

Wise practices for coping with

# BEACH EROSION



Carriacou

Petit  
Martinique

Grenada



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UNESCO Environment and Development in Coastal Regions and in Small Islands

## FORCES TO BE RECKONED WITH

Beaches are continuously changing – from day to day, month to month and year to year – as the natural forces of wind and water meet the land. These changes, which have been taking place for millions of years, are linked to variations in wind, waves, currents and sea level height.

But it is not just natural forces that change the beach, humans have a big role to play in this process as well, through mining stones and sand from the beaches and dunes, polluting and damaging coral reefs, and constructing buildings and walls too close to the sea.

Changes in the beaches affect everyone. The coast is a place we are all attracted to for recreation, sports and simple enjoyment. This constantly changing and hazard-prone coastal environment is also where the greatest financial investment is concentrated, as large tourism properties and establishments continue to be attracted towards the shores of Grenada, Carriacou and Petit Martinique. Tourism is a driving force in the country's economy so the state of its beaches is of major importance.

### *Natural forces*

- **Hurricanes and tropical storms**, occurring between June and November, cause dramatic beach changes usually resulting in serious beach erosion.
- **High waves in winter** resulting from storms in the North Atlantic Ocean, and known as swell waves, or locally as 'groundseas'.
- **Sea-level rise**, which is a long-term factor, taking place very slowly over decades causes shorelines to retreat inland.

Since 1995, the Atlantic Basin (including the Atlantic Ocean, the Caribbean Sea, and the Gulf of Mexico) has entered a more active hurricane cycle, which may continue for more than 20 years.

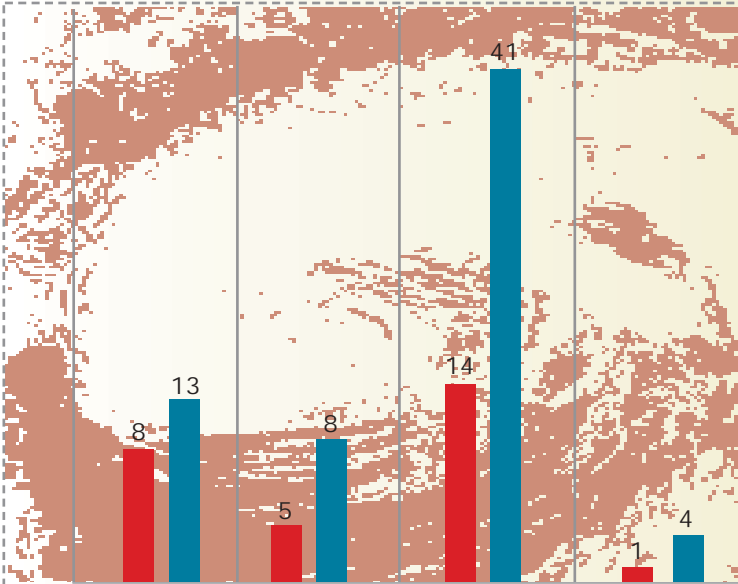


Number of  
named storms  
per year

Number of  
hurricanes  
per year

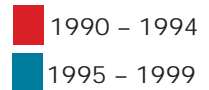
Number of  
hurricane days  
per year

Number of  
category 3, 4, 5  
hurricanes per year



Hurricane  
frequency  
between 1990  
and 1999  
in the Atlantic  
Basin

5 year periods



Source: Gray et al <http://typhoon.atmos.colostate.edu/forecasts/1999/nov99/>

In the Atlantic Basin the number of really severe hurricanes (categories 3, 4 and 5) increased from one per year (1990 -1994) to four per year (1995 - 1999).

## Human forces

- **Removing sand** from beaches and dunes for construction purposes causes erosion and the loss of beaches and coastal lands, destroying the natural heritage of the coast and reducing the vibrancy of the tourism industry.
- **Building too close to the beach** interferes with the natural sand movement and may impede beach recovery after a serious storm or hurricane.
- **Badly planned sea defences** may cause the loss of the beach, and of neighbouring beaches.
- **Pollution from human activities** on the land may damage coral reefs and seagrass beds; these biological systems protect, and provide sand to the beaches.
- **Removing vegetation from the dunes** destabilises these protective sand barriers; and clearing sites inland results in increased soil and dirt particles being washed offshore and smothering coral reef systems.

*Plastic and other debris  
on the beach  
at Petit Martinique  
eventually washes into  
the sea and impacts  
marine life, 2000*



## WHAT'S HAPPENING TO OUR BEACHES?

In order to manage these changes, Grenada's beaches have been monitored since 1985 by the National Science and Technology Council, together with the Fisheries Division, Lands and Surveys Division, and the Land and Water Resource Unit. The Hillsborough Secondary School and the Fisheries Division have measured Carriacou's beaches since 1997. They measure the beach slope and width every 3 months at numerous sites around the islands.



Boat building on beaches, a tradition in Petit Martinique, 2000

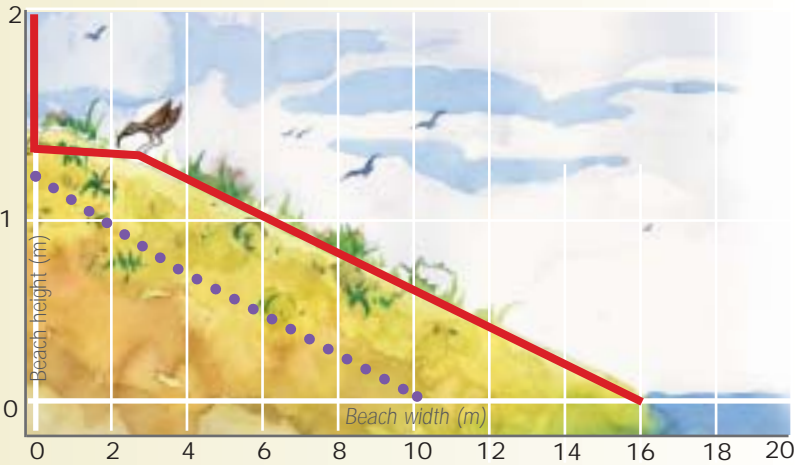


Beach monitoring in progress at Magazin Beach, 1995



## SAND IN, SAND OUT

When Hurricane Lenny struck in 1999, many of the beaches in Grenada, Carriacou and Petit Martinique were severely eroded. In the months and years after the hurricane the beaches recovered, but often not to pre-hurricane levels.



### BEACH PROFILE

Harvey Vale,  
Carriacou.  
Beach erosion

Before  
Hurricane Lenny  
(22/10/99)

After  
Hurricane Lenny  
(31/03/00)

Location of monitored  
beaches in Carriacou



Damage to the coastal  
road at Havey Vale,  
Carriacou, resulting from  
Hurricane Lenny  
in 1999



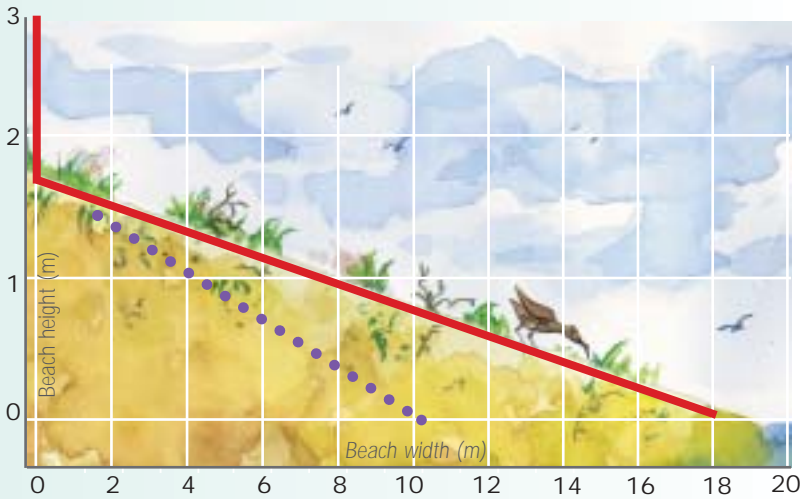
# HURRICANES WREAK HAVOC

## BEACH PROFILE

Grand Anse  
Central, Grenada.  
Beach erosion

Before  
Hurricane Lenny  
(23/06/99)

After  
Hurricane Lenny  
(24/03/00)



Aerial view  
of a hurricane

Grenada's Grand Anse beach, popular among island residents and well known to visitors and tourists, was also severely eroded during Hurricane Lenny. However, sand started to come back in the weeks following the hurricane.

A famous nightclub  
at Grand Anse,  
Grenada, 1987

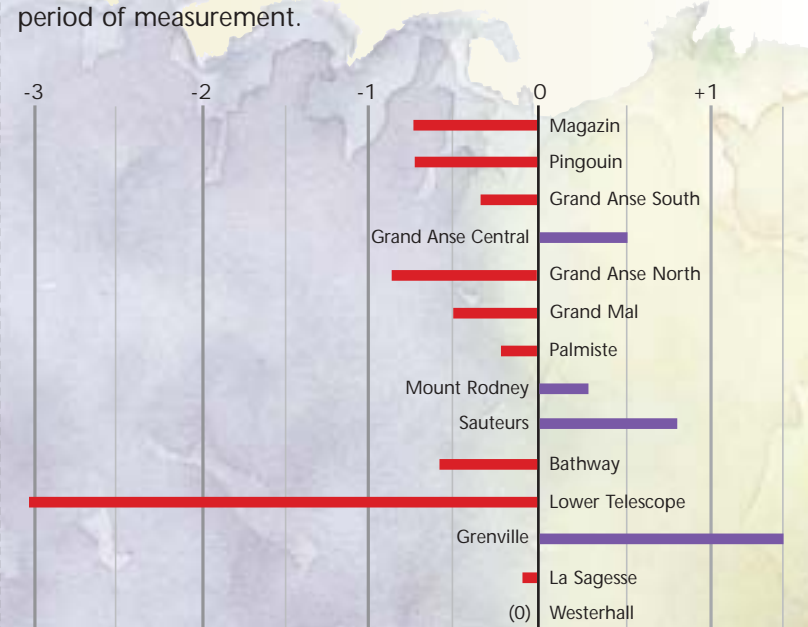


Much of this  
same building  
was reduced  
to rubble  
by Hurricane  
Lenny in 1999



## HERE TODAY, GONE TOMORROW

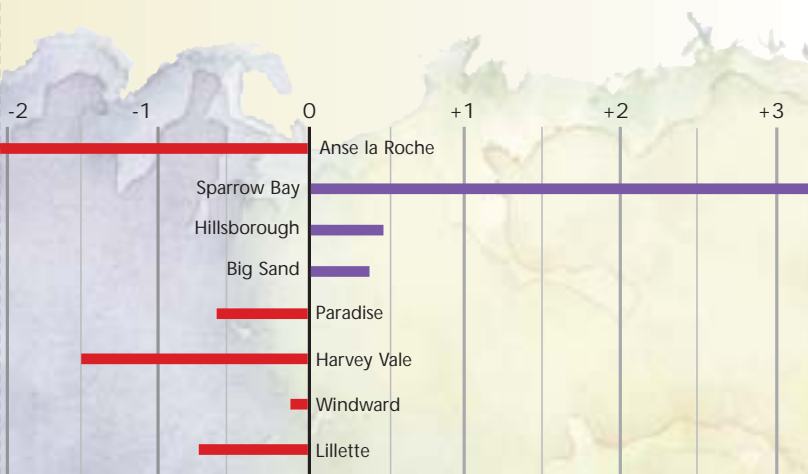
The table shows generalised rates of change at the measured beaches in Grenada and Carriacou. In Grenada, most of the west coast beaches have shown erosion, while in Carriacou, the picture is more varied. Many of the beaches show erosion along one part of the beach and accretion (or build-up) at adjacent sections, thus these figures must be treated as average trends. The tri-island state has only been impacted by one severe hurricane during the period of measurement.



Beach change rates in Grenada between 1985 and 1999 (metres per year)



Eroded tree roots at Grand Anse, Grenada, after Hurricane Lenny, 1999



Beach change rates in Carriacou between 1997 and 1999 (metres per year)

A negative rate of change (■) indicates erosion and retreat of the shoreline, a positive rate of change (■) indicates accretion or advancement of the shoreline towards the sea.

## WISE PRACTICES FOR A HEALTHY BEACH

Natural beach vegetation at Lower Paradise Beach, Carriacou, 2000



Sea grape planted at Grand Anse after Hurricane Lenny, 2001

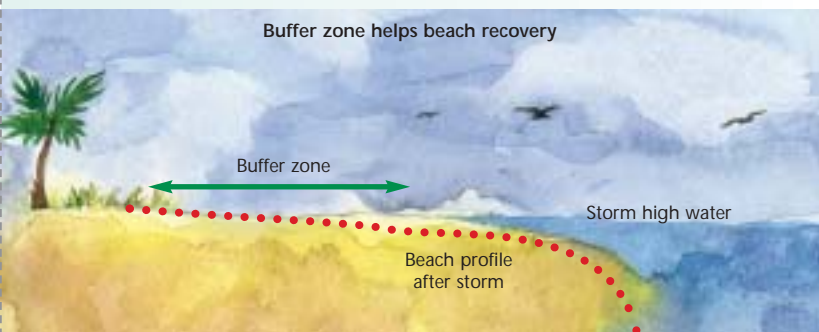
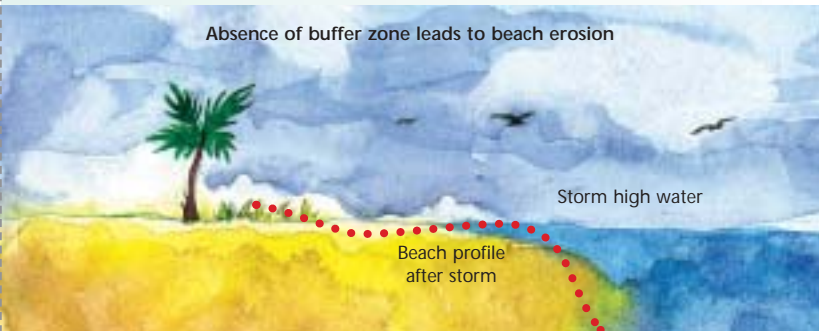


Ensuring new development is a 'safe' distance from the dynamic beach zone, helps conserve the beach

The state of the beach affects everyone's lives. There are no simple or universal solutions to shoreline erosion, since there are often several factors, both human and natural, contributing to the problem at a particular beach. Each beach behaves differently, so it is advisable to find out as much information as possible about a particular beach before taking any corrective action. It is necessary to consult the Physical Planning Unit before undertaking any action at a beach.

Some forces of change, such as hurricanes and winter swells are natural, and there is little we can do to stop them, yet there are ways we can help to slow down the rate of erosion:

- Planning new development so that it is a 'safe' distance behind the beach will reduce the need for expensive sea defence measures in the future.
- Revegetating dunes with native vegetation e.g. grasses and vines, and planting beach areas beyond the reach of storm waves with salt-resistant, deep-rooting trees, such as sea-grape. (Additional development controls are required in the fragile offshore cays.)



Graves being eroded,  
Tibou, Carriacou, 2000



Hard engineering structures, such as this rock revetment at Victoria, Grenada, serve to protect the land, in this case, the coastal highway from erosion; but they do not promote the build-up of sand, 1999

- Resorting to 'hard' engineering structures such as seawalls, revetments and bulkheads, only when there is a need to protect beachfront property from wave action. Such structures, even with careful design, result in the loss or narrowing of the beach over time.
- Considering all other beach enhancement measures such as offshore breakwaters, groynes and beach nourishment (placing sand from the offshore zone or from an inland source on the beach) at a particular site. All such measures require careful design and environmental impact assessments, so always first consult the Physical Planning Unit.



(top) Rebuilding the beach after Hurricane Lenny, 1999













(left) Planting this low dune in front of a hotel at Grand Anse may help to stabilise the dune and protect the hotel, 2001



(top) This newly constructed building at Carriacou is on the beach and is very vulnerable to hurricane waves, 2000

This hotel at Grand Anse, was positioned well behind the dynamic beach area and was safe from Hurricane Lenny's waves, Nov. 1999

# WISE PRACTICES CHECKLIST

-  **Plan for existing and future coastline change** by positioning all new development (large and small) a 'safe' distance landward of the vegetation line (consult the Physical Planning Unit for information on 'safe' distances).
-  **Review and carefully consider ALL options** when planning ways to mitigate beach erosion, these should include planning, ecological and engineering measures.
-  **Continue to monitor the rate of coastline change** and share the findings with all stakeholders.
-  **Involve all stakeholders** (e.g. government agencies, coastal communities, non-governmental agencies, coastal residents, beach users and others) in the improvement of beach facilities.
-  **Provide for improved beach cleaning** through government and private initiatives, education and awareness efforts, and proper sewage disposal.
-  **Develop principles for coastal stewardship** so that everyone plays their role to the fullest.
-  **Respect the rights** of all beach users.
-  **Stop the mining of sand and stones from beaches and dunes** in the tri-island state and utilise alternative sources of construction material.
-  **Implement policies to control the number of visitors to certain very sensitive sites** e.g. Sandy Island.
-  **Conserve and restore vegetative cover**, both adjacent to the beach in order to stabilise the sand, and further inland to reduce sediment reaching the reefs and seagrass beds.

For more information on shoreline change in **GRENADA** consult:

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For more information on shoreline change in the **CARIBBEAN** consult:

*Coping with Beach Erosion*  
by Gillian Cambers  
UNESCO Publishing, 1998  
ISBN 93-3-103561-4

This booklet is a result of co-operation between UNESCO, the Caribbean Development Bank and Grenada's Government agencies