

The Natural Capital Project (NatCap) and WWF are supporting the Coastal Zone Management Authority and Institute (CZMAI) in developing an Integrated Coastal Zone Management Plan (ICZMP) that will guide future coastal permitting and zoning in Belize. Together the team is consulting stakeholders to understand their use of, and visions for, the coastal zone. We are also mapping and valuing marine environmental services provided now and under alternative zoning schemes. The results have been used to produce a coastal zone management plan for the entire Belizean Coast that designates areas for preservation, restoration, development, and other uses. This plan reflects local visions and values, is based on the best available science, and when finalized by the end of 2013, will enhance the coastal zone's ability to provide for people now and in the future.

Belize is managing threats to coastal ecosystems with long-term, comprehensive appraisals of their ecological and economic impacts.

The 1998 passage of visionary legislation establishing the Coastal Zone Management Authority and Institute (CZMAI) has created the opportunity to develop a national Integrated Coastal Zone Management Plan (ICZMP) in Belize. A partnership between the Natural Capital Project and the CZMAI is bringing together the essential elements of an authoritative ICZMP, including the scientific knowledge, economic valuation, spatial planning, and political and social support necessary to bring this plan to fruition.

Once completed, the Plan will establish a marine and coastal zoning scheme, preserve national opportunities for sustainable development and economic growth, and promote long-term viability of this treasured barrier reef.

In partnership with local Belizean stakeholders, NatCap aims to:

- Understand how people use the coastal zone
- Map and value coastal environmental services
- Create a revised ICZMP that designates areas for preservation, restoration, development, and other uses

Our collaborative effort synthesizes available data on the current condition of Belize's coastal and marine ecosystems, the human activities impacting their provision of critical benefits, and the zoning and use recommendations of local Belizean stakeholders. NatCap's InVEST software is helping to resolve conflicts among competing development interests by clearly communicating options to manager and stakeholders. Together NatCap, WWF, and the CZMAI aim to create an ICZMP that reflects local visions and values, is based on the best available science, and will sustain local livelihoods across Belize's coastal zones.



Results

■ **Informed First Integrated Coastal Zone Management Plan (ICZMP):** With the Coastal Management Authority and Institute (CZMAI), NatCap created maps of marine ecosystem services to inform the drafting of Belize's first comprehensive coastal management plan. The ICZMP was completed in 2012 and will be put to vote in the House of Representatives in 2013.

■ **Convened and engaged stakeholders** in collaboration with the CZMAI to discuss and document recommendations for conservation and development. Consultations with government agencies, private sector representatives and leaders of coastal communities are helping the national zoning plan reflect local interests.

■ **Trained Professionals in InVEST Software** during high-level training workshops, where the CZMAI staff demonstrated its use of InVEST. Participants ran InVEST software on their computers and contributed their perspectives on zoning options. The CZMAI expects to continue using InVEST in future environmental impact assessments for the coastal zone.

■ **Employed and Expanded Marine InVEST models:** A working Spiny Lobster model was developed for use in Belize in 2011. NatCap also added mangrove forests and corals to our coastal protection models and quantified their ability to draw visitors and generate tourism revenue.



Ecosystem Services

■ **Tourism:** World-renowned diving and snorkeling and the Western Hemisphere's longest unbroken barrier reef draw 800,000 tourists to Belize's shores annually. The tourism industry employs over 25% of workforce, driving construction of airports, urban areas, and ship ports.

■ **Biodiversity:** Endangered species such as the West Indian manatee, American crocodile, and marine turtles find shelter on the Belizean coastline. It also houses a vast array of reef fish, mollusks, and coastal birds.

■ **Coastal Protection:** Belize's barrier reefs, mangrove forests, and wetlands create buffers against erosion and storm surge. These natural features defray costs from hurricane damage and help protect the 40% of Belizeans that live in the coastal zone.

■ **Carbon Sequestration:** Coastal mangroves and seagrasses store carbon in their standing stocks and bury it in their sediments, creating large reservoirs of long-term sequestered carbon.

■ **Fisheries and Aquaculture:** Belize is a hotspot for commercial, recreational and subsistence fishing. The commercial lobster and conch fishery is a multi-million dollar industry and supports the livelihoods of over 25,000 Belizean fishermen.

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Managing Complex Tradeoffs along Belize's Coastal Zone

Tradeoffs involved in alternative management plans illustrate the complexity of coastal zone management decisions. Results thus far indicate that where coastal development expands, risks to marine habitats generally increase, lobster catch and revenue decline, and areas of the coastline vulnerable to storm surges expand. However, intensified development can also benefit local livelihoods and increase revenue from recreation and tourism activities. NatCap's InVEST software tools help decision makers manage complex and multifaceted tradeoffs by analyzing relationships between specific investment opportunities and their environmental or economic impacts. For example, we look at:

- The extent to which mangrove forests and coral reefs mitigate the need to invest in protective coastal seawalls
- The impact of oil exploration and intensive aquaculture on lobster catches
- The impact of habitat conservation on long-term tourism revenue

Comparing Zoning Options with InVEST: Turneffe Atoll

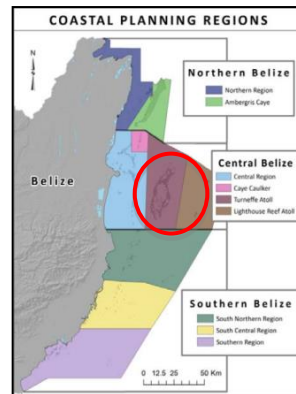


Figure 1

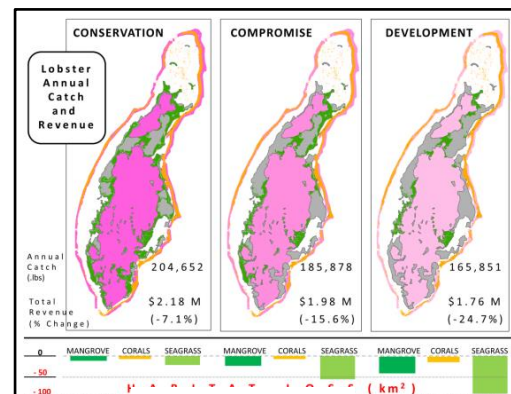


Figure 2

Although national in scope, the ICZMP builds upon efforts at the local level to develop sustainable resource guidelines. These efforts are coordinated with Coastal Advisory Committees from nine planning regions along the coast and offshore cays and atolls, depicted in Figure 1. On Turneffe Atoll, circled in red, a pioneering set of development guidelines were finalized in 2003. Figure 2 shows three zoning options for Turneffe Atoll that emphasize different stakeholder priorities. Different levels of permitted coastal development, transportation, and dredging practices affect the mangrove, coral and seagrass habitats supporting the Spiny Lobster population. Changes in the expected annual catch and revenue generated by the lobster industry are also calculated and displayed for each scenario. These tradeoff maps produced with InVEST provide guidance for government agencies and users that must collaboratively manage these systems, by identifying the magnitude and locations of conflicting uses and comparing the outcomes for multiple services.

Advancing Dialogue: Beyond the Ecosystem/Economy Divide

In support of Belize's first nationally integrated plan to manage coastal resources, NatCap and its partners gathered comprehensive scientific knowledge about local ecosystems and garnered sociopolitical support to overcome *ad hoc* development decisions. This inclusive process is advancing the dialogue beyond sector-specific issues and providing an open platform for stakeholder and government discussions about realistic development tradeoffs. More broadly, it opens opportunities for coordinating sustainable economic growth and ensuring the long-term viability of Belize's natural capital and the full range of benefits it provides to people.