

- Consult with the relevant authorizing agency and other experts before designing and/or commencing any coastal development;
- Make allowances (setbacks) for hurricanes and beach changes when planning coastal developments;
- Seek sources of sand other than from the beach, river, river mouth bars and sand dunes for construction and land filling;
- Dredge on the leeward sides of islands or the mainland;
- Conserve our forests and other vegetation such as mangroves, shrubs, vines and grasses to help prevent the accelerated erosion of beaches and siltation of our reefs;
- Plant trees, especially deep rooting species such as sea grape and West Indian almond (*Hammons*), for shade, beauty and the stability of our beaches;
- Avoid the use of vehicles on beaches; and
- Maintain pollution free beaches and coastal waters (including rivers).



Using mangroves to stabilize the beach, Turneffe Island Lodge (S. Cruz)



Coastal Development Authorities

Most coastal development and activities, specifically those occurring in the 66' reserve area and anywhere on the seabed of Belize, require authorization from the Government of Belize. Table 1 below gives a summary of major coastal activities and development and their respective authorizing agency.

Table 1: Coastal activities and the responsible agency.

Activity	Agency
Dredging/mining	Geology and Petroleum Dept. (GPD)
Land filling/reclamation	GPD & Lands and Survey Dept.
Pier, seawall, groyne and other forms of construction	Lands and Survey Dept. (*Physical Planning Section)
Mangrove clearance	Forest Dept. (*Mangrove Unit)
Subdivisions	Land Utilization Authority (*Physical Planning Section)
Pollution, Environmental Clearance & Environmental Impact Assessment	Dept. of the Environment

*Denotes contact

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Coastal Zone Management Authority and Institute

“Supporting the allocation, sustainable use and planned development of Belize’s coastal resources through increased knowledge and building alliances, for the benefit of all Belizeans and the global community.”



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BEACH EROSION IN BELIZE



Beach at Calabash Caye (S. Cruz, 2000)

What You Need To Know!



Our Changing Beaches

The beaches found on the mainland coastline and adjacent cayes of Belize are subject to continuous change as the forces of wind and water interact with land. This continuous exchange of energy and matter results in erosion and accretion. Of the two, beach erosion has been the more noticeable. Beach erosion has recently evoked concern in the wake of very noticeable changes caused by Hurricane Mitch in 1998. Sea-level rise projections as a result of Global Warming, have now become an issue of grave concern for not only the beaches in Belize, but also the entire coastal zone throughout the world. For these reasons, it is important that proper consultation and planning take place before any coastal development is conducted.



Tourists enjoying the Caye Caulker beach (S. Cruz)



Importance of Beaches

Belize's beaches are essential to our social, economic and environmental well being. They:

- Protect the coastline and cayes (**and their adjacent properties**) from wave action, especially during hurricanes,
- provide an important recreational resource for tourists and local residents,
- are an important part of the tourism product,
- provide habitat for coastal wildlife such as nesting areas for sea turtles, and
- are aesthetically pleasing and culturally important.



Beach Erosion and its Impacts

The simple definition of erosion is the wearing away of land, usually by 1) natural forces, including extreme events such as hurricanes and storm floods, and 2) increase in sea level. In addition, a major cause of erosion in Belize is as a result of 3) human activities such as **sand mining** (from beaches, rivers and river mouths), **dredging, land reclamation, damming of rivers** (rivers provide sediments that make up beaches along the mainland coastline), **reef destruction** (reefs protect beaches and provide them with sand), **obstruction of longshore drift** and **hazardous vegetation clearance** (vegetation helps stabilize beaches).

The impacts of beach erosion in Belize have resulted in the loss of public and private property, infrastructure, coastal vegetation and wildlife habitats.



Eroded beach and destroyed seawall at the "Split" in Caye Caulker - the aftermath of Hurricane Keith (S. Cruz)



Hurricanes and Beaches

Extreme events such as hurricanes play a major role in the structure of the coastline of the mainland and cayes. The **high waves** and **surges** caused by storms and hurricanes move sand from beaches. These two forces also damage corals (which provide natural protection) and sea grass beds (which add to the stability of the mainland coastline and cayes). Seagrass beds and corals also add to the sediment supply for some Belizean beaches.

Hurricanes that miss a particular country (or area) may still cause beach erosion to that site as a result of swell waves. This occurred in 1998 when Hurricane Mitch eroded massive volumes of sediment along the windward side of Ambergris Caye, Caye Caulker, Tobacco and South Water Cayes and destroyed portions of the Belize Barrier Reef Complex.

Hurricanes may also build beaches and create shoals by depositing eroded sand and other material elsewhere. However, these formations may be sensitive to change and therefore, should not be developed.



Sea Level Rise and Beach Erosion

Even though there is no data on sea-level rise for Belize, most experts believe that sea level rise as a result of the "greenhouse effect" also causes beach erosion. Bruun (1962) illustrated this causal relationship in "Bruun Rule" which states that, as sea level rises, material from the upper beach is eroded and deposited on the nearshore ocean bottom. This ultimately results in shoreline recession.

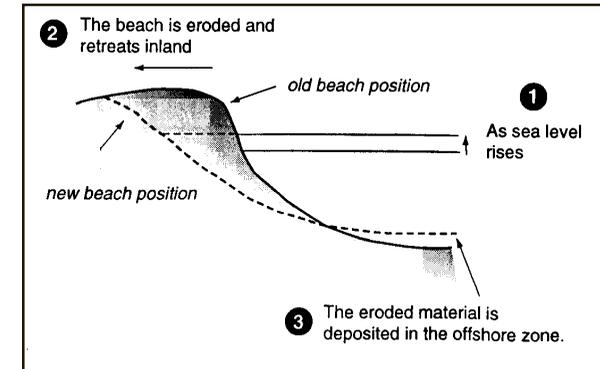


Figure 1. Schematic Representation of the Bruun Rule (1962)



Combating Beach Erosion and its Impacts

It is important to understand that during the natural seasonal cycle, beaches "come and go," however, long term erosion may also be occurring in some parts of Belize. With this in mind, the following must be considered: