Wise practices for coping with BEACH EROSION




Barbuda

Antigua

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UNESCO Environment and Development in Coastal Regions and in Small Islands

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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.

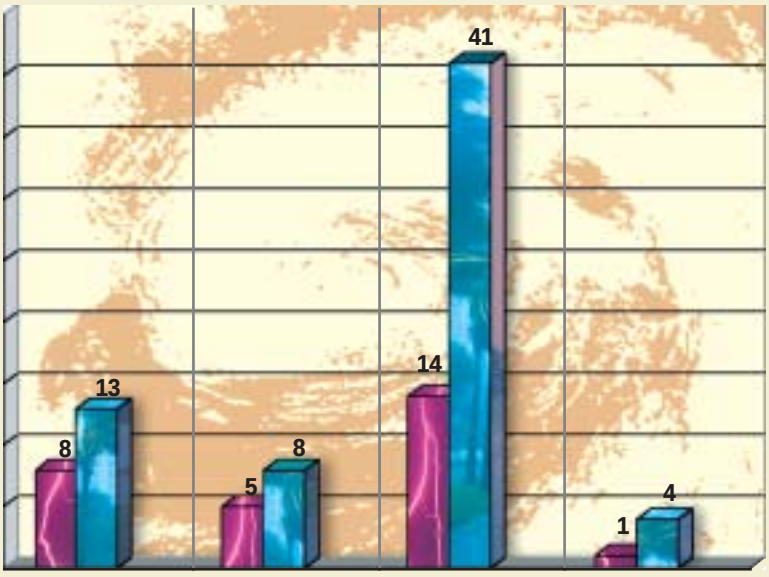
But it is not just natural forces that change the beach, humans have a big role to play in this process as well, through mining stones and sand from the beaches and dunes, polluting and damaging coral reefs, and constructing buildings and walls too close to the sea.

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 Antigua and Barbuda. 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 'groundswells'.
- 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.



Hurricane frequency between 1990 and 1999 in the Atlantic Basin

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

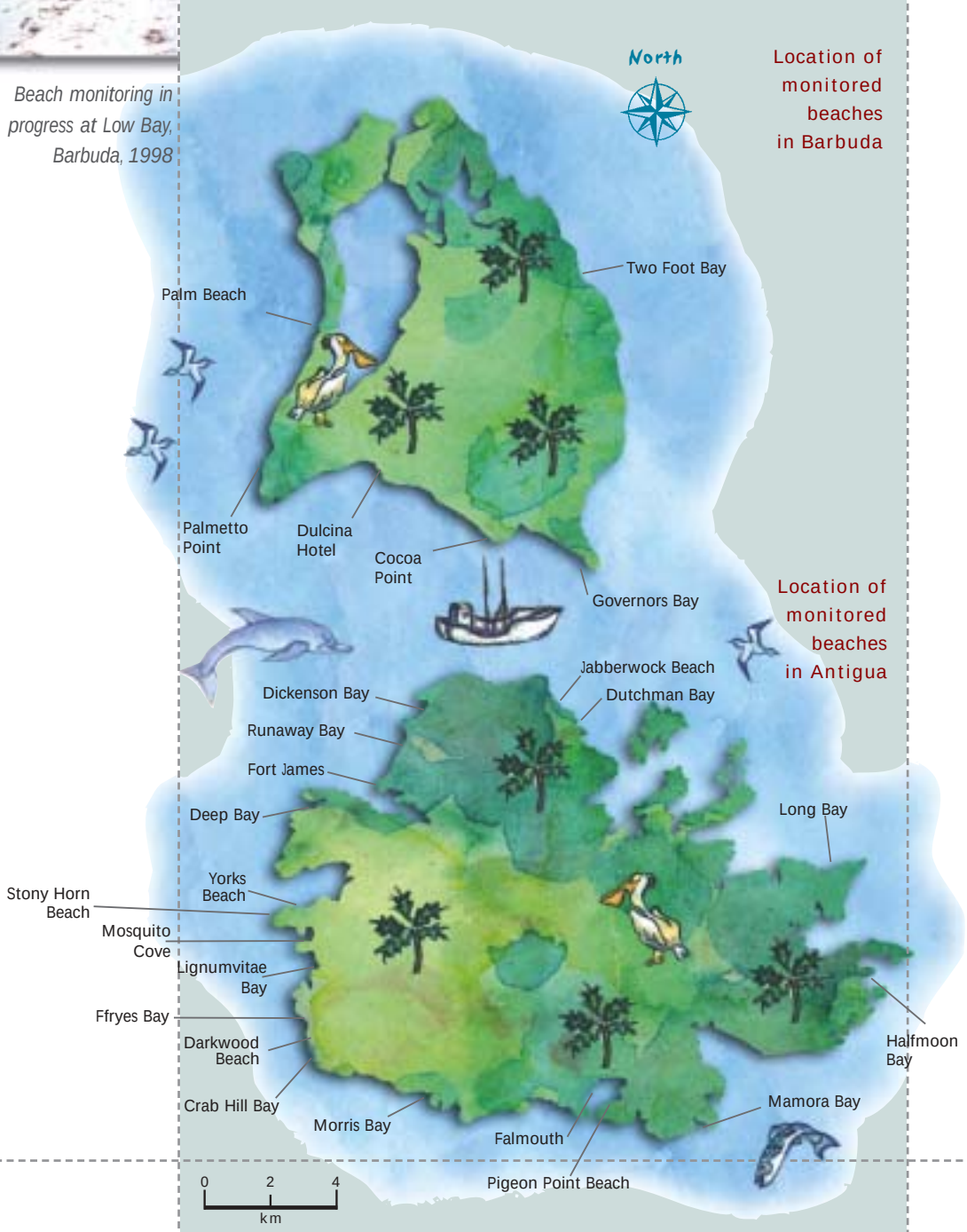
- Removing sand from beaches and dunes for construction purposes causes erosion and the loss of beaches and coastal lands, destroying the natural heritage of the coast and reducing the vibrancy of the tourism industry.
- Building too close to the beach interferes with the natural sand movement and may 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.

Pipes discharging onto the beach and into the sea cause pollution and may harm marine life, Dickenson Bay, 1995

What's happening with Antigua and Barbuda's beaches?

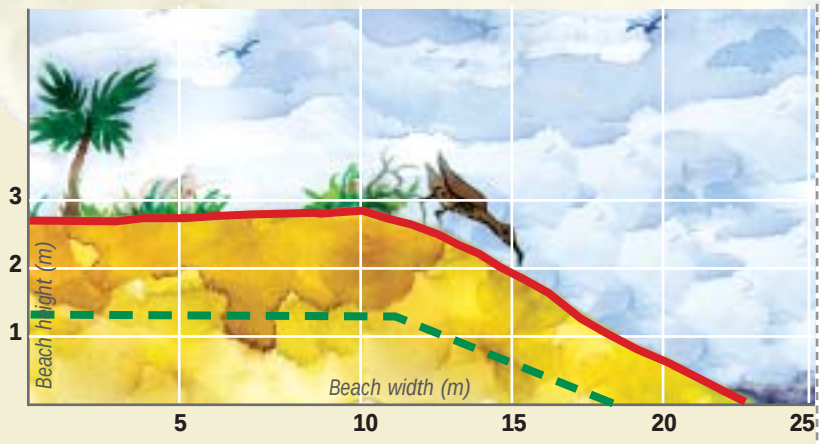
Beach monitoring in progress at Low Bay, Barbuda, 1998

In order to manage these changes, beaches have been monitored since 1991 in Antigua and since 1995 in Barbuda by the Fisheries Division, who measure the beach slope and width every 3 months at numerous sites around the two islands.



SAND IN, SAND OUT

When Hurricane Luis struck in 1995, much of the beach was lost at Runaway Bay and at other beaches in Antigua and Barbuda. In the months and years after the hurricane the beaches recovered, but not to pre-hurricane levels.



BEACH PROFILE
Runaway Bay, Antigua.
Beach erosion

Before Hurricane Luis
(February 1994)

After Hurricane Luis
(Sept.1995)

Prior to Hurricane Luis there was a sandy beach at the northern end of Runaway Bay, 1994

After Hurricane Luis the beach had gone and the waves were undermining the retaining walls, 1996

DUNES AS RESERVOIRS OF SAND

Dunes function as reservoirs of sand, supplying beaches during storms and protecting coastal land from flooding.

Dunes such as this one at Two Foot Bay, Barbuda, play a valuable role in protecting coastal lands, 1995

Low dunes at Willoughby Bay, Antigua, were severely eroded by Hurricane Georges, at least in part because the vegetation had been removed, 1998

Much of Barbuda's coastline and many of Antigua's bays are fringed with low sand dunes. Many of these dunes were severely eroded during Hurricanes Luis and Georges, as can be seen below at Coco Point. Since dunes take decades to become established, it is especially important to keep their natural vegetative cover

BEACH PROFILE

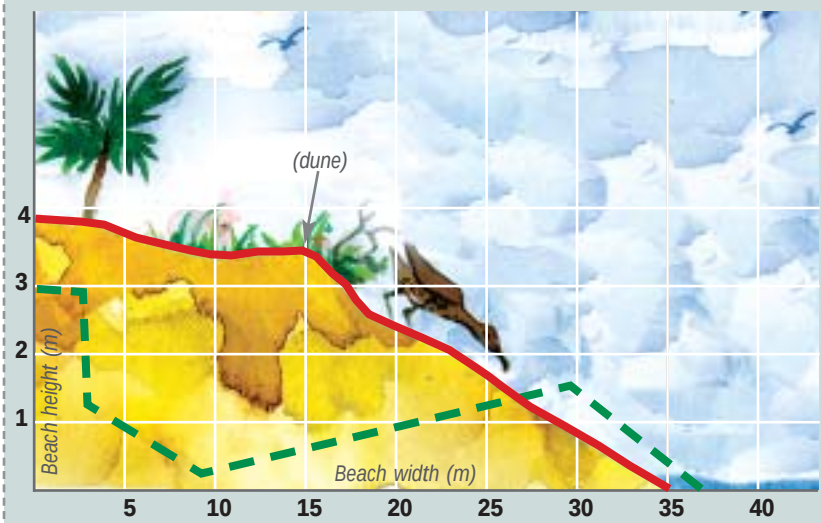
Coco Point, Barbuda. Beach and dune erosion

Before Hurricane Luis

(July 1995)

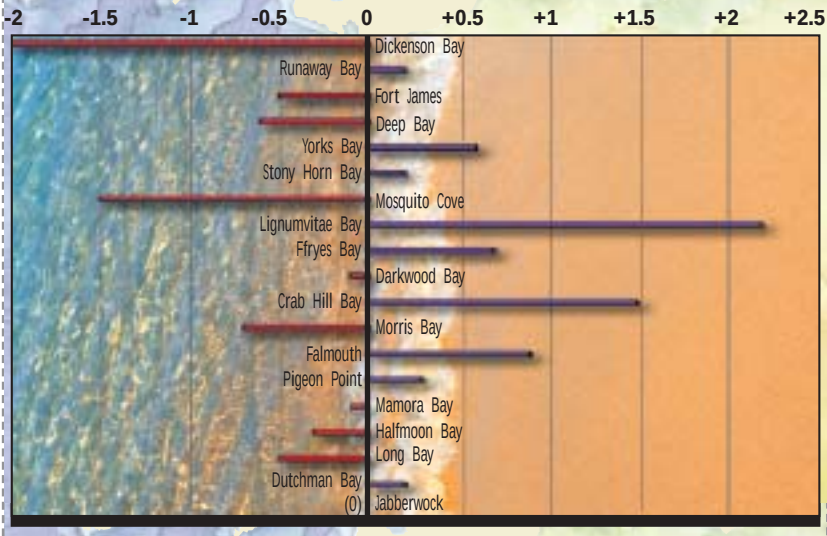
After Hurricane Luis

(Sept.1995)

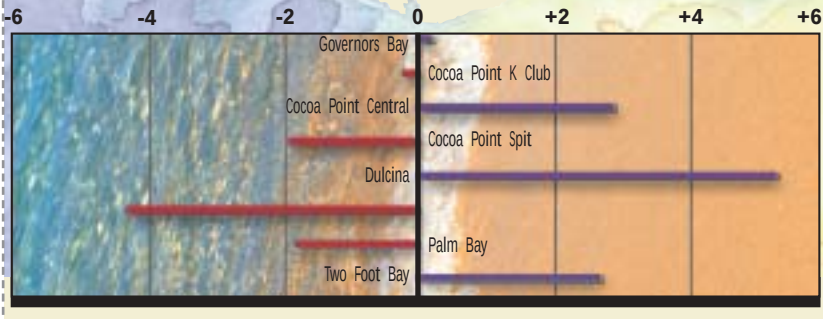


HERE TODAY, GONE TOMORROW

The tables show generalized rates of change at the measured beaches in Antigua and Barbuda. During the 1990s, some of the beaches showed erosion, while others showed sand build-up (or accretion). Furthermore, many beaches showed erosion along one part of the beach and accretion at adjacent sections, e.g. Runaway Bay where the northern end eroded and the southern end accreted. So these figures must be treated as average trends.



Beach change rates in Antigua between 1992 and 1999 (metres per year)

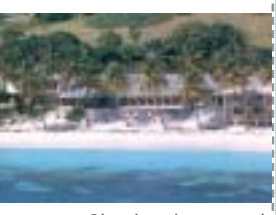


Beach change rates in Barbuda between 1995 and 1999 (metres per year)

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.

This coastal highway at Darkwood Beach in Antigua is frequently damaged during hurricanes, 2000

WISE PRACTICES FOR A HEALTHY BEACH



Clearing the natural vegetation and building close to the water, seen here at Dutchman Bay, Antigua in the early 1980s, is an unwise practice

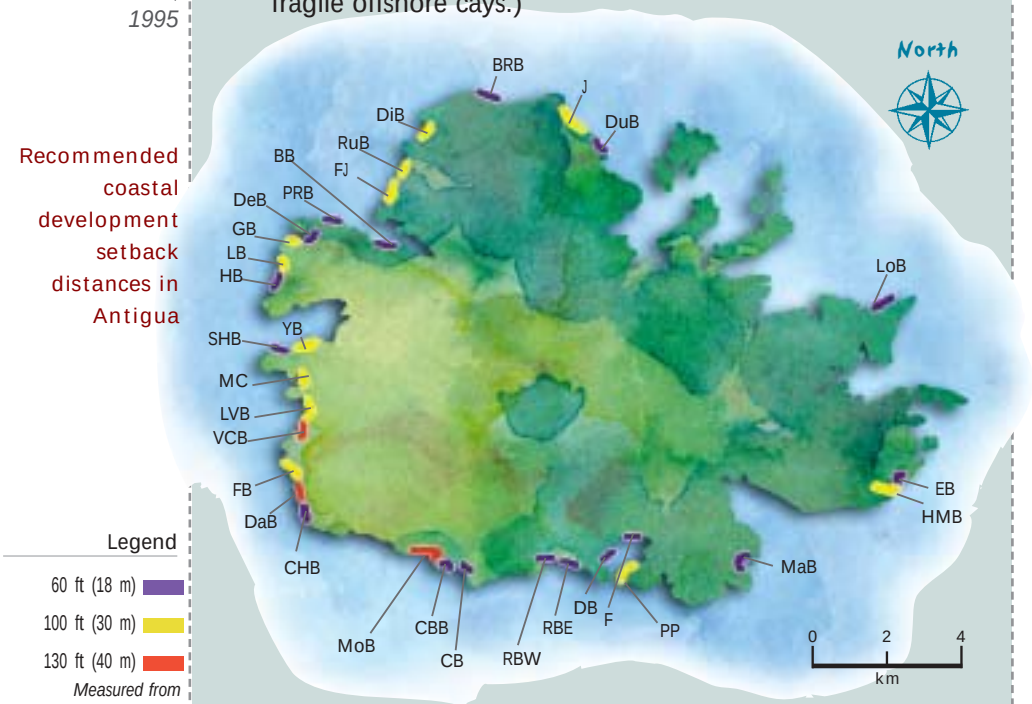
Maintaining the natural vegetation, as seen here at Half Moon Bay, Antigua, helps to stabilize the beach, 1995

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 Development Control Authority 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.)

Recommended coastal development setback distances in Antigua



KEY

DiB: Dickenson Bay; RuB: Runaway Bay; FJ: Fort James; BB: Ballast Bay; PRB Pillar Rock Bay; DeB: Deep Bay; GB: Galley Bay; LB: Landing Bay; HB: Hawksbill Bay; YB: Yorks Beach; SHB: Stony Horn Bay; MC: Mosquito Cover; LVB: Lignumvitae Bay; VCB: Valley Church Bay; FB Ffryes Bay; DaB: Darkwood Bay; CHB: Crabhill Bay; Mob: Morris Bay; CBB: Curtain Bluff Bay; CB: Carlisle Bay; RBW: Rendezvous Bay West; RBE: Rendezvous Bay East; DB (CBH): Deep Bay, Colony Beach Hotel; F: Falmouth; PP: Pigeon Point; Mab: Mamora Bay; HMB: Halfmoon Bay; EB: Exchange Bay; LoB: Long Bay; Dub: Dutchman Bay; J: Jabberwock; BRB: Black Rock Bay.

Recommended coastal development setback distances in Barbuda

Legend

100 ft (30 m)

130 ft (40 m)

300 ft (90 m)

No development

Measured from vegetation line

- 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 Development Control Authority.

Abandoned sand mining pits need to be restored and replanted, Spanish Point, Barbuda, 1998

(top) Offshore breakwater, Lignumvitae Bay (Jolly Beach), Antigua, 1996

Vertical retaining walls protect properties but do not promote beach build-up, Crab Hill Bay, Antigua, 2000

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 Development Control Authority for information on 'safe' distances).
- **Ensure the physical planning process** is fair, equitable and transparent.
- **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.
- **Coordinate an integrated approach to beach management**, by ensuring that individuals, groups and agencies work together.
- **Promote the concept** of coastal stewardship and civic pride.
- **Respect the rights** of all beach users.
- **Provide for public access to all beaches**, and where appropriate provide facilities for beach users (e.g. parking, safety measures, sanitary facilities).
- **Stop the mining of sand from beaches and dunes**, ensure that inland mining sites are restored after use, and investigate alternative building practices.
- **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 sea grass beds.

For more information on shoreline change in ANTIGUA AND BARBUDA 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 Antigua and Barbuda's Governmental agencies

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

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SC-2002/WS/63