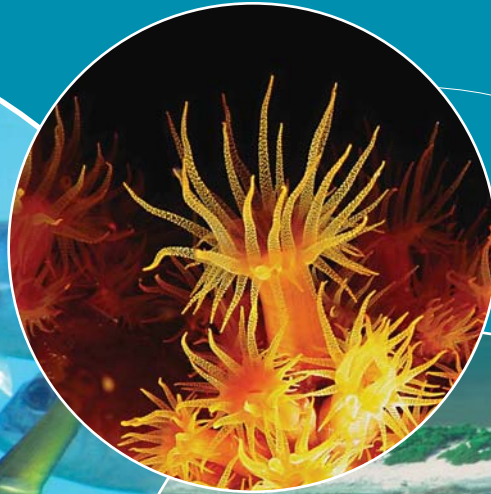


Coastal Capital: Belize

The Economic Contribution of Belize's Coral Reefs and Mangroves



Coastal and marine ecosystems provide vitally important goods and services to countries in the Caribbean. This study looks at only three out of the many culturally and economically valuable services provided by these ecosystems in Belize. Even within this narrowed scope, this study finds that the country's coastal resources are extremely valuable. Belize's coral reefs and mangrove-lined coasts provide critical protection against erosion and wave-induced damages from tropical storms; they have supported artisanal fishing communities for generations; and they stand at the center of vibrant tourism industry, drawing snorkelers, divers and sport fishermen from all over the world.

Despite their importance, these benefits are frequently overlooked or underappreciated in coastal investment and policy decisions. Unchecked coastal development, overfishing, and pressures from tourism threaten the country's reefs, with the additional threats of warming seas, fiercer storms, and other climate-related changes

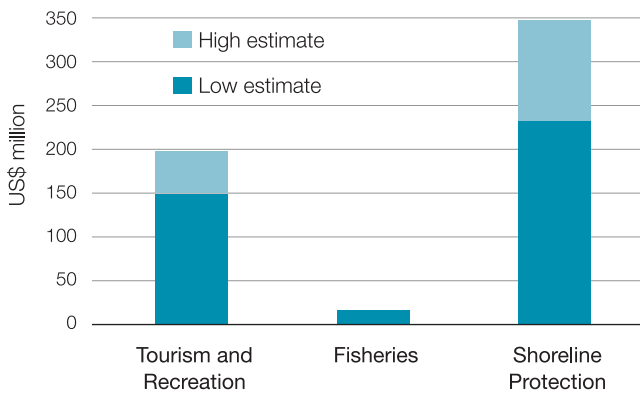
looming on the horizon. Fish populations, including commercially valuable sport-fishing species and colorful reef fish, will diminish if they lose the mangrove forests they rely upon as critical nursery habitats. Coastal properties will become increasingly vulnerable to storms and erosion, and reef-related tourism will suffer as reefs and mangroves decline.

Belize's government, NGOs, and private sector have begun to recognize the importance of coastal ecosystems to the economy. Nevertheless, the amount currently invested in protecting Belize's coral reefs and mangroves is very small when compared to the contribution of these resources to the national economy. The World Resources Institute (WRI), in collaboration with WWF Central America, assessed the economic contribution of these services at the national level and within individual Marine Protected Areas in Belize. For the full report and methodology, please visit www.wri.org/project/valuation-caribbean-reefs.

Key Findings

This study evaluated the average annual contribution of reef- and mangrove-associated tourism, fisheries, and shoreline protection services to the economy of Belize.

ANNUAL ECONOMIC CONTRIBUTION OF CORAL REEFS AND MANGROVES IN BELIZE



DISTINGUISHING REEF AND MANGROVE VALUES

Coral reefs and mangroves are highly interconnected habitats, physically supporting each other and providing habitat for many species. For example, mangroves filter sediment and pollutants from coastal runoff, supporting the clean water favored by corals. Many species important to fisheries and tourism rely upon mangrove habitat for part of their life-cycle.

This study did not directly evaluate the independent contributions of mangroves and coral reefs to fisheries and tourism services, but assessed their collective value. We examined the proximity of mangroves and coral reefs across Belize to break out these values into portions which a) rely exclusively on coral reefs, b) rely exclusively on mangroves, and c) depend upon both. We estimate that approximately US\$60–78 million of Belize’s tourism revenue per year stems from the presence of healthy mangroves. Several of Belize’s major commercial species rely on mangroves during some portion of their life. We estimate that mangroves contribute approximately US\$3 to \$4 million in fisheries value per year.

Coral reef- and mangrove-associated tourism contributed an estimated US\$150 million to \$196 million to the national economy in 2007 (12 percent to 15 percent of GDP). Fishing is an important cultural tradition, as well as a safety net and livelihood for many coastal Belizeans. Annual economic benefits from reef and mangrove-dependent fisheries is estimated at between US\$14–16 million. Reefs and mangroves also protect coastal properties from erosion and wave-induced damage, providing an estimated US\$231 to US\$347 million in avoided damages per year. By comparison, Belize’s GDP in 2007 was US\$1.3 billion. These estimates capture only three of the many services provided by coral reefs and mangroves, and should not be considered the “total” value of these resources. These numbers should be regarded as a lower bound estimate.



WRI’s shoreline protection analysis does differentiate between the protection provided by mangroves and reefs. Mangroves play an especially important role in buffering against storm surge and reducing erosion. We estimate that Belize’s mangroves contribute US\$111–167 million in avoided damages per year.

ESTIMATED CORAL REEF AND MANGROVE CONTRIBUTIONS TO THE ECONOMY (USD)*

	Coral Reefs	Mangroves	Combined Contribution
Tourism	\$135–176 m	\$60–78 m	\$150–196 m
Fisheries	\$13–14 m	\$3–4 m	\$14–16 m
Shoreline Protection	\$120–180 m	\$111–167 m	\$231–347 m

*Mangrove & reef fisheries and tourism values are not additive, as they include revenues that rely on both habitats.

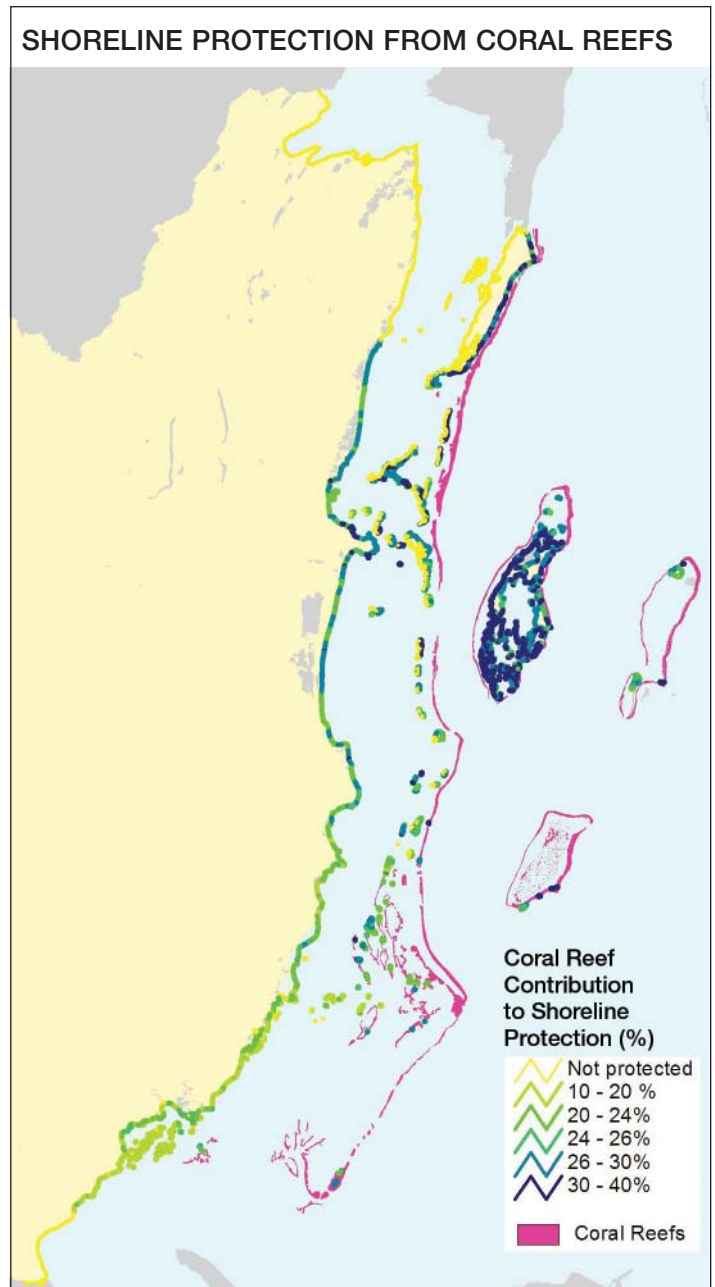
Preserving Value: Shoreline Protection

Valuable tourist centers and residential properties, as well as most of Belize's major cities and towns, lie along its coast. Coral reefs and mangroves play a vital role protecting this shoreline from both routine waves and the more severe impacts of tropical storms. Nearly 700 km² of land in Belize was identified as vulnerable to erosion and damage from waves, which comprises about 3% of all land in Belize and over 85% of land within 1 km of the coast.

Coral Reefs: The Belize Barrier Reef, the longest in the Western Hemisphere, shelters most of the windward coast of Belize. About two-thirds of the mainland coast is protected by coral reefs, as well as the windward coast of most cayes. The degree of protection provided by a reef varies with reef type, depth, and distance from shore, as well as with coastal context—the elevation and slope of the shore, the geologic origin of the area, and the wave energy along the coast. Emergent reefs, such as the barrier reef, can mitigate over $\frac{3}{4}$ of wave energy. This project developed and applied a new, innovative method for evaluating the role of reefs and mangroves in shoreline protection. Reefs close to shore provide the most protection, as waves have less chance to regenerate. The barrier reef off of Ambergris Caye, for example, contributes about 40% of the stability of the coast, due to its close proximity to the shore. The atolls and barrier reef, though further offshore, also contribute to protection of the cayes and mainland coast.

The annual value of avoided damages through shoreline protection services provided by coral reefs is estimated at US\$120–180 million for Belize. The importance of coral reefs in protecting the shoreline will increase with the rising sea level and increased storm intensity associated with climate change and warming seas.

Mangroves: Unlike coral reefs, which can protect wide swaths of the coast, mangroves protect the immediately adjacent shoreline. Mangroves, which can mitigate the force of both waves and storm surge, shelter about half of the mainland coastline and about 75% of the shoreline of cayes. We estimate that there are between 400 and 420 sq. km of mangrove within 1km of the coastline of Belize



(including all cayes). Where mangroves are present, they contribute between 10–35% of the stability of the shoreline. The value of shoreline protection services provided by mangroves is estimated at US\$111–167 million per year.

Earning Power: Coral Reefs and Mangroves

TOURISM AND RECREATION

Tourism is a vitally important industry in Belize, contributing almost a quarter of GDP. Over 250,000 overnight tourists visited in 2007, coming to see spectacular attractions both inland and on the coast. We estimate that 64 percent of “tourist days” in Belize are spent in the coastal areas and involve reef- or mangrove-related activities ranging from snorkeling and sport fishing to lounging on a coralline beach. Decisions on how to manage coastal development and visitation pressure on reefs have important implications for coral reef health, and therefore for the future attractiveness of Belize as a destination.

In 2007, reef- and mangrove-associated tourists spent an estimated US\$150 to \$196 million on accommodation, reef recreation, and other expenses. Additional indirect economic impacts, including locally manufactured materials that support the industry, contribute **another US\$26–\$69 million a year.** Combined, these result in a **total economic contribution of US\$175–\$262 million from coral reef- and mangrove-associated tourism in 2007.** Tourists spent between US\$30–\$37 million on sport fishing and diving alone (not counting accommodation, etc.). These are “high value” industries that are especially sensitive to reef condition, and thus particularly vulnerable to degradation. Belize’s cruise industry, by comparison, brings a high volume of tourists—620,000 in 2007—but has a very small economic impact compared to the overnight sector. Only 10% of cruise visitors engage in reef- or mangrove-related activities (including snorkeling, wildlife viewing, diving, etc.), bringing an estimated **US\$5.3 to \$6.4 million in revenues and taxes to the country.** Hence, while the negative impacts of

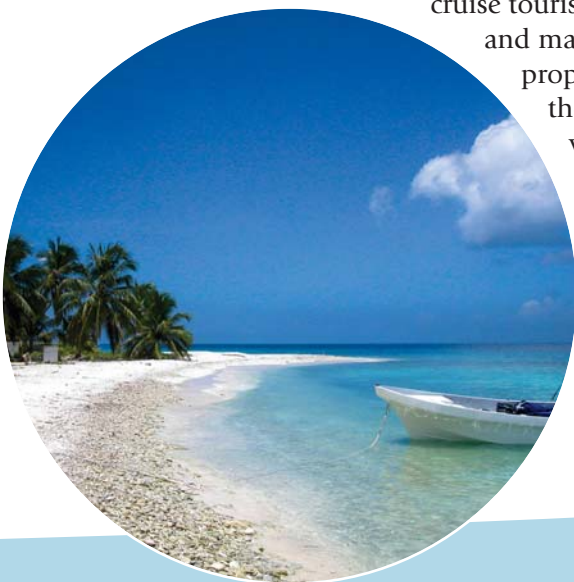
cruise tourism affect coastal and marine areas disproportionately, these areas reap very little economic benefit from the industry.



FISHERIES

The size of Belize’s fishing industry pales in comparison to tourism, but it remains one of the country’s primary export industries, and is an important livelihood and safety net for coastal communities. This study focuses on commercial revenues from fish that spend at least part of their life cycle in reefs, mangroves, or reef-protected habitat. In Belize, almost all commercial species meet these criteria.

Approximately 1.2 million pounds of fish were sold to Belize’s Fishermen’s Co-ops in 2007. Over 80% of that total was exported, earning **US\$11.2 million in gross revenue.** In addition, Co-ops earned an estimated US\$1 million in local sales. Fishermen also sell their catch to local markets and restaurants, and distribute it to family and friends, contributing **an additional US\$1.9 to \$3.5 million per year** to the economy. In total, **reef- and mangrove-associated fisheries have an estimated direct economic impact of US\$14 to \$16 million per year.** Belize’s fisheries are threatened by overfishing, especially of desirable finfish such as grouper and snapper, and will also decline with the loss of healthy coral reef and mangrove habitat.



Belize's MPAs: A Valuable but Under-funded System

The Marine Protected Area (MPA) system of Belize is well known and widely hailed as an example of forward thinking in marine conservation. The system consists of 18 protected areas managed primarily by the Fisheries and Forestry Departments in collaboration with local NGOs. Belize's MPAs are an important draw for divers, snorkelers and sport fishermen, and contain no-fishing areas that, when well-protected, help to maintain stocks of key commercial species.

Belize's MPAs provide an extremely good "value for money" — they generate economic benefits well beyond the amount invested in their protection. MPA managers reported approximately 115,000 visitors in 2007. Although some were likely repeat visitors, this is still a remarkable share of Belize's total 250,000 overnight visitors that year (very few MPA visitors come from the cruise lines). The average reef-related visitor spends approximately US\$150 a day. If we associate one day with each recorded visitor, over US\$17 million in direct spending can be associated with MPA tourism in 2007. Indirect economic impacts contributed an additional \$3.5 to 6.9 million to the economy. By relying solely on recorded visitation, these figures significantly underestimate total impact — almost all of the MPA managers note that a significant chunk (sometimes as much as 30%) of visitation goes unrecorded.

Unfortunately, the current situation is not sustainable. At most MPAs, management levels fall well below what is needed to keep their reefs healthy and attractive to visitors over the long-term. Visitation, investment, and management levels vary widely across the system. Many MPAs rely heavily on grant funding that may not be reliable from year to year. Staff, fuel, and equipment limitations make it difficult to curb illegal fishing and monitor visitation in most of the reserves. If the condition of the reefs and mangroves protected by the system continues to decline, visitors may decide MPAs are no longer worth the trip. This is especially true for some of the most fragile sites, such as the rare mangrove and reef habitats in the Pelican Cayes in South Water Caye Marine Reserve, and Glover's Reef, below.

Belize's MPAs provide benefits well beyond what can be measured in economic terms alone. Even with an increase in government support, they will continue to be an extraordinarily "good deal" — and remain so much further into the future. In recognition of both uncaptured potential at some MPAs and the threat of losses from ecosystem decline at others, we recommend:

- Committing additional resources to a permanent fund for MPA management
- Improving collection of basic indicators of human use (e.g. visitation, recreation, and fisheries data)
- Capturing missing revenue – improve fee collection across the board.

Glover's Reef Marine Reserve, an atoll system enclosing over 800 patch reefs, is especially popular with divers and hosts a world-renowned research facility. It was designated a World Heritage Site in 1996. Guests visit from the mainland or come for a week at a time to kayak, snorkel, and dive from one of the five resorts inside the reserve. We estimate that between on-site resorts and day-trip visitors, **reef-related tourism in Glover's contributes US\$3.8–5.6 million a year to the economy.** Glover's also support critical habitat for key commercial species, including lobster, conch, and grouper. **Fisheries revenues from inside the reserve**—not counting potential spillover if spawning sites are well managed—**are estimated at US\$0.7 to 1.1 million for 2007.** By comparison, the typical management budget allocated to the Fisheries Department per MPA is \$US100,000 a year, plus occasional supplements for fuel.



Actions Needed

Coastal and marine ecosystems provide vitally important goods and services to Belize's economy. As these resources become increasingly threatened, it is critical to recognize the value they provide, and to incorporate them into decision-making. It is in the long-term economic interest of Belize to:

1) Invest in management, monitoring, and compliance:

- Reinvigorate the Coastal Zone Management Authority and Institute and build capacity for monitoring the state and use of coastal resources.
- Tighten fishing regulations and invest greater resources in enforcement.
- Increase overall investment in MPAs. Improve fee collection and monitoring of visitors.
- Build resilience to coral bleaching into the management and expansion of the MPA network.



WRI and Economic Valuation of Coastal Resources

The World Resources Institute (WRI) launched the Coastal Capital project in the Caribbean in 2005. The project works with local partners to produce national and sub-national assessments of the economic contribution of coral reefs and mangroves. WRI aims to increase local capacity to perform ecosystem valuations, to raise public awareness of the economic and social benefits of marine resources, and to provide dollar value estimates that can be used to inform planning and decision-making.

For More Information

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2) Plan and implement development sensibly:

- Enforce land-use and development regulations in the coastal zone.
- Minimize the loss of mangroves along the shoreline – they play an especially important role in fisheries and shoreline protection.
- Conduct and thoroughly evaluate Environmental Impact Assessments and subsequent compliance plans for development in sensitive coastal areas, such as the cayes.
- Incorporate sewage and solid waste disposal in planning for tourism development. The cost of appropriate facilities can be compared to potential losses in reef services from further degradation.
- In planning a long-term tourism strategy, the government should weigh revenues from cruise tourism against potential economic losses from environmental impacts. Tourism carrying capacity studies are also needed.
- Evaluate distributional effects (“winners” and “losers”) of proposed coastal development projects.

Project Partners

This project would not have been possible without the financial support of the **Oak Foundation**, the **Netherlands Ministry of Foreign Affairs**, **SwedBio**, the **Campbell Foundation**, and the **MacArthur Foundation**. The project was implemented in collaboration with the Belize office of **WWF-Central America**. Many other partners in Belize also provided data, reviewed the analytical approach and results, and guided outreach. These include:

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