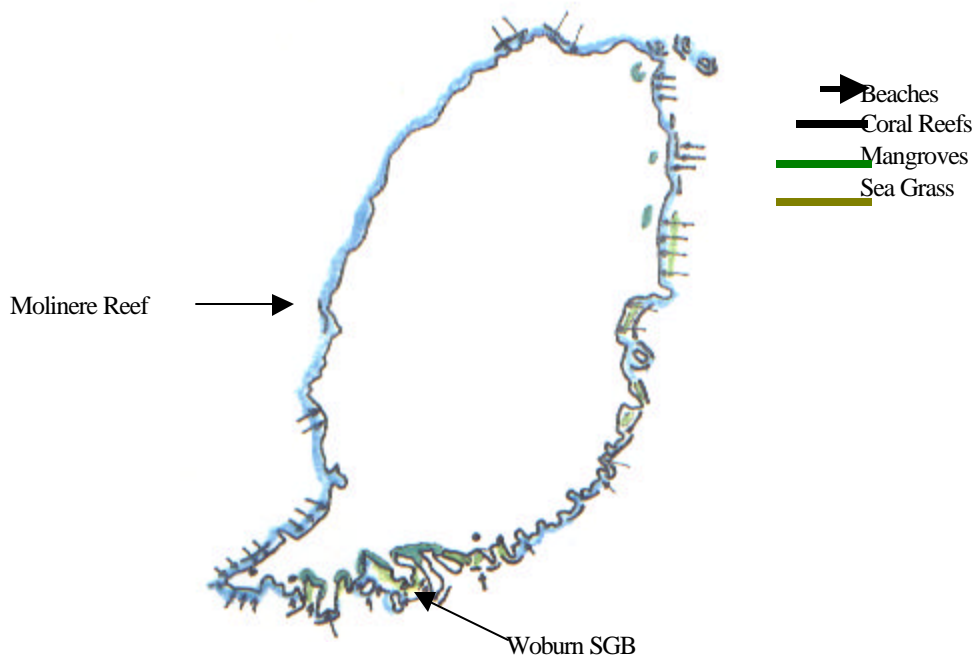


Figure 6: Grenada Marine and Coastal Ecosystems (Adopted from PPU, 2000)

3.3 Significant Coastal Ecosystems

Mangrove swamps, coral reefs, sea grass beds, beaches and river outlets are the main coastal ecosystems and provide invaluable ecological, biological, geological functions. These ecosystems are of valuable socio-economic importance. Their vulnerability to global environmental changes and phenomena such as sea level rise (SLR); rise in seawater temperature; increase frequency and potency of natural hazards is of immense importance.

Mangrove Swamps

There are 470 and 98 acres of mangrove in Grenada and Carriacou respectively (Eschweiler, 1982), which consist mainly of the typical populations of red, black, white and button types. However, Barriteau (1998) in his study on coastal wetlands, which was presented during the Forestry Policy consultations, concluded that mangrove forest is constantly under threat and present estimates may be less. Significant areas of mangrove in Grenada include: Levera Pond, Conference Bay, La Sagesse, and the Bays and Islands from Woburn to Westerhall Bay. Important mangrove systems in Carriacou include: Petite Carenage Bay, Saline Island, Tyrrel Bay, and Lauriston Point (Env. Profile, 1991).

According to Barriteau (1998), data and information on the loss of mangroves is lacking. However, through interviews and community meeting with users of the resource, it was qualitatively established that a large portion has been lost to conversion, over-harvesting and pollution.

Based on interviews conducted the average Grenadian sees mangrove wetlands as “a smelly, useless, mosquito infested swamp”. The problem is compounded by politicians who insist that they should be converted into “something more immediately useful” which will have short-term economic benefits and allow them to gain political mileage (Barriteau, 1998).

Mason (2000) identified major threats to mangroves include:

- ◆ Tourism oriented development such as hotels and marinas proposed for coastal wetland areas particularly in the St. Davids parish and Levera pond;
- ◆ Possibility of conversion to landfills;
- ◆ Major infrastructural development such as the expansion of Lauriston Airport at Carriacou;
- ◆ Public ignorance of the ecological, environmental and socio-economic importance of the perception of these ecosystems due to lack of awareness;
- ◆ Sand mining.

Coral Reefs

Coral reefs occur mainly along the south (mainly fringing reefs), north and east (mainly barrier reefs) of the coast of Grenada and Carriacou. The 'best reef' of Grenada is identified as the Molinere reef, while Saline Island and White Island, outlying Carriacou, are said to have the 'best reefs in the Country' (GOG, OAS, 1988). The biological compositions of these reefs are mainly Elkhorn, finger, and brain coral.

Hunte (1987) who conducted quantitative marine biological surveys of the Grand Anse reef and other adjacent areas indicated that community structures are characteristic of reefs under stress from high nutrient levels. In addition, the reefs outside the bay and north of the deep basin were exposed to sediment stress. However, the six fathoms offshore reefs were found to be in a healthy condition despite the elevated nutrient levels measured in the water. However, it is hoped that the construction of the south coast sewer system in 1994 will reduce the influx of organic nutrients into the Grand Anse marine environment.

DuBois (1984) found that Molinere reef and other West Coast beaches appear to be under stress from high sedimentation rate.

In Grenada the major threats to coral reefs include the following:

- ◆ Run-offs;
- ◆ Dredging;
- ◆ Pesticide and chemical use;
- ◆ Coral harvesting;
- ◆ Anchor damage by boats;
- ◆ Sewage pollution;
- ◆ Sand mining;
- ◆ Coastal developments;
- ◆ Diseases;
- ◆ Sedimentation;
- ◆ Pollution;
- ◆ Coral Bleaching;
- ◆ Sea temperature rise;
- ◆ Loss of macro algal grazers;
- ◆ Coastal development;
- ◆ Physical damage.

Sea Grass Beds

Sea grass beds consisting of turtle and manatee grass are found along the east central and south parts of Grenada's coast and on the west coast of Carriacou (Env. Profile, 1991). Smith (1987) shows sea grass beds in Grenville Bay, Great

Bacolet Bay, the southern bays from Mount Hartman to westerhall and windward Bay in Carriacou.

The sea grass bed of True Blue Bay, an important grazing site for the white sea egg, is stressed as a result of heavy sediment load in the water and little information exist on the status of other sites in Grenada. According to GOG/UNDP et al., (2000) in Carriacou and Petite Martinique sea grass beds are damaged to varying degrees by anchors and chains in Tyrrel Bay, Windward, Sanchez, and White, Saline and Sandy Islands. In Tyrrel Bay and near the main port of Hillsborough, nutrients and pollution from land based sources and yachts are causing detrimental algal growth in the sea grass beds.

Beaches

Beaches are widespread along the coastline of Grenada and its dependencies. Typically they are located in small pockets within bays and are have active profile widths varying from 14m to 45m (Peters, 2000). The longest and most known is Grand Anse which is 2.7 km long.

Major threats to beaches include:

- ◆ Sand mining;
- ◆ Developments;
- ◆ Recreational activities;
- ◆ Tourism activities;
- ◆ Hunting of nesting turtles.

3.4 Major Threats to Management of Coastal Ecosystems

The following is a summary of the major threats to the management of the coastal habitats and ecosystems:

- ◆ Vulnerability to Sea Level Rise and Global Warming including sea temperature rise;
- ◆ Influx of nutrients from land-based activities;
- ◆ Stress from sediment loading;
- ◆ Coastal developments;
- ◆ Ecological imbalance such as the selective removal of key grazer species;
- ◆ Marine activities such as the anchoring and washing of boats and discharge of sewerage by yachts;
- ◆ Lack of awareness and education;
- ◆ Lack of Political will;
- ◆ Lack of appropriate legislation for coastal zone management;
- ◆ Watersport activities;

- ◆ Sand mining;
- ◆ Lack of integrated management responsibility.

3.5 Living and Non-living Marine Resource Exploitation

Almost all sand used in the construction industry comes from beaches and the occurrence of sand mining resulted in recorded beach erosion on most beaches prior to 1992, which was determined by profiling. In fact, Chambers (1986) indicated that extensive sand mining, which has caused serious erosion, was observed at Beausejour, Palmiste, Conference and Telescope Bays (Appendix 6).

Presently, sand mining is only authorized at three sites in Grenada. The sites in Grenada are Pearls, Telescope and Galby. At present only the Pearls site is used for official sand mining activities. Responsibility for the mining of sand was given to the Gravel and Concrete Corporation a statutory body. The high cost of obtaining sand, mainly due to the haulage, has led to smaller scale illegal sand mining at almost all beaches throughout the state.

The exploitation of mangroves is on a small scale mainly for production of charcoal and building materials. The practice of harvesting of corals for the production of jewelry although significant in the past is now the decline. Over harvesting of specific species of reef fish and shellfish remains the main issue related to exploitation of coastal resources. Spare fishing constitute the main form of livelihood to many and on a daily basis harvesting is done in areas which are demarcated as MPAs, due the higher catch per unit effort. This was noticed in the Woburn and Molinere areas and the proposed MPAs of Carriacou; in fact approximately 10,000 kgs of the reef fish are exported from Carriacou to Martinique on a weekly basis.

According to the Fisheries Division, the pelagic fishery is commercial and the fishing effort increased steadily over the years in terms of number of fishing vessels and the equipment used. The main species caught and targeted is the Yellow-fin Tuna contributing a leading average of 16 % of the landings. Other significant contributors to the landings are *inter alia*: Dolphin, Black-fin Tuna and flying fish all of which are important to the fishery at the national level.

The removal of the mangroves is reducing the natural physical and biological functionality of this ecosystem. The harvesting of corals is physically damaging the structure of the reefs and the functions they provide. Preference in the harvesting of more valuable species of reef fish and shellfish, such as snapper and lobsters, has the potential of skewing the species abundance to those that are less important, offsetting the population dynamics of a normal functioning reef and damaging the stock structure. The sein fishery, which is common along the southwest and western coast, is damaging to the physical structures of the fringing and patch reefs in their path. In addition, they do not discriminate in type and to a

lesser extent size of fish caught since regulations for the 'match' size of the nets are absent resulting in wastage, which can affect the stock replenishment rate.

An evaluation of the pelagic fishery is challenging, since regional common stocks exist for most species, warranting a regional approach to management. The absence of adequate data on the stock structure and fishing effort together with socio-political and economic implications make the management of the fishery a challenge and in most cases the stock is damaged before management measures are implemented.

3.6 Aquaculture

Aquaculture is not significant in the coastal area however, suitable sites on the eastern part of the island were identified for such project. Presently, there is an existing demonstration center at Paradise, St Andrew's which will be used as a pilot project.

3.7 Climate Change and Natural Disasters

The impact of extreme weather occurrences on coastal ecosystems include:

- ◆ Damage to coastal ecosystems;
- ◆ Beach erosion;
- ◆ Coastal erosion and inundation;
- ◆ Increased siltation and sediment loading;
- ◆ Damage to infrastructure

There are no specific measures in place with respect to disaster preparedness and climate change on coastal ecosystems.

The development practices, which constitute to threat to life and property include:

- ◆ Inappropriate construction designs;
- ◆ Building too close to the shore line;
- ◆ Sand mining

The Initial Communications Project under the UNFCCC, previously referenced, identified the following potential impact of climate change:

Impact on the Coastal Zone

Grenada has been selected as one of the pilot sites for the Coastal Zone Vulnerability and Adaptation Component of the CPACC Project. The results of this pilot project are not yet available and, when available, will further inform the analysis in this section.

The preliminary results however indicate that there could be serious adverse impacts on coastal communities and infrastructure, from flooding and inundation, especially during storm surges. The experience of Hurricane Lenny in 1999 is instructive in this respect. There is also significant potential for salt water intrusion into the water supply in Carriacou.

Some parts of the main commercial center of St. George's (e.g. the Carenage, Melville Street) and the tourist areas in the southwest peninsula are also susceptible to flooding during periods of high seas and heavy precipitation. Serious disruption of social and economic life in these areas could be expected to occur as a result of sea level rise.

Coastal erosion from sea level rise and extreme events would also disrupt coastal villages like Gouyave, Grand Mal, Duquesne, Soubise and Marquis.

Roads through these communities and other unsettled areas (e.g. Airport road, Carriacou, and a number of sections of roads on the Western Coast) are practically at sea level and below sea level in some cases. These roads could experience flooding, become impassable during high tides and experience severe damage during storm surges.

Beach Erosion

The earliest *Beach Monitoring* in Grenada dates back to 1985 with a coastal monitoring programme in response to severe erosion problems identified in Grand Anse and other beaches (Cambers 1996). Early studies showed that the erosion had greater seasonal variation (up to 34% beach profile area) than long-term variation (up to 10.5% beach profile area), particularly in the West Coast. For Grand Anse, annual erosion was about 11% during 1984 to 1986.

Application of the Bruun rule to beach erosion analysis shows that for a 50 cm rise in sea level, up to 60% of Grenada's beaches would disappear in some areas (Peters, 2000). These beaches include Grand Anse, Morne Rouge, Harvey Vale and Paradise all of which are important tourist attractions.

Sandy Islands and Reefs

Sandy Island, White Island and a number of Keys, which are one to two meters above sea level, could be wiped out as a result of submergence during storm surges. In the past 25 years, Sandy Island on the west coast of Carriacou, has lost about 60% of its area, while small sand banks that existed for hundreds of years between Carriacou and Petite Martinique have disappeared completely.

Tourism

The impact of climate change and sea level rise on tourism would be mostly indirect. As climate in the higher latitudes would be milder, Grenada could be a less desirable climate-influenced destination.

Another possible negative impact on tourism could be the loss of beaches, or the deterioration of the beaches due to erosion from natural phenomena and/or climate change. Water sports, which is currently a rapidly growing sub-sector of tourism, would become less attractive in the absence of quality beaches.

Higher temperatures would increase the operating costs of hotels, as there would be greater per capita water consumption and power consumption for air conditioning. A good analogue of the impact of temperature rise on power consumption can be seen in the annual variation of mean temperature and power usage.

An analysis of the historic power and temperature data for a small tourism plant shows that for a 1.1 °C variation in average monthly temperature, there is 25% variation in power consumption. July to September 1999, was one such period on record, with a 0.9 °C above average temperature causing an 11% increase in power consumption.

Human Health

The major effects of climate change on global human health are caused by heat stress, air pollution, alterations in the incidence of communicable diseases, under-nutrition and inundation. (WHO 1990). The ability to assess the human health impacts of climate change is at a very early stage of development (Balbus et al, 1998), with the impact being more complex than on other sectors.

In Grenada the main effect is likely to be caused by the increased incidence of vector-borne communicable diseases for which the vectors are currently resident, or are likely to be imported. Respiratory diseases associated with regional dust storms during the hurricane seasons are also likely.

Preliminary analysis of the three most common diseases, influenza, viral conjunctivitis and gastro enteritis shows correlation between annual and July precipitation and these diseases. Significant positive correlations are observed for the incidence of viral conjunctivitis and influenza and August precipitation - $R=0.70$ and $R=0.62$ respectively.

3.8 Transboundary Threats

The transboundary threats include the following:

- ◆ Oil spills and Pollution of coastal areas;
- ◆ Fish kills and Algal intrusion;
- ◆ Toxic waste trans-shipment;
- ◆ Freshwater influx.

3.9 Tourism

The major tourism concerns to coastal area management includes the following:

- ◆ Hotel construction and other developments;
- ◆ Carrying capacity excesses;
- ◆ Lack of coastal zone management;
- ◆ Lack of regulation of coastal zone activities;
- ◆ Violation of laws;
- ◆ Pollution/contamination;
- ◆ Loss of habitats.

3.10 Health

The Ministry of Health is the body responsible for performing the regulatory function as regards coastal water quality. Water quality monitoring is limited in spatial extent. Specific sampling sites were established, such as in the vicinity of the Green Bridge sewage outfall and the inner harbor, and bacteriological analyses are done on a periodic basis to determine the level of sewage related microbes in the water. It is believed that the plume from the St. George's sewage is affecting the coastal area. Ear and enteric infections among sea bathers have been blamed on coastal water quality although no statistical links were established.

Numerous complaints are received by the Environmental Health Department concerning the presence of raw sewer in the water of bays. It is assumed that yachts and other small vessels are the main culprits but investigations were never confirmed. However, the possibility of land based activities as a contributor to such contaminants was never ruled out due to the drainage pattern and frequency of flush out especially after heavy rains.

The link between food poisoning from the consumption of fish and shellfish has long been established, but data to verify the outbreaks as a consequence are not available. However, once there are evidence of sewage contamination of the marine environment the potential for food poisoning by microbes and helminthes exist.