Coastal Zone Management
The Barbados Model

Gregory R. Scruggs and Thomas E. Bassett

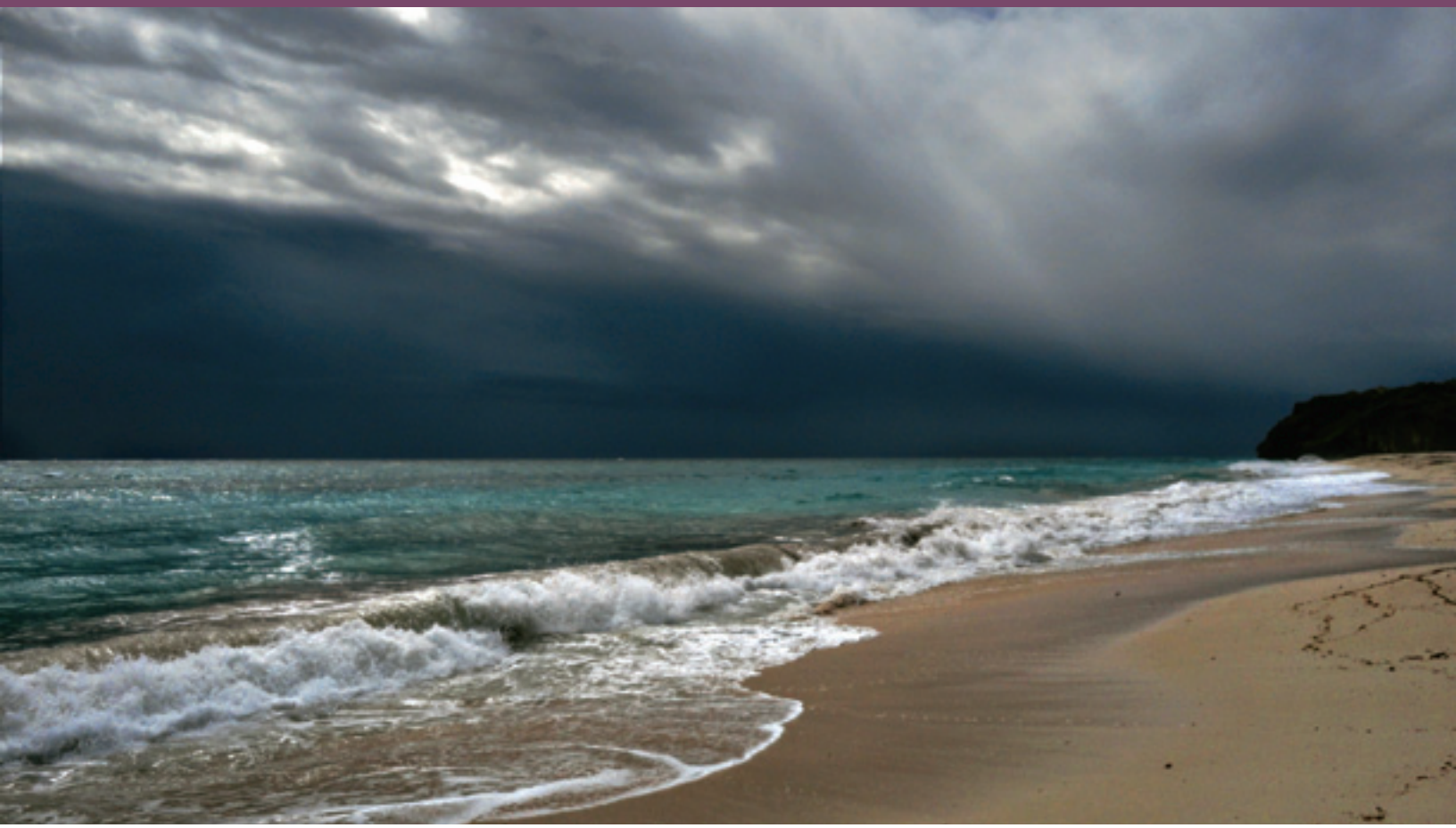
For every travel article featuring a Caribbean paradise with gentle waters lapping a sandy beach, there is an anxious news story about a brewing hurricane. The Lesser Antilles, an archipelago of small islands that form a crescent in the eastern Caribbean, have always been particularly vulnerable, thrust into the volatile waters of the Atlantic Ocean. In 1776, the Pointe-à-Pitre hurricane struck the French colony of Guadeloupe and killed 6,000, making it the deadliest Atlantic storm on record at that time. Four years later, the Great Hurricane of 1780 hit even harder, making landfall in Barbados, then ravaging nearby islands, killing at least 20,000 and wrecking British and French fleets maneuvering at the height of the American Revolution. Two centuries and dozens of storms later, even Hurricane Ivan wasn't as deadly when it devastated Grenada in 2004, leaving the parliament in ruins and 85 percent of the structures on the island damaged.

Amanda Wait/NonprofitDesign.com

Barbados is the easternmost island in the Lesser Antilles. Owing to British-style town and country planning, the island is divided into 11 parishes (inset).

In recent decades, climate change has heightened threats to the region. U.S. strategies employed in the wake of Hurricane Katrina or Superstorm Sandy are not especially relevant to the fragile, yet vibrant islands of the Lesser Antilles, from Puerto Rico in the north to Trinidad and Tobago in the south. With tourism-dependent economies and extremely limited amounts of developable land, especially on mountainous islands, this potpourri of independent countries, dependent territories, and overseas departments share a common land use challenge: how to grapple with development patterns oriented toward the coast while managing the growing threat of sea level rise.

One island in the region stands out for its exceptional capacity to recognize and prepare for the rising tide: Pear-shaped Barbados has become a Caribbean leader in integrated coastal zone management—the contemporary practice of integrating sectors, levels of government, and disciplines to address the coastal zone both in the water and on dry land. Coastal land use and environmental management are always contentious issues on a small island. But, as former UN Secretary General Kofi Annan once remarked, "Barbados consistently punches above its weight." Almost 50 years since independence, the island nation has leveraged a combination of foresight, international support, and local capacity to develop planning institutions and prepare for an uncertain future.



© Berit Watkin/flickr

As climate change intensifies hurricanes in the Caribbean, Barbados works hard to protect its best asset: 60 miles of coast in the eastern Caribbean.

From Sugar to Sun Worshippers

Today, Barbados is famous as a top international tourist destination, with trademark white-sand beaches, warm aquamarine water, and ample sunshine along its 60 miles of coastline. Nearly 300,000 people live on the 166 square-mile island; 44 percent of Barbadians are classified as living in urban areas, centered in Bridgetown and along the developed south and west coasts. With a per capita GDP of US$23,600 and near-universal literacy, Barbados ranks 38th in the world and first in the Caribbean according to the United Nations Development Programme's 2013 Human Development Index. Relying on its sand and surf, Barbados derives 80 percent of its US$4.4 billion GDP from its tourism and service industries.

But this evolution is a recent one, part of a similar pattern of development across the Caribbean in light of independence movements and the advent of commercial aviation. Originally inhabited by a native Amerindian population, Barbados was first settled in 1627 by the English, who quickly turned it into one of the world's leading sugar producers. Barbados's colonial history is unusual for the region; unlike many other Caribbean islands that saw multiple changes of European powers, Barbados did not leave British rule until independence in 1966—earning it the nickname "Little England."

The colonial economy was a classic model of trade to enrich the metropolis. The English imported African slaves to work sugarcane plantations, molasses refineries, and rum distilleries. As a result, 90 percent of modern-day Barbadians claim African descent. Following independence, the already-lagging sugar crop, which suffered fluctuations common to any monoculture, became even less reliable as the push for free trade led the U.K. and later the EU to slowly draw down subsidies and preferential pricing.

At the same time, Barbados invested heavily in its tourism services, which shifted the locus of development. Historically, the island was mostly rural, with sugarcane plantations carving up the interior of the country, home to slaves and, later, itinerant sharecroppers toting moveable wooden "chattel" houses, Barbados's typical vernacular architecture. The coast was home to Bridgetown, the principal port, where a navigable river meets the ocean, and a few smaller towns and fishing villages. A deep-water port dredged in 1961 also laid the groundwork for the arrival of cruise ships. The growing number of tourists necessitated hotels, resorts, restaurants, shops, and bars, all within a

stone's throw of the ocean. This impulse led to strips of coastal development between the airport and Bridgetown, on the south coast, and along the west coast, home to the calmest water and charming Holetown and Speightstown. By the 1990s, Barbados's Grantley Adams International Airport was receiving regularly scheduled British Airways flights from London on one of the few Concorde supersonic jets.

"Key decision makers have recognized that coastal zone management is important not just as an environmental program but to grow the economy of Barbados."

The Local Response to Rising Waters

Lying just east of the main arc of the other eastern Caribbean islands, outside the Atlantic hurricane belt, Barbados has a meteorological advantage. Although it's still susceptible to major storms, it experiences far fewer hurricanes than its neighbors to the northwest. Yet any threat to the beach and coral lining Barbados would have devastating consequences, given the island's economic dependence on the coast. Its well-being is endangered by creeping sea level rise, coupled with possible storm surge if the island suffers even a glancing blow from a major hurricane. The Intergovernmental Panel on Climate Change (IPCC) has strong evidence that following a period of almost no change for centuries, there was an increase in global sea level measures in the 20th century, and that trend is accelerating in the 21st century. In August, the IPCC said sea levels could rise more than three feet by 2100.

Never a major contributor of carbon emissions, small island states are disproportionately impacted by global climate change resulting from modern industrialization elsewhere in the world. Shifts in weather patterns have produced a greater number of major storm systems, increased global temperatures, melted polar ice caps, and contributed to sea level rise. While major industrialized countries such as the United States, China, and Western Europe also experience impacts from sea level rise, the vulnerable proportion of these countries is miniscule compared to the susceptible areas of Barbados. The developed world's inability to understand the impacts and consequences of its behavior, as evidenced by political inaction on issues such as carbon cap-and-trade agreements, has forced countries in the developing world to act now or face a perilous future.

Paradoxically, Barbados's imperial history—often a burden on postcolonial countries—has proved an advantage, in that the island has a long, uninterrupted history of British-style town and country planning. Like the United Kingdom, Barbados is administratively divided into parishes, and modern development law is based on the British Town and Country Planning Act of 1947. Once independent, Barbados established its own planning framework with the 1972 Town and Country Planning Development Order. Presently, the Town and Country Development Planning Office (TCDPO) oversees all construction on the island, with the chief town planner reporting directly to the prime minister.

The Physical Development Plan from 1988 guides development on the island. Since the document's amendment in 2003, there has been a turn toward sustainable development, not just as a catch phrase, but as an inherent value for the government's vision for the island. In a 2008 conference speech, the previous prime minister, David Thompson, outlined a few core ideas of the plan: protect natural, agricultural, and cultural resources; promote mixed-use centers and corridors to encourage a diversified economy; maintain central Bridgetown as the financial and commercial hub; and stimulate tourism by the modernization of older beachfront properties and development of new opportunities. Today, the current prime minister, Freundel Stuart, continues this push for sustainability, as shown by his participation in high-level panels at last year's United Nations Conference on Sustainable Development, Rio+20.

By the late 1970s, individual property owners began to notice coastal erosion affecting their land. The media began to harp on this issue, as it was concurrent with the push for tourism, quickly becoming the country's main source of foreign exchange reserve. Prompted by this coastal erosion—but also concerned about catastrophic events such as hurricanes, earthquakes, tidal waves, volcanic eruptions, and oil spills—the Barbados government embarked on a diagnostic pre-feasibility study in 1981 with funding from the Inter-American Development Bank (IDB) as part of its Coastal Conservation Program. The study focused on the west and south coasts, as these areas of the island had the greatest potential for tourism infrastructure.

© Gregory R. Scruggs

© David Berkowitz/flickr

TOP: **Colonial architecture lines Bridgetown's natural harbor, known as the Careenage.**

BOTTOM: **The success of Barbados's coastal zone management owes in part to the population's 98% literacy rate.**

At that time, the government set up the temporary Coastal Conservation Project Unit (CCPU), which oversaw the pre-feasibility study and came to a series of conclusions on the causes of coastal erosion and damage to beachfronts. For example, because inland Barbados had poor water quality, the runoff polluted the sea, damaging coral reefs. Natural phenomena, such as storm swells and the occasional erratic hurricane, also caused erosion. In turn, the sea defense structures in place were poorly designed. The IDB study mandated the CCPU to continue monitoring the shorelines, to provide advice to the public on coastal matters, and to serve as an advisor to the TCDPO on waterfront development.

Coastal Zone Management Unit is Born

As the Coastal Conservation Project Unit continued its mandate for a decade, the Government of Barbados, along with additional funding from the IDB, embarked on another study, which recommended the establishment of a permanent unit to oversee the coastal zone. This Coastal Zone Management Unit (CZMU) was created in 1996 to regulate, make recommendations, and educate the Barbadian population about coastal management. Still receiving a large amount of its funding from the IDB, the CZMU is currently housed in the Ministry of Environment, Water Resources, and Drainage. As its title suggests, the CZMU manages the coastal zone, which it defines as "the transition zone where the land meets water; the region that is directly influenced by marine hydrodynamic processes; extends offshore to the continental shelf break and onshore to the first major change in topography above the reach of major storm waves." Therefore, the unit oversees the coral reefs around Barbados and all coastal engineering projects, while serving as an advisor to the TCDPO for onshore coastal development.

Land use issues are at the forefront of the relationship between the CZMU and TCDPO. When the TCDPO receives any application for development in the coastal zone, it forwards it automatically to the CZMU for review and comment. Since the tourism industry is based mainly in the coastal zone of the island, many of Barbados's development applications go through the CZMU for review. The unit vets the application to make sure the setbacks are correct, 30 meters from the high water mark for developments along the beach and 10 meters for developments along cliffs,

Photos: © Gregory R. Scruggs

The Richard Haynes Boardwalk (left) doubles as a concrete seawall. Groynes (right) help prevent sediment from shifting.

measured from the landward point of undercut. In addition to verifying setbacks, the CZMU looks at drainage requirements, buffer zones, fencing restrictions, and other regulations. The CZMU then makes recommendations to the TCDPO on the application.

CZMU Acting Director Dr. Lorna Inniss, who holds a Ph.D. in oceanography from Louisiana State University, praises this process. She says, "Our interministerial collaboration is extremely high. We have the ability to establish and improve government structure that's inclusive and consultative by nature." The government process is admirable for its cooperation and silo-breaking tendencies; unfortunately the CZMU's recommendations are purely advisory and have no binding power for the TCDPO to enforce. Regulations in the coastal zone are not retroactive for the legions of properties built during the resort boom, and penalties for violations also remain very low. This process is the closest Barbados approaches to a formalized environmental impact assessment, per a U.S. model, but it's a strong first step for the Caribbean. CZMU and TCDPO have been more successful in planning for low-impact future development—along the more rugged east coast, for example, where the Physical Development Plan envisions a national park.

The CZMU is most effective in implementing coastal engineering projects to protect the coastline and stop beach erosion. The most natural conservation technique is to restore sand dunes and mangroves. Planting vegetation in the coastal areas allows the dunes to form naturally and hold back inundations from storm surges, while mangroves absorb wave action. Beach nourishment is a popular quick fix but more of a Band-Aid approach that is more costly and less effective, as currents and storms can easily erode the nourished beach.

The CZMU safeguards the coast with various physical interventions as well, including breakwaters, groynes, and seawalls. Breakwaters are concrete structures, sunken close to the beach, that force waves to break farther from the coast so they don't directly pummel the sand. Groynes are rock structures that jut out into the ocean to disrupt the movement of sediment. Seawalls are the CZMU's largest type of intervention. Intended to protect more populated areas, these construction projects involve either a riprap design of large rocks or a flat, concrete seawall that can create public space attractive to both tourists and residents, such as the Richard Haynes Boardwalk, partially funded by an IDB loan. Because these techniques can sometimes exacerbate erosion and require more expensive maintenance than natural interventions, their long-term efficacy is up for debate, but, in the short term, they protect the coastline and the tourism industry.

Given the island's vulnerability to storms, engineering projects can be costly. Inniss, however, explains, "We have a policy of rigorous stakeholder consultation, and it's not just lip service. November through April is our high season; on a recent project in Holetown, we heard from merchants that it was vital to complete work by November, so we hustled to do so. In a spirit of mutual cooperation, we can get private sector buy-in." Hopefully, the CZMU can leverage the political capital it earns from the private sector on such projects, in order to make more demanding regulations become binding down the road.

In order to build support, the CZMU maintains a major outreach campaign to educate the island's population, to which Inniss herself attributes the success of the CZMU internally and externally:

"It begins with a nationally high level of education and literacy—over 98 percent for decades." Former Senator Henry Fraser echoes her, "People ask, 'Why do things work in Barbados?' It's largely because of the emphasis on education since emancipation. And, because it's a small, highly religious place with people living close together, respect, tolerance, and a work ethic are greater than elsewhere."

To deepen the educational foundation of Barbados's cooperative approach to coastal zone management, the CZMU distributes a newsletter, maintains a strong social media presence, and produces an educational television show that explains the geological history of the island and techniques to raise awareness about sea level rise and the importance of coastal management. It also hosts many activities such as International Coastal Clean-Up Day, Sundown Beach Walks, Summer Seminar Series, and a summer internship program for secondary- and tertiary-level students. It also provides lectures for schools and educational institutions, NGOs, private organizations, and the general public.

Next Steps and Global Cooperation

The IDB continues to be a major supporter of Barbados's efforts. The development bank's most recent aid to the country includes a 25-year, $30 million loan to pursue a Coastal Risk Assessment and Management Programme. Inniss is excited by the confidence that such support expresses, as it indicates the government's belief that the CZMU can execute a project that will create enough value to repay the money. "It will be a next level, state-of-the-art integrated coastal zone management strategy that will involve a series of stakeholders: tourism, rum distilleries, light and power utilities, marinas, boaters, commercial fishermen, the port, divers," Inniss details. "Key decision makers have recognized that coastal zone management is important not just as an environmental program but to grow the economy of Barbados." Hopefully other Caribbean countries have taken notice, as Inniss herself has provided technical assistance to St. Lucia, Trinidad and Tobago, and St. Vincent and the Grenadines—while in turn taking cues from New Zealand, Hawaii, and Fisheries and Oceans Canada as a model of how to implement international standards.

Of course, there is still room for improvement. Even as the CZMU works closely with TCPDO on land use planning, with national marine parks to conduct ecosystem-based monitoring, and with civil engineers from the Ministry of Public Works, CZMU is still not fully integrated with the Ministry of Agriculture and Fishing. For example, Inniss acknowledges, "We know scientifically that agricultural runoff is the biggest contributor of marine pollutants."

Indeed, on a small island, the land and water are intrinsically interconnected. While Barbados continues to do its part in the battle against global climate change—another IDB loan signed alongside the coastal management funding will establish an Energy Smart Fund to reduce dependence on fossil fuels—it cannot sit tight and wait for the larger countries of the world to act. As small, developing island states in the Indian and Pacific oceans face the prospect of resettling their populations in other countries a few decades down the road, Barbadians plan to stay and protect their piece of paradise.

ABOUT THE AUTHORS

GREGORY R. SCRUGGS *was a consultant to the American Planning Association for Latin America and the Caribbean from 2010 to 2013. He is currently pursuing a master's in regional studies of Latin America and the Caribbean at Columbia University. Contact: gscruggs.apa.consult@gmail.com.*

THOMAS E. BASSETT, *a senior program associate at the American Planning Association, works on the Energy and Climate Partnership of the Americas grant from the U.S. Department of State as well as the domestic Community Assistance Program. Contact: thomas.e.bassett@gmail.com*

RESOURCES

Bassett, Thomas E. and Gregory R. Scruggs. 2013. Water, Water Everywhere: Sea level Rise and Land Use Planning in Barbados, Trinidad and Tobago, Guyana, and Pará. Lincoln Institute of Land Policy Working Paper WP13TB1. *https://www.lincolninst.edu/pubs/dl/2282_1621_Bassett_WP13TB1.pdf.*

Belle, N. and B. Bramwell. 2005. Climate change and small island tourism: Policy maker and industry perspectives in Barbados. *Journal of Travel Research* 44: 32–41.

Dharmartne, G. and A. Brathwaite. 1998. Economic valuation of coastline for tourism in Barbados. *Journal of Travel Research* 37: 138–144.

Inter-American Development Bank. 2010. Indicators of disaster risk and risk management, Program for Latin America and the Caribbean, Barbados. September. Accessed July 9, 2012. *http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=35160015.*

Phillips, M. R. and A. L. Jones. 2006. Erosion and tourism infrastructure in the coastal zone: Problems, consequences, and management. *Tourism Management* 27: 517–52.