

Wise practices for coping with

BEACH EROSION



Dominica



Forestry, Wildlife and Parks Division, Dominica
University of Puerto Rico, Sea Grant College Program
Caribbean Development Bank

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.

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, gravel and sand from the beaches, 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 roads, airports, buildings and tourism properties continue to be constructed on the only flat area in Dominica – the land behind the beach.

Natural forces

- **Hurricanes and tropical storms**, occurring between June and November, cause dramatic beach changes usually resulting in serious beach erosion.
- **High waves during 'winter' months** 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.

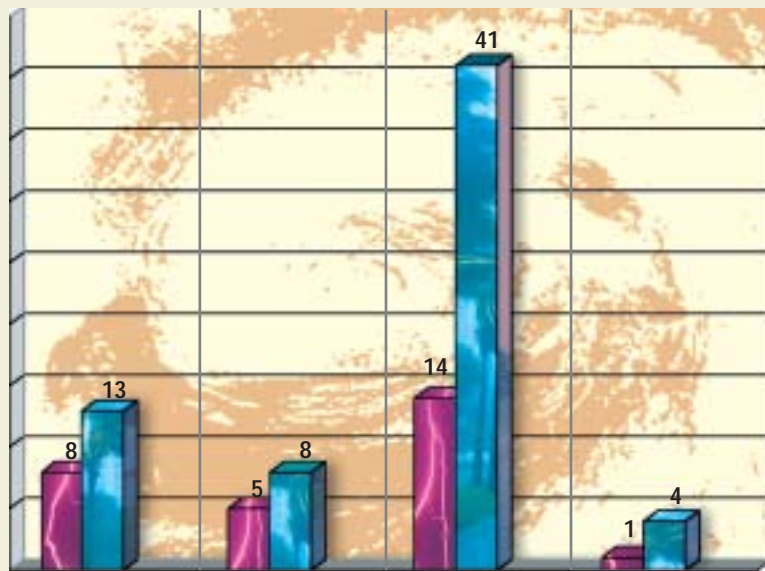


Number of
named storms
per year

Number of
hurricanes
per year

Number of
hurricane days
per year

Number of
category 3, 4, 5
hurricanes per year



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 and other materials** from beaches and adjacent areas 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 coastal areas** destabilises beaches; and clearing sites inland results in increased soil and dirt particles being washed offshore and smothering coral reef systems.

Hurricane
frequency
between 1990
and 1999
in the Atlantic
Basin

5 year periods

1990 – 1994
1995 – 1999

*A baby leatherback
turtle makes its
way across the
beach to the sea
near Roseau
Harbour, 1987*



WHAT'S HAPPENING WITH DOMINICA'S BEACHES?

In order to manage these changes, Dominica's beaches have been monitored since 1987 by the Forestry, Wildlife and Parks Division, who measure the beach slope and width regularly at numerous sites around the island.



Beach monitoring in progress at Woodford Hill, 1994

Location of monitored beaches in Dominica

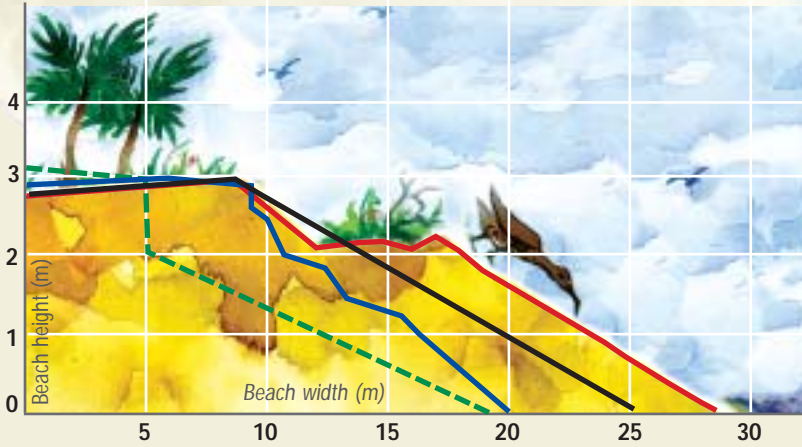


A windswept east coast beach at Londonderry, 1994



SAND IN, SAND OUT

Several hurricanes have hit Dominica in recent decades, and beach sand and stones are lost during each event. Following the hurricane event, the beaches recover to some extent, but not to pre-hurricane levels.



BEACH PROFILE

Toucarie Bay,
Dominica.

Beach erosion

February, 1987

**After Hurricane
Hugo, 1989**

**After Hurricane
Luis, 1995**

**After Hurricane
Lenny, 1999**



*Toucarie Bay
in 1987*



In 2000, after three major hurricanes, Toucarie Bay was a narrow strip of stones and the coastal highway was seriously damaged

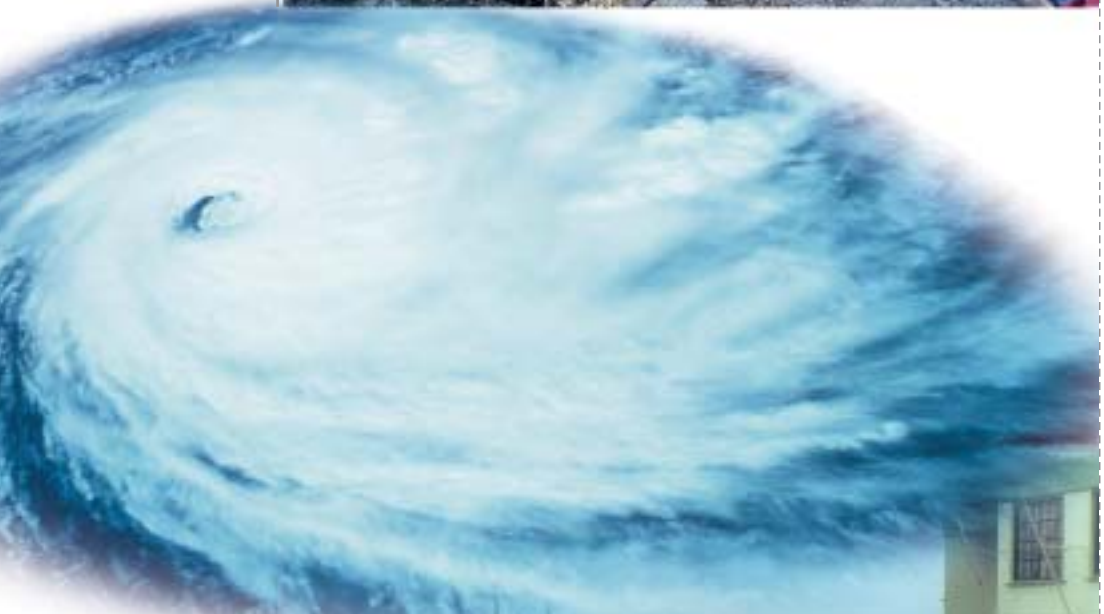
HURRICANES WREAK HAVOC



Only a low stone bank connects Dominica to the Scotts Head Islet in 1994

On the southwestern corner of Dominica, before Hurricane David in 1979, there used to be a tree-lined ridge connecting the small islet of Scotts Head to the mainland. Now, after several hurricanes, all that remains is a low stone bank which is easily breached by small storms.

Coastal highway under the Tarou Cliffs, 2000. The telephone poles show where the road used to run before the recent hurricanes

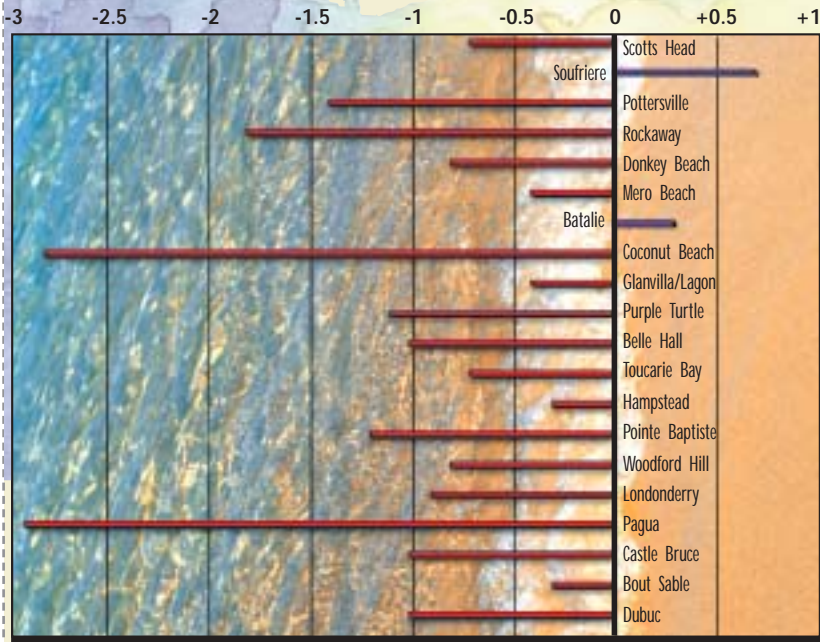


Waves building at Roseau waterfront as Hurricane Luis approaches, 1995



HERE TODAY, GONE TOMORROW

The table shows generalised rates of change at the measured beaches in Dominica. During the period 1988-1999, nearly all the beaches showed erosion, a result, at least in part, of the impact of several severe hurricanes since 1989. However, most of the beaches in Dominica 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.



Beach change rates in Dominica, 1987-2000 (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.



A once popular picnic place and sandy beach at Belle Hall has become a rocky strip (in 2000) after the ravishes of several hurricanes

WISE PRACTICES FOR A HEALTHY BEACH

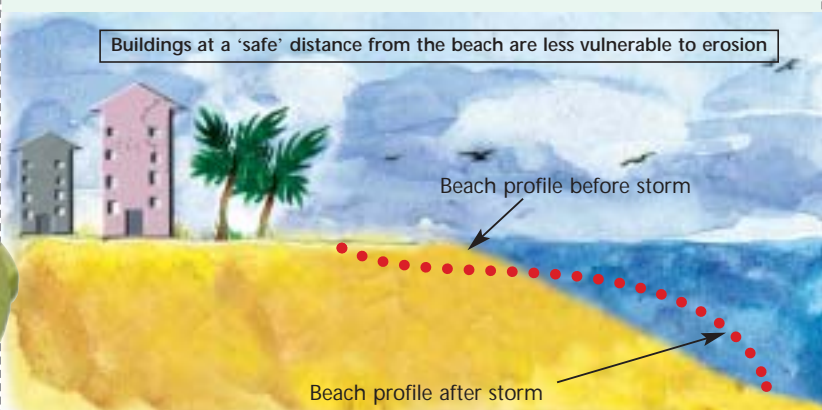
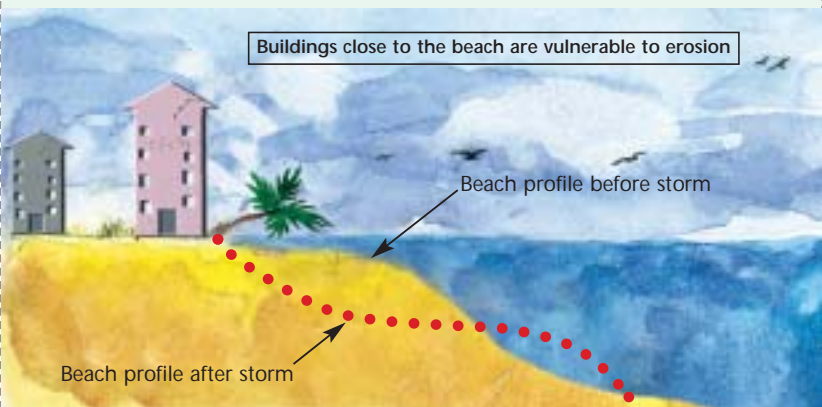
The state of the beach affects everyone's lives. There are no simple or universal solutions to shoreline erosion, since there are often several factors, both human and natural, contributing to the problem at a particular beach. Each beach behaves differently, so it is advisable to find out as much information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

Bout Sable - only specific salt resistant plants such as seagrape can exist on Dominica's windswept east coast (1994)

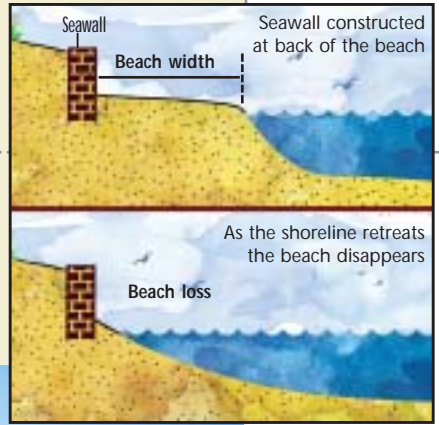
Some forces of change, such as hurricanes and winter swells are natural, and there is little we can do to stop them, yet there are ways we can help to slow down the rate of erosion:

- 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 beach areas beyond the reach of storm waves, and other coastal areas, with native vegetation, e.g. grasses, vines and salt resistant, deep-rooting trees, such as sea-grape.

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



Hard engineering structures such as this seawall at Roseau, serve to protect the city's seafront buildings, but do not promote the build-up of sand



A waterfront hotel at Castle Comfort (2000), even protected by a sea-wall, is very vulnerable to storms and hurricanes

- 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 Division.



Rebuilding on the beach after a hurricane, as seen here at Prince Rupert Bay in 2000, is an unwise practice and leaves the building vulnerable to future storms

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 Division for information on 'safe' distances).
- ✓ **Review and carefully consider ALL options** when planning ways to slow down the rate of coastline change, these should include planning, ecological and engineering measures.
- ✓ **Continue to monitor the rate of coastline change** and share the findings with all other stakeholders.
- ✓ **Seek to change community attitudes** about the disposal of solid waste.
- ✓ **Coordinate an integrated approach to beach management**, by ensuring that individuals, groups and agencies work together.
- ✓ **Promote the concept of coastal stewardship** and the need for individuals to have a personal commitment to the benefit of the country.
- ✓ **Respect the rights** of all beach users.
- ✓ **Stop the mining of sand, gravel and stones** from beaches and adjacent areas and utilise alternative sources of construction material.
- ✓ **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 **DOMINICA** 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 Dominica's Governmental agencies

To view this booklet on-line, please see:
www.unesco.org/csi/act/cosalc/brochdom.htm