

# CAYE CAULKER COASTAL ZONE MANAGEMENT GUIDELINES



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## **ACKNOWLEDGEMENTS**

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### **Participants to First Consultation Meeting (May 16, 1997)**

- |                           |   |
|---------------------------|---|
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| 2. Alexander Young        | Shirley's Guest House                             |
| 3. Shirley Young          | Shirley's Guest House                             |
| 4. Maria Vega             | Vega's Inn  |
| 5. Antonio L. Vega Sr.    | Vega's Inn  |
| 6. Emmanuel Rodriquez     | Caye Caulker Village Council, Chairman            |
| 7. Gerald Badillo         | Caye Caulker Village Council, Secretary           |
| 8. David Herredia         | Anchorage Resort                                  |
| 9. Anna M. Bounting       | Belize Diving Service                             |
| 10. Frank Bounting        | Belize Diving Service                             |
| 11. Thomas Brown          | Sand Box Restaurant                               |
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| 13. Eduardo Reyes, Sr. JP | Hotelier & Airline Attendant                      |
| 14. Alberto Villanueva    | Fisherman   |
| 15. Robert Blease         | Caye Caulker Village Council, Assistant Secretary |
| 16. Perfilio Guzman       | Fisherman   |
| 17. Wendy de la Fuente    | Village Voice                                     |
| 18. George Besta          |   |
| 19. Mario Guizar          |   |
| 20. Luis Reyes            |   |

### **Stakeholders consulted on a regular basis (1997)**

1. Caye Caulker Village Council
1. Forest And Marine Reserve Association of Caye Caulker (FAMRACC)
2. Caye Caulker Planning Committee
3. Caye Caulker Belize Tourism Industry Association
4. Physical Planning Section (Lands and Survey Department)
5. Caye Caulker Tour Guide Association

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6. Ina Auxillou
7. Dane Dingerson
8. Robert Blease

The following individuals of the Caye Caulker region participated in CZMAI's coastal planning consultations during 2011-2012, and are thus acknowledged for their valuable input towards revising and updating the coastal zone management guidelines for the region. These individuals are namely:

**Caye Caulker Region Consultation Participants (2011-2012):**

<b>NAME</b>	<b>ORGANIZATION/AFFILIATION</b>
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3. Maria Vega	Citizen
4. Tony Aguilar	Citizen
5. Javier Novelo	Citizen
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7. Inez Cardenas	Belize Fisheries Department
8. Alli Cansino	Belize Fisheries Department
9. Shakera Arnold	Belize Fisheries Department
10. Miguel Alamilla	Belize Fisheries Department
11. Isaias Majil	Belize Fisheries Department
12. Ellen McRae	Siwa-ban Foundation/Forest and Marine Reserve Association of Caye Caulker (FAMRACC)

A final round of consultations was held July 7<sup>th</sup> 2015-September 7<sup>th</sup> 2015 as-the re-constituted CZMA Board of 2014 directed a re-opening of the public comment period.

Despite best efforts to garner public participation via public service announcements, using television, radio, and newspaper advertisements, CZMAI was unsuccessful in holding a well-attended public consultation meeting in Caye Caulker on Tuesday June 11, 2013 during the public consultation period. As a result, these management guidelines is a combination of CZMAI's foundation planning efforts in 2004, outcomes of consultations during 2011-2012, and discussions with a few key citizens of Caye Caulker. Those consulted in 2013 include:

**Public consultations 2013:**

- |                     |                 |
|---------------------|-----------------|
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| 2. Lewis Aguilar    | FAMRACC         |
| 3. Ilda Marin       | Rainbow Hotel   |
| 4. Ellen McRae      | FAMRACC         |

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## **LIST OF ACRONYMS**

<b>BEL</b>	Belize Electricity Limited
<b>BTB</b>	Belize Tourism Board
<b>BWS</b>	Belize Water Services
<b>CCCAC</b>	Caye Caulker Coastal Advisory Committee
<b>CCVC</b>	Caye Caulker Village Council
<b>CZAC</b>	Coastal Zone Advisory Council
<b>CZMAI</b>	Coastal Zone Management Authority and Institute
<b>DOE</b>	Department of Environment
<b>EIA</b>	Environmental Impact Assessment
<b>FAMRACC</b>	Forest and Marine Reserve Association of Caye Caulker
<b>GOB</b>	Government of Belize
<b>HRA</b>	Habitat Risk Assessment
<b>InVEST</b>	Integrated Valuation of Ecosystem Services and Trade-off
<b>STP</b>	Sustainable Tourism Master Plan
<b>SWMP</b>	Solid Waste Management Plan
<b>PHB</b>	Public Health Bureau

## GLOSSARY OF TERMS

Certain technical terms have been used in the text of these guidelines. The following represents an explanation of such terms that were not provided within the text.

**Artisanal/Subsistence Fishing** means traditional fisheries involving fishing households (as opposed to commercial companies), using relatively small amount of capital and energy, relatively small fishing vessels (if any), making short fishing trips, close to shore, mainly for local consumption.

**Building Height** means the recommended maximum building height that should be allowed for each building to be measured from ground level to roof

**Building Setback** means the recommended minimum distance that should be allowed between buildings or between buildings and site boundaries

**Commerce** means the storage and retail of consumer goods

**Commercial Development** means land use involving the construction of a building or buildings that are used solely for commerce and business activities by the owners or others to the exclusion of all other uses within the density requirements of these guidelines

**Commercial Fishing** means the harvesting of fish, either in whole or in part, for sale, barter or trade.

**Conservation** means the retention of the natural features but with allowance of limited non-disruptive development

**Conservation Area** means areas including the 66ft reserve and other reserves, canal buffers, water bodies, flood prone lands; areas with ecological significance such as mangrove wetlands,

**Community Facilities** means Spaces set aside in large residential or commercial subdivisions for public purposes. They may include facilities such as public parking lots, schools, cemeteries, churches, public sporting areas, youth centers, police stations or health facilities

**Coverage** any building, including balconies and verandas, and expressed as a percentage of total lot size

**Density** means a level of development within a site, as measured by the number of lots per acre, number of dwelling units per acre, or maximum site coverage

**Development** means any activity which involves mining, engineering or building operations or change of use of land or building in, under, over or on land

**Dwelling Unit** means a living area consisting of contiguous rooms intended for convenient, long-term occupancy by one family and providing complete, independent facilities for living, eating, cooking, sleeping and sanitation

**Fish camp** means a building that is permanently or temporarily used for ancillary housing, trap-making and storage, boat repair and docking by full or part time commercial fishermen as licensed by the Fisheries Department,

**Habitable Room** means any room except that used for a kitchen or bathroom

**Land** means all incorporeal hereditaments of every tenure or description that are either permanently or temporarily above the surface of the sea, whether through natural or man-made activity. The seabed, while not 'physical' land, is defined as National Land

**Liquid Waste** means grey water from bath, basin and sink and sewage waste that consist mainly from discharge of body waste.

**Lots** acre should be subdivided and alienated

**Low-Density Development** means development of a site that does not exceed 20 dwelling units per acre, 6 lots per acre and a maximum site coverage of 50 percent

**Low-Impact Development** means an ecologically-friendly approach to site development and storm water management that mitigates development impacts to land, water and air; through conserving natural systems and hydrologic functions of the site. Site development includes residential dwelling units and community facilities and impervious surface cover is a maximum of 30 percent of total cover

**Marina** means a mooring facility for four or more recreational vessels

**Maximum Human Carrying Capacity** means the maximum population size of humans that the environment can sustain indefinitely, given the food, habitat, water and other necessities available in the environment.

**Maximum Number of Floors** means the recommended maximum number of floors a building should have, including attics or roof space designed for habitation

**Maximum Number of Lots** means the recommended maximum number of lots in which an acre of land can be subdivided and alienated

**Maximum Habitable Rooms** means the recommended maximum number of rooms to be allowed and measured per acre of land

**Maximum Building Coverage** means the recommended maximum ground coverage of any building including balconies and verandahs and expressed as a percentage of total lot size

**Maximum Site Clearance** means the recommended maximum amount of land that should be allowed to be cleared and expressed as a percentage of the total site area

**Medium-Density Development** means development of a site that does not exceed 40 dwelling units per acre, 8 lots per acre and a maximum site coverage of 66 percent

**Medium-Impact Development** means an ecologically-friendly approach to site development and storm water management that mitigates development impacts to land, water and air; through conserving natural systems and hydrologic functions of the site. Site development includes a combination of residential dwelling units, community facilities and commercial activities, and impervious surface cover is a maximum of 50 percent of total cover

**Minimum Lot Size** means the recommended smallest size a parcel of land should be allowed to be alienated

**National Land** means all lands, including cayes and parts thereof not already located or granted and also includes any lands which have been, or may hereafter become, escheated to, leased by, or otherwise acquired by the Government;

**Piers per Site** means the recommended number of piers that should be allowed to be constructed on any site

**Primary Land Use** means the recommended preferred use of the site

**Residential Development** means land use that involves the construction of a building or buildings that are used solely for permanent or temporary domiciles by the owners or others on a non-commercial basis to the exclusion of all other uses within the density requirements of these guidelines

**Resort** means a building, buildings or site which offers accommodation and general amenities to visitors with other uses such as bars, restaurants, general storage and repair facilities and docking

**Secondary land Use** means the recommended next preferred use to be applied to the site either in conjunction with the primary land use or as an alternative to the primary land use if that is not applicable

**Solid Waste** means any unwanted material that is useless, thrown away or discarded

**Swamp** means an area of very shallow lagoon with mud, savannah or very low vegetation

**Utility** means the service and infrastructure used for the supply of energy, water, communication and waste disposal

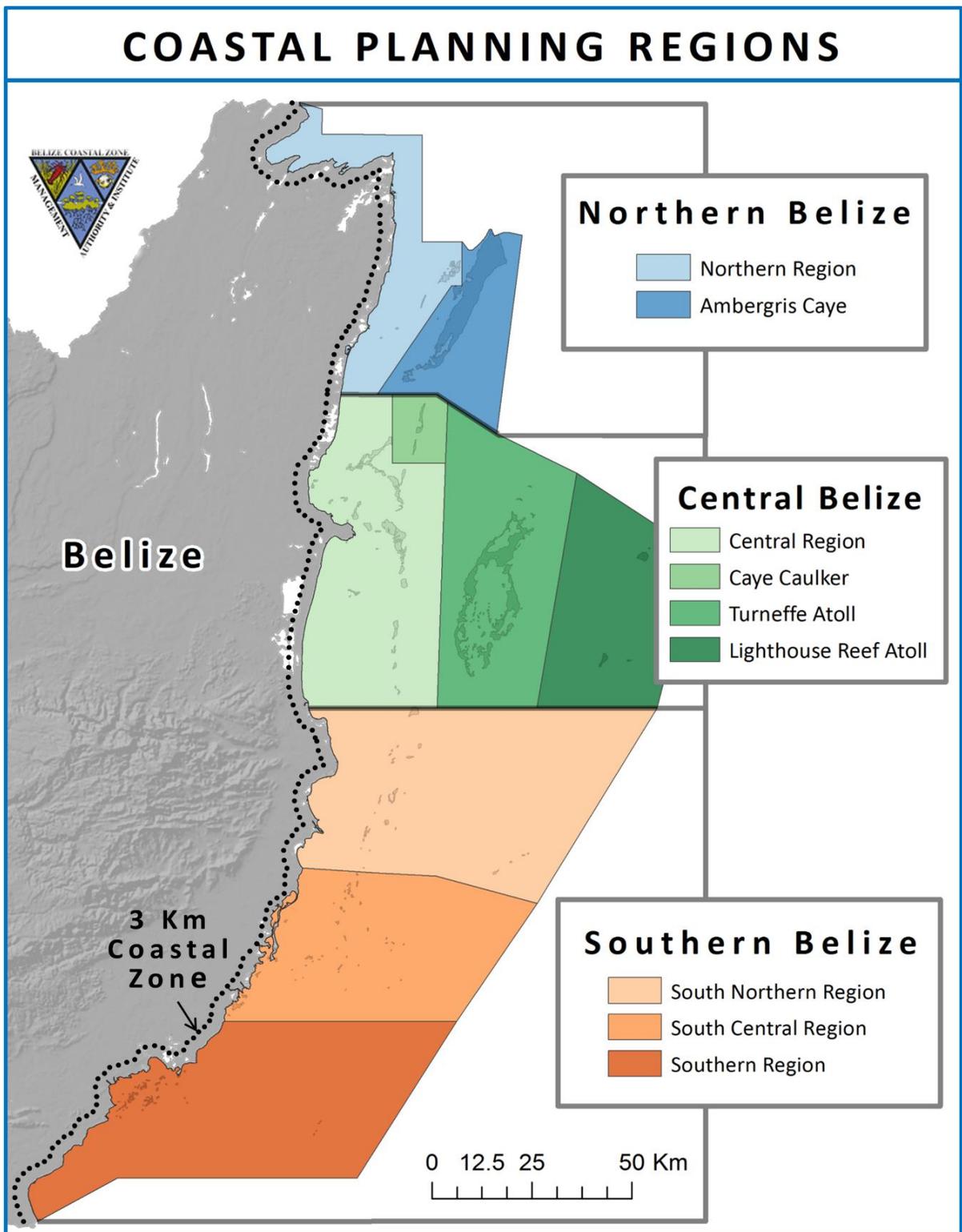
## **PREAMBLE**

The Belize Coastal Zone Management Authority and Institute (CZMAI), a statutory body established by the Coastal Zone Management (CZM) Act of 1998, is tasked with the broad responsibility of assisting with the development of policies, strategies and guidelines for the improved management and sustainable use of the country's coastal resources at a national level. In keeping with its mandate to prepare an integrated coastal zone management plan, the agency has developed regional coastal zone management guidelines to provide support for planned development and resource management along the coastline and offshore areas of the entire country. These guidelines have been prepared for nine (9) coastal planning regions (**Map 1**), which were demarcated based on commonalities, geographic definition and regional characteristics. The coastal zone management guidelines will help to integrate management efforts across the land-sea interface.

The Caye Caulker Coastal Zone Management Guidelines were developed by the CZMAI, in conjunction with stakeholders of the Caye Caulker region. The region, which consists of Caye Caulker and Caye Chapel, is relatively developed and known for its diverse marine flora and fauna, white sand beaches, and proximity to sensitive coral ecosystems. Using the expert opinion and subjective information from stakeholders, as well as the best available objective data, CZMAI was able to produce this guideline with the following goals:

1. Encourage and promote the sustainable development of areas within the Caye Caulker Region that will promote economic growth while simultaneously ensuring ecosystem stability and the efficient delivery of ecosystem services.
2. Protect and preserve the traditional way of life of the stakeholders within the Caye Caulker Region
3. Ensure sustainability of coastal resources by identifying areas in need of conservation and reducing user conflicts

These goals are informed, and rooted, where possible, on sound science and local knowledge. These guidelines represent the views and recommendations of the stakeholders of the Caye Caulker Region whom were consulted. They are also a response towards addressing the management gaps identified by stakeholders through CZMAI's consultation process. These coastal zone management guidelines will ensure that human use of the coastal region occurs in consideration of the carrying capacity of the environment in addition to other ecological, cultural, social and economic development priorities of the region. These guidelines will aid policy development for integrated coastal zone management. They will be implemented by all those agencies that have legal mandates and/or permitting powers that impact resource utilization in the coastal zone of Belize, in partnership with this region's stakeholder groups.



**Map 1: Coastal Planning Regions of Belize**

## 1.0 INTRODUCTION

The island of Caye Caulker has rapidly developed over recent years. This traditional fishing community, most of which resides in the Caye Caulker Village, has quickly diversified into tourism as the natural and societal attributes of the island have become internationally sought and acclaimed. This diversification and expansion of tourism has resulted in numerous economic opportunities and development as well as village and population growth.

Caye Caulker Village, with a resident population of over 1700, is located on the southern portion of the island and lies on the narrow strip between the airstrip and the “Split.” The wide southern section is mostly privately owned. The northern portion contains the only available National Lands, and has recently been targeted for development in the form of both private and governmental residential subdivisions. The Caye Caulker coastal planning region encompasses the entire island, and the surrounding waters. It also includes the forest and marine reserves, which encompass an area of 0.5 square kilometers and 40 square kilometers respectively.

Fishing has been the traditional source of income for Caye Caulker residents. As a result, the fishing industry has contributed to shaping the natural, architectural and social attraction of the island. Despite the rich fishing history, fishers have reported that their effort/catch has decreased in recent years observing an overall decrease in conch, lobster, and finfish catches. The industry, however, is still supporting a sizable portion of the community. As such, every effort should be made to protect the ecosystems (mangroves, seagrass beds, and reef) supporting the industry while implementing a management regime (e.g. closed, seasonal closure, open areas) through the marine reserve’s zoning scheme in an effort to promote sustainable harvests.

Caye Caulker is not unlike other areas of interest in Belize in that tourism has now become an important source of income, particularly since the fishing industry is declining and seasonal. In fact, tourism is now a leading direct and indirect income earner on the island. Most, if not all, commercial activities and services are in some way connected to the tourism sector. Guests are offered SCUBA, snorkeling, sport fishing, nature tours, water sports and other activities and services. Approximately 65 tour guides/operators reside on the island. Most of them depend entirely on the tourism industry for their livelihood but a few maintain their traditional fishing activities when appropriate. Subsidiary services, including food and beverage, transportation, and gift shops are also on the increase to complement the growing industry. The main attraction in this area, the Belize Barrier Reef, is located between 1.2 and 1.5 nautical miles away. The health of this sensitive and complex ecosystem may be related to direct (SCUBA, snorkeling, etc.) and indirect (sedimentation, eutrophication, etc.) human activities. However, natural storms, diseases and climate change have and may also play an important role on the nearby reef system.

Until recently, development on Caye Caulker could be classified as small scale and local. However, the development trend has experienced a turn where foreign investment is becoming more common. The visible increase in human-induced stresses (increased garbage, vegetation clearance) on the terrestrial and marine environments, as well as haphazard developments, have resulted in the recognition by both residents and non-residents of the need for systematic and directed development in Caye Caulker.

The need for thinking about the future through planning and the long-term development and sustainability of the economy, environment and people are widely accepted. The strategic development options can be basically stated as the choice between the macro and micro approach. One option is a development future that could lead to the island being developed along the lines of the Florida Cayes, which would considerably alter the natural features and impose the need for “hi-tech” utility and waste disposal systems which do not guarantee the maintenance of a healthy Belize Barrier Reef. The other option is the promotion of domestic-scale development that is based on the advantages of the natural characteristics of the land and the aspirations of the local community, as has been expressed by residents of Caye Caulker. Within the Sustainable Tourism Master Plan, Caye Caulker was identified as a candidate to be a model in this region for low carbon tourism development. This initiative that will be implemented under the upcoming STP 2 will promote the latter vision for Caye Caulker, a destination that promotes safe and sustainable tourism practices.

Caye Chapel, on the other hand, is a small, privately owned island in Belize, 3 miles (4.8 km) south of Caye Caulker. It was once owned by Isaiah Emmanuel Morter, Belize's first colored millionaire. Unlike Caye Caulker, this island has one resort, an airstrip, 18 hole golf course, 25,000-square-foot (2,300 m<sup>2</sup>) clubhouse and conference facilities. The golf course was designed by Patrick Horvat from Lethbridge, Alberta, Canada. In 2015, the island was purchased from the Belize Bank (through the process receivership) by Mexican developers, Abraham Roffe and Abraham Saade, the owners of El Secreto Resort in San Pedro Ambergris Caye.

## **2.0 REGION BOUNDARIES**

### **Location and Geographic Definition**

The Caye Caulker Region, for which these coastal zone management guidelines have been prepared, is one of nine regions into which the coastal zone has been demarcated (**Map 1**). It is situated south of the Ambergris Caye Region, East of the Central Region and West of the Turneffe Atoll Region (**Map 2**). It encompasses approximately 234.7 square kilometres of land and sea and can be described as the area enclosed within the following UTM 16 coordinates:

Point 1: (1969958 N, 383896 E)

Point 2: (1970038 N, 395088 E)

Point 3: (1968133 N, 397787 E)

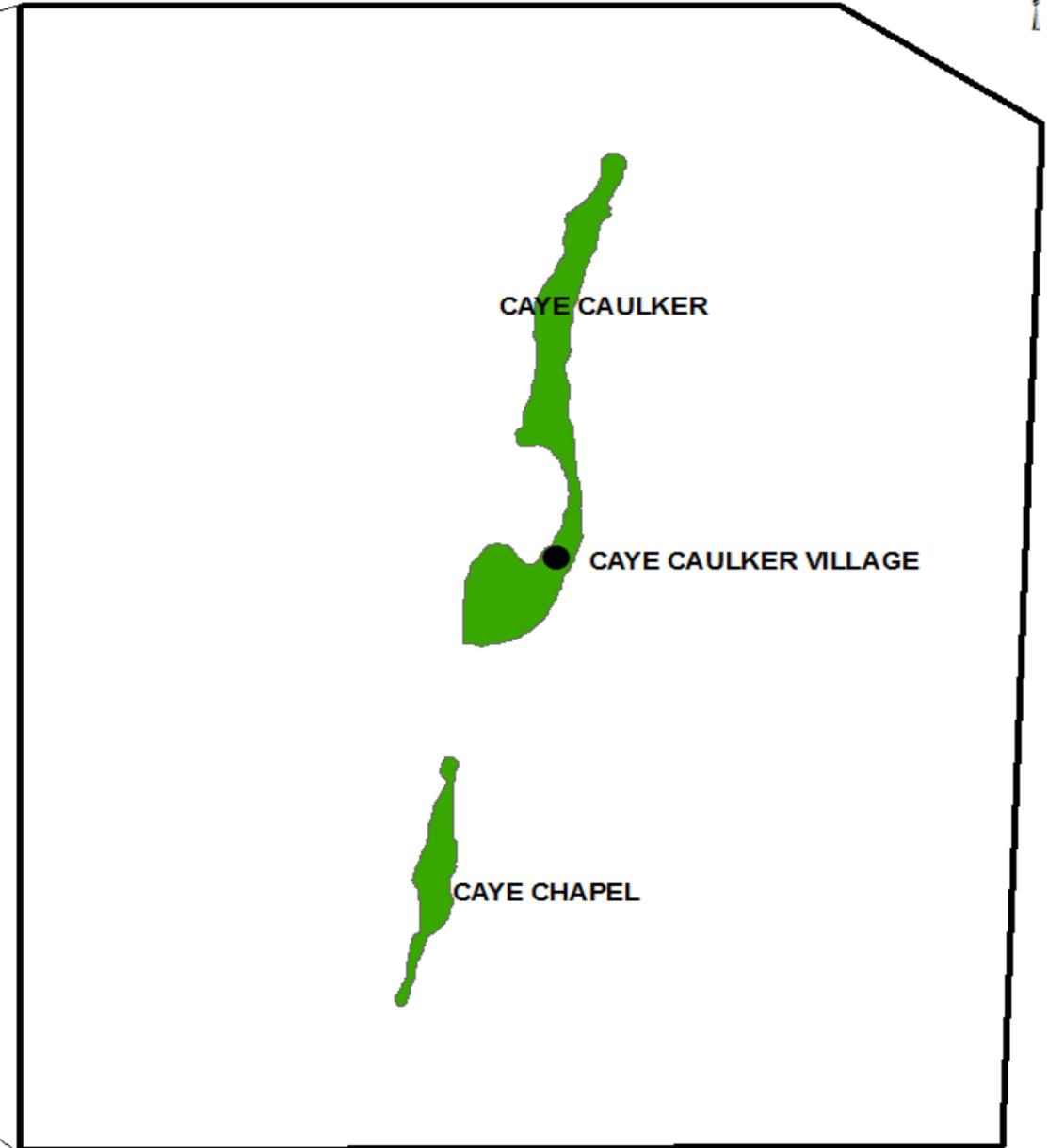
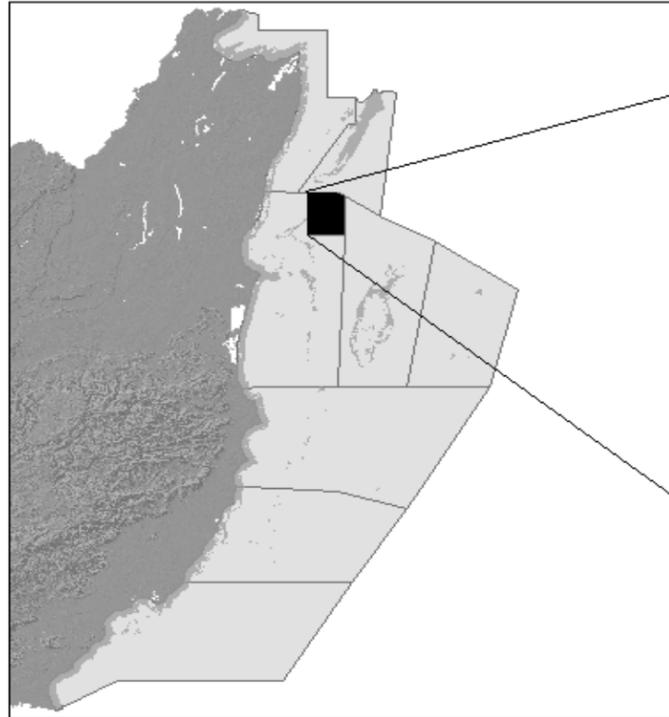
Point 4: (1952575 N, 397152 E)

Point 5: (1952416 N, 383896 E)

### **Regional Context**

The Caye Caulker Region is made up of two (2) cayes, Caye Caulker and Caye Chapel, comprising approximately 234.7 square kilometres of terrestrial and aquatic environment including flats and reefs of which 5.2 square kilometers or 2.22% is terrestrial and 37 square kilometers or 97.78 % is aquatic. The forest reserve encompasses 0.051 square kilometres and the marine reserve, 40.21 square kilometres. They are located on the northern tip and east of Caye Caulker respectively. The island is divided in two by a natural channel, called the “split”, which has widened over the years as a result of the 1961 hurricane and subsequent storm events in combination with continuous dredging and mangrove removal.

# CAYE CAULKER COASTAL ZONE PLANNING REGION



-  Cayes
-  Caye Caulker Village

Scale: 1:85,000  
NAD 1927 UTM ZONE 16N  
5 2.5 0 5 Kilometers

Map 2: Caye Caulker Coastal Zone Planning Region

### **3.0 OBJECTIVES**

The management of the Caye Caulker region's coastal zone must be linked to the goals and aspirations of the people of Belize, particularly the residents of Caye Caulker Village and Caye Chapel. Consequently, it must be intrinsically tied to the socio-economic, cultural and other basic needs of the people of Caye Caulker and Caye Chapel, and their use and demand for land and marine resources. Thus the key objectives of the Caye Caulker region coastal zone management guidelines may be summarized as follows:

1. Protecting the fishing resources and traditional fishing rights, especially for the fisher folk from the community of Caye Caulker.
2. Promoting orderly and sustainable development, based on suitable land use planning, and with effective development guidelines that will meet the needs of current and future generations
3. Maintaining and protecting on going and future conservation, recreational and tourism areas and uses
4. Preventing inappropriate high-impact, unsustainable developments that are incompatible with community needs
5. Protecting and preserving significant national and international natural features and ecological biodiversity of special interest or uniqueness that define the character and scientific importance of the Caye Caulker marine ecosystem.
6. Preserving the social and cultural values of the people and communities of the region that are connected to the environment
7. Fostering and supporting a continued partnership among stakeholders for managing the coastal resources
8. Establishing a framework for regulating the development and use of resource of the region through the continuation of CZMAI's coastal planning program activities and coastal advisory committee process

#### **4.0 LEGISLATIVE AND INSTITUTIONAL FRAMEWORK FOR INTEGRATED COASTAL ZONE MANAGEMENT IN BELIZE**

The Coastal Zone Management Act, hereinafter referred to as “the Act”, was enacted in 1998 and has been described as reflective of the trend in legislation in Belize towards more accountability and transparency for government actions, and more direct participation by the public in decision making, particularly public resources. The intent of the Act is to promote the sustainable development of coastal and ocean areas through coordination of existing legislation affecting coastal resources and through building capacity and expertise to manage coastal resources. The main purpose of the Act is to:

- Provide for the improvement of coastal zone management in Belize through the establishment of a Coastal Zone Management Authority and a Coastal Zone Management Institute;
- Provide for the establishment of a Board of Directors to control and manage the affairs of the Authority;
- Provide for the preparation of a Coastal Zone Management (CZM) Plan;
- Provide for the establishment of mechanisms to improve monitoring of various activities within the coastal zone;
- Provide for the payment of fees and charges related to the use of the coastal zone and
- Provide for matters connected therewith and incidental thereto

The Coastal Zone Management Authority is the policy making and planning institution for coastal zone management. Its functions are primarily in the realm of planning, advising, cooperating, collaborating and monitoring. It is given no jurisdiction to permit or regulate activities which may affect the sustainable development of the coastal zone. The Coastal Zone Management Institute is the research and technical arm of the Authority. As is indicated above, the Coastal Zone Management Authority is mandated to develop a comprehensive Coastal Zone Management (CZM) Plan for Belize. The CZM Plan is to be developed by the Chief Executive Officer (CEO) of the Authority through consultation with all affected government agencies, non-governmental agencies, statutory bodies and the private sector. The Act mandates that the plan address certain areas. These include:

- Guidelines to be used in determining the suitability of particular development activities in the coastal zone;
- Guidelines for the general monitoring of the coastal zone, including its biological species, communities and habitats;
- Proposals, including existing proposals from Government agencies, relating to the coastal zone that deal with the following subjects:
  - Land use
  - Planning for the establishment of marine protected areas and for the conservation of threatened or potentially threatened or endangered species;
  - Preservation and management of the scenic, cultural and other natural resources;
  - Recreation and tourism;
  - Monitoring of the environment and natural resources, mineral extraction, living resources, human settlements, agriculture, aquaculture, and industry
- Proposals for the reservation of land or water in the coastal zone for certain uses, or for the prohibition of certain activities in certain areas of the coastal zone;
- Recommendation for the improvement of public education as well as public participation in the management of coastal resources;
- Recommendations for strengthening governmental policies and powers and the conduct of research for the purposes of coastal resources conservation and management

The process for approval of the CZM Plan is as follows: The Act requires the CEO of the Authority to submit the CZM Plan to the Board of the Authority, who has sixty days to make modifications. Thereafter, the Board is to notify the public of the availability of the CZM Plan by an order published in the Gazette. Any member of the public may submit comments within sixty days. Upon completion of the sixty days, the Board may approve the CZM Plan, subject to modifications, if they deem it fit in regard to the comments submitted, and then submit the same to the Minister for approval. The Minister, after approving the CZM Plan, shall table it in the House of Representatives for approval by the House by affirmative resolution. Subsequent to approval by the House, the CZM Plan must be published in three consecutive issues of the Gazette. The CZM Plan is to come into operation on the date of the last publication or such later date as may be specified therein. The Act requires the CZM Plan to be revised during the four year period after it comes into operation.

It was agreed by the CZMAI that the CZM Plan would be developed in phases, with the first phase being the development of an Integrated Coastal Zone Management Strategy document, which underwent extensive public consultation. It was endorsed by the cabinet in 2003, and is an official policy document of CZMAI. The second phase involved the formulation of cayes development guidelines for eight of the nine coastal planning regions into which the coastal zone has been sub-divided by the CZMAI. This subdivision was based on geographical, biological, administrative and economic similarities. The Ambergris Caye Development Master Plan serves as a guide for regulating the use and development of land in the Ambergris Caye Planning Region. See **Map 1** for the definition of the nine coastal planning regions.

The management guidelines were formulated using the Cayes Development Policy (2001) as a framework. During 2010-2012, the cayes development guidelines were updated to include new information on the cayes, but also to include human use of the coastline and marine waters. As such, the development guidelines have been renamed the coastal zone management guidelines. Thus, the Integrated Coastal Zone Management Strategy (2003), together with the coastal zone management guidelines for the nine coastal planning regions, contributes to the development of the comprehensive Integrated Coastal Zone Management Plan.

## 5.0 GUIDING PRINCIPLES

It is important that the coastal zone management guidelines for the region be formulated as a part of a sustainable plan geared towards contributing to national, regional and local development policies, goals and aspirations. They must therefore be holistic and pragmatic, yet underpinned by certain fundamental principles. These can be detailed as follows:

**Principle 1:-** *Recognition that the Caye Caulker Region needs special protection and management because of its physical, economic, scientific, cultural and aesthetic attributes*

**Principle 2:-** *Recognition of the need to avoid placing undue strain on the terrestrial and aquatic environment of the region by ensuring that proposed development activities do not exceed the carrying capacity of the region*

**Principle 3:-** *Recognition of the rights and interests of traditional users and stakeholders while acknowledging the national development policy which promotes tourism and job creation*

**Principle 4:-** *Recognition that environmental concerns are best handled with the participation of all concerned stakeholders at all levels and from all sectors*

**Principle 5:-** *Recognition that planning guidelines represent a preventative and precautionary approach to environmental degradation and a tool for pursuing sustainable development of the region*

## 6.0 SECTORAL ISSUES AND POLICIES

These policies are organized into ten sectors that address current and potential issues within the Caye Caulker Region coastal zone, and provide recommendations from stakeholders. They include: Fishing, Marine Tourism, Land-Use, Marine Dredging, Sensitive Habitats, Utilities, Pollution Control, Social Amenities, Conservation, and Research and Education. They were developed by CZMAI and the key people consulted from the Caye Caulker Region during CZMAI's consultation efforts.

### 6.1 *Fishing*

Lobster is the main catch in Caye Caulker's fishing industry. A Fisheries Department survey (1994) of 39 fishing crews (representing a total of 89 fishermen) indicated that fishers used gill nets (42%) and fish traps (32%). Also of particular interest is that the fishers surveyed reported to be involved in multiple fisheries, with 94% of fishers reporting involvement in the lobster fishery, 22% in the finfish fishery and 8% in the conch fishery. The most frequently used gear was the lobster trap (96%). The storage and construction of traps have posed some conflicts at times on the island, as there are some traditional construction, repair, and storage areas. Some of these areas are either privately or publicly-owned, and sometimes compromises are difficult to arrive at. In addition, some of the publicly-owned areas are actually streets, which are usually 20 feet wide, but in some cases may be less. This may sometimes contribute to congestion and other concerns.

The total spiny lobster coverage for Caye Caulker was determined to be approximately 211 km<sup>2</sup>. Using InVEST's ecosystem service model for Spiny Lobster, it was estimated the exports of tail meat amounted to 12,031 lbs., and generated revenue of approximately BZ \$319 thousand (**Fig. 4, Appendix**). In addition, model results suggest that a Conservation Zoning Scheme could increase exports to 17,597 lbs.; and generate an annual revenue of BZ \$467 thousand by 2025. However, a Development Zoning Scheme would decrease the catch to 535 lbs., generating annual revenue of only BZ \$14 thousand by 2025. The model results indicate that the proposed zoning Informed Management Zoning Scheme for this region (**Map 3**) could increase exports to 15,577 lbs., generating annual revenue of BZ \$414 thousand by 2025.

Compared to the Informed Management Zoning Scheme (**Map 3**), the Conservation Zoning Scheme is the better option for maintaining increased lobster catch and revenue through to 2025. This is mainly attributed to the fact that under the Conservation Zoning Scheme, habitats that support the lobster fishery are under relatively less stress from human activity than in the Informed Management scheme. However, while the zoning scheme under a Conservation Scenario is good for habitats and the provision of important ecosystem services, such as protein from lobster, significantly less human activities occur in this zoning scheme. Although there may be some loss to habitat quality and lobster production, the Informed Management zoning

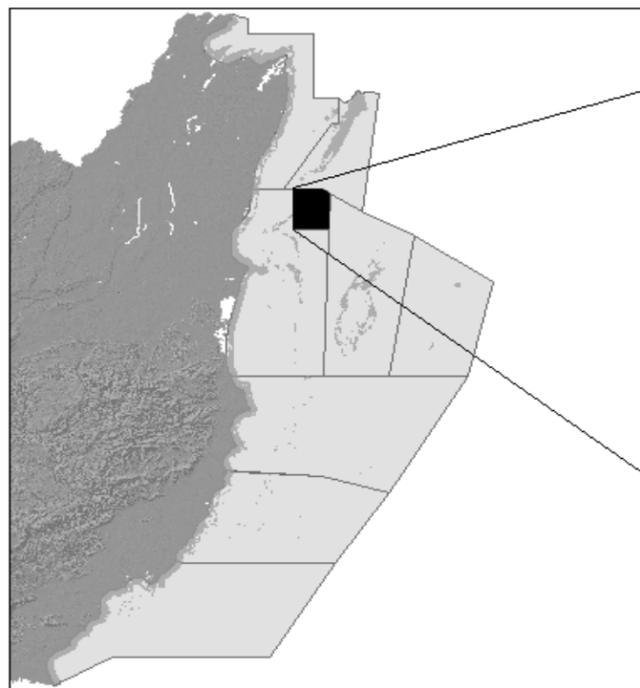
scheme represents a balance between managing the resources of the coastal zone and the continued allocation of areas for human use through to 2025.

In discussing the results of the InVEST ecosystem models, and in particular the lobster fishery model, there is the need to consider limitations of the model, which are highlighted below:

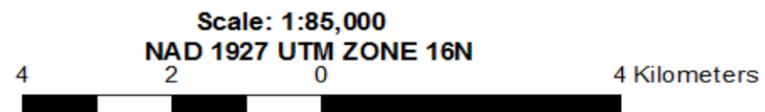
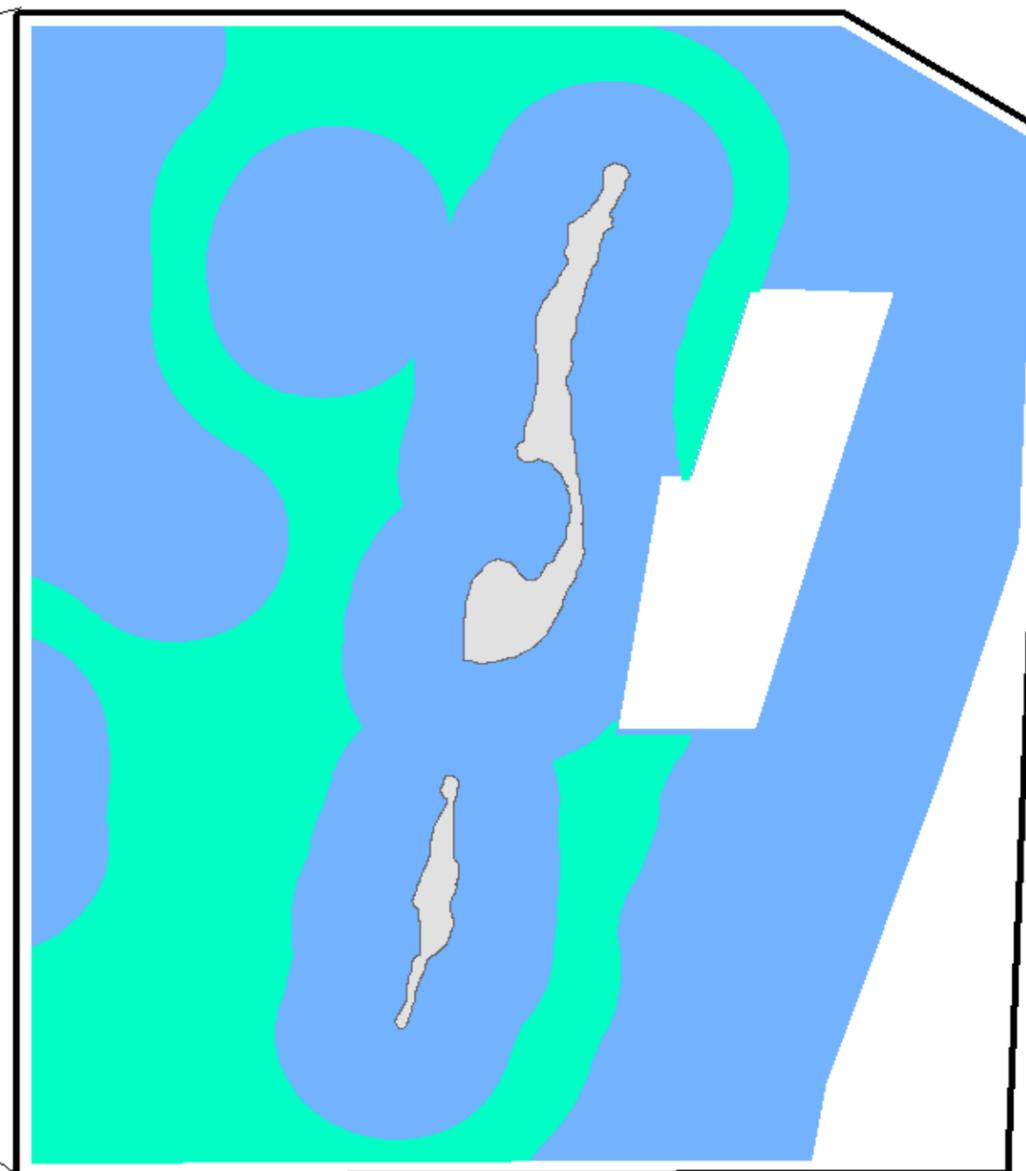
- Population growth parameters are nationwide, not region-specific
- Habitat dependencies are obligatory (e.g., habitat substitutability is not explicit represented).
- The population responds to change in habitat quantity (i.e., areal extent of mangrove, seagrass, and coral reef), not quality of those habitats.
- The fishery is assumed to take place at the start of the year, before natural mortality
- The model assumes near knife-edge selectivity in harvest function
- Harvest selectivity (and catchability) is invariant, such that technological improvements to gear or changes in fishing practices are not modeled.
- Market operations are fixed, such that they do not vary in response to amount of harvest, shifts in market or consumer preference, or technological changes.
- Climate change impacts are not directly accounted for in model

Additional information on how this model works can be found in **Appendix B.4** of the Belize Integrated Coastal Zone Management Plan.

# INFORMED MANAGEMENT ZONING SCHEME FOR FISHING: CAYE CAULKER



- Sportfishing
- Caye Caulker Base
- Commercial/Subsistence Fishing



Map 3: Informed Management Zoning Scheme for Fishing in the Caye Caulker Region

**Table 1: Framework for Implementing Informed Fisheries Management at Caye Caulker**

ZONE	CHARACTERISTICS OF ZONE	SCHEDULE OF PERMITTED USES			SCHEDULE OF RESTRICTED USES	SUPPORTING NATIONAL POLICIES	IMPLEMENTING AGENCY
		Dominant	Compatible	Regulated			
<b>Fishing</b>	Marine area defined for the extraction of fish for food and commercial trade, except for sport fishing which only involves the catch and release of fish	1.Sportfishing (bonefish, tarpon, permit); 2.Wild capture of commercial fish species using only permitted fishing gear 3. Subsistence fishing using traditional fishing gear 3. Wild capture of invasive species	Marine recreation and eco-tourism Passage/entry of fishing vessels Research and Education within marine reserves Establishment of fish pots and traps Seaweed culture	Sport fishing Commercial fishing Research and Education	1. Illegal extraction of catch and release species, endangered marine species and organisms under seasonal management regime; 2.Extraction within legally specified “no-take”/replenishment zones 3. Dredging 4. Use of prohibited fishing gear 5. Trawling 6. Shipping and navigation 7. Dumping of solid and liquid wastes 8. Oil exploration and extraction	Fisheries Act Coastal Zone Management Act	Fisheries Department Coastal Zone Management Authority

The Fisheries Act, administered under the Fisheries Department, is the principal governing legislation to regulate the fishing industry (**Table 1**), and is directly concerned with maintaining sustainable fish stocks and protecting the marine and freshwater environments. In order to protect the fisheries resources within the Caye Caulker Marine Reserve, and the traditional fishing rights of fishing communities of the region, the following action steps are recommended, to complement the existing Fisheries regulations and to enhance regional management of the fisheries resources.

### **Recommended Actions:**

1. For areas traditionally used for traps usage, providing that there is no compromise of village interest, either a compromise is made with the guidance of an agreed upon arbitrator or the committee identify public areas where this use may be pursued on a controlled basis. Regardless of what method of compromise is sought and realized, the Caye Caulker Village Council, the Northern Fishermen Cooperatives Limited and fishers of Caye Caulker and San Pedro Town should be consulted.
2. Document and manage a database on lobster trap ownership.
3. Increase representation and participation of local fishermen in local interest groups, such as the Caye Caulker Marine Reserve Advisory Committee, Caye caulker Tour Guide Association, and others groups with a direct or indirect stake in the region's fishing sector
4. Map traditional fishing areas and manage a database on which local residents are traditional participants in the region's fishing sector.
5. Increase patrolling efforts in the marine reserve with occasional early morning patrols to deter illegal fishing
6. Implement the recommended Informed Management zoning scheme for fishing (**Map 3**)

## 6.2 *Marine Tourism and Recreation*

Caye Caulker is a major recreational center with tourism related activities increasing significantly in recent years. The 2000 Belize Tourism Board (BTB) statistics showed that the number of hotels more than doubled between 1989 and 1999 alone. With the apparently declining commercial fishery stock and increase in foreign and local investment, the tourism industry is expected to continue this trend. One limitation affecting the tourist industry, as has been expressed by the Caye Caulker Village Council (CCVC) in the past, is the absence of a channel deep enough for large vessels to dock at the village pier. Two options had been identified: (1) lengthening the existing pier or (2) dredging a deeper channel. In addition, the number of piers on the island's eastern beach reserve is of concern. The island's piers are now clustered and unsightly in some areas. One option, as recommended by these guidelines, is the development of a marina on the leeward portion of the island and the implementation of a pier policy. Regardless of which options are considered, an in-depth cost/benefit (economic and environmental) analysis should be done before any action is taken.

Keeping in mind that Caye Caulker is a small island with most of its higher developable land already in some form of development, the fragility and ecological importance of the various swamps, water bodies and littoral forests must be recognized. The rise of the tourism industry will give rise to numerous related and ancillary services including the development of gift shops, tour operators, dive shops, snorkel shops, boating, which should all subscribe to a policy of ecotourism. Small hotels and guesthouses can help to distribute more widely the money spent by tourists and would more than likely be locally owned and operated, unlike large hotels and resorts. As the tourism industry grows, serious planning guidelines are necessary to avoid confrontation between conflicting uses. It must be emphasized that the tourism and recreation product of Caye Caulker is its natural and cultural assets, which must, therefore, be safeguarded. This balance of nature must be maintained.

The Sustainable Tourism Master Plan recommends that the primary tourism products offered should be nautical, ecotourism and adventure and Sun and Beach Tourism. As such beach infrastructure should be improved and high regulation of marine traffic should be enforced and centralized. Secondary tourism products include cultural tourism. Caye Caulker is expected to continue to exude its low-key charm along with attractive beaches and cultural offering.

InVEST's Recreation and Tourism ecosystem service model results suggest this region is projected to experience an increase in its tourist visitation by 2025 (**Fig.5, Appendix**). In 2010, approximately 60 thousand people visit this region, generating revenue of BZ \$7 million annually (**Fig.6, Appendix**). In a Conservation Zoning Scheme, InVEST Recreation model results indicate that there may be an increase in tourist visitation to approximately 87 thousand, generating annual revenue of BZ \$9.6 million. In a Development Zoning Scheme, there would also be a decrease in the current tourist visitation to approximately 43 thousand, and which would generate annual revenue of BZ \$4 million by 2025. In the proposed Informed Management Zoning Scheme (**Map 4**), InVEST Recreation model results indicate that there will also be an increase in tourist visitation to approximately 85 thousand and that tourist expenditure

**Caye Caulker Coastal Zone Management Guidelines**

Belize Integrated Coastal Zone Management Plan

Coastal Zone Management Authority & Institute 2016

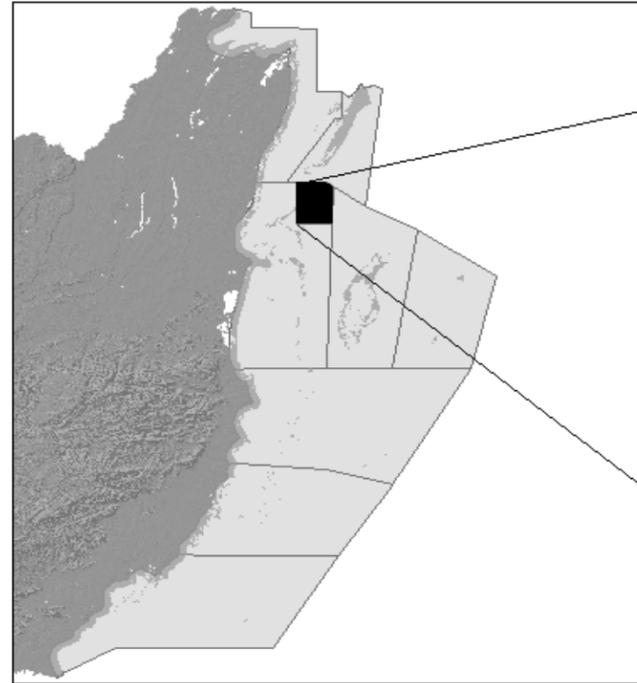
would generate an annual revenue of BZ \$14.6 million. The supporting framework for implementing the Informed Management Zoning Scheme for marine recreation and tourism is outlined in **Table 2**.

In discussing the results of the InVEST ecosystem models, and in particular the recreation model, there is the need to consider limitations of the model, which are highlighted below:

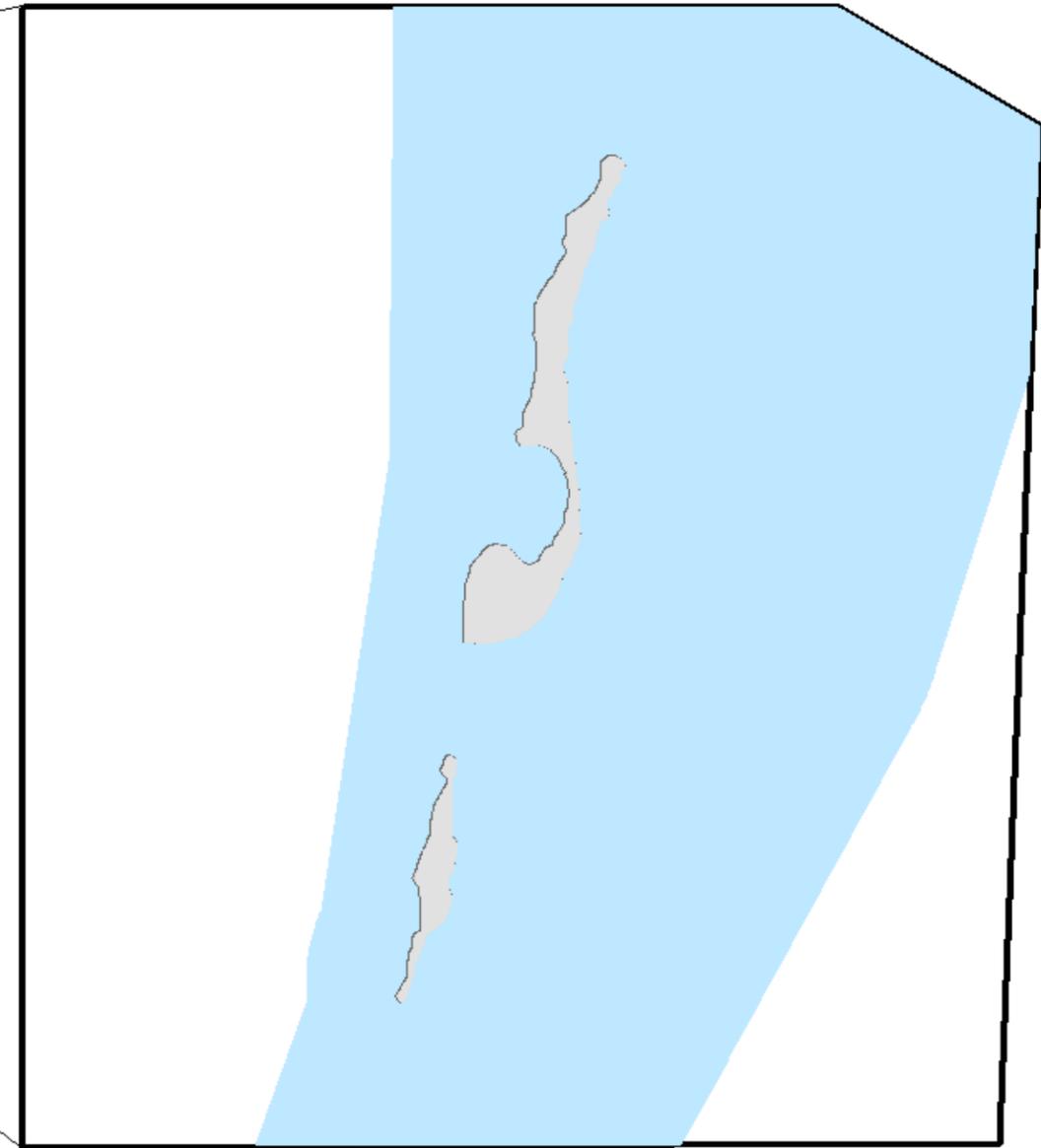
- The model assumes that people will respond similarly in the future to the attributes that serve as predictors in the model. In other words, the assumption is that people in the future will continue to be drawn to or repelled by a given attributes to the same degree as currently.
- Some of the attributes that are used as predictors of visitation are representations of areas managed for particular human use (e.g. transportation). The model assumes that future management of the zones and the type of activities that they represent are similar to current.
- Since there are no fine-scale data on the distribution of visitors to Belize, we use photo-person-days as a proxy for the relative density of actual person-days of recreation across the coastal zone.
- Climate change impacts are not directly accounted for in model

Additional information on how this model works can be found in **Appendix B.3** of the Belize Integrated Coastal Zone Management Plan.

# INFORMED MANAGEMENT ZONING SCHEME FOR MARINE RECREATION: CAYE CAULKER



- Marine Recreation
- Caye Caulker Base



Scale: 1:85,000  
NAD 1927 UTM ZONE 16N



Map 4: Informed Management Zoning Scheme for Marine Recreation in the Caye Caulker Region

**Table 2: Framework for Implementing Informed Marine Recreation in the Caye Caulker Region**

ZONE	CHARACTERISTICS OF ZONE	SCHEDULE OF PERMITTED USES			SCHEDULE OF RESTRICTED USES	SUPPORTING NATIONAL POLICIES	IMPLEMENTING AGENCY
		Dominant	Compatible	Regulated			
<b>Marine Recreation</b>	Marine areas especially suited to swimming, snorkeling, diving, kayaking, surfing, jet skiing, kite boarding, and other water sports	1. Swimming 2. Snorkeling 3. Diving 4. Kayaking 5. Surfing, 6. Jet skiing, 7. Kite boarding 8. Other water sports	Passage/entry of water taxis, tour boats, cruise vessels  Research and education within marine protected areas  Sport fishing	Research and Education  Eco-tourism activities within marine protected areas  Sport fishing	1. Commercial fishing 2. Establishment of fish pens/cages, mariculture 3. Oil exploration and extraction 4. Dredging 5. Passage of commercial fishing vessels 6. Shipping and navigation 7. Trawling 8. Dumping of solid and liquid wastes from ships and boats	Belize Tourism Board Act  Fisheries Act  Coastal Zone Management Act  Hotel and Tourism Accommodation Act  National Sustainable Tourism Master Plan	Belize Tourism Board   Fisheries Department  Coastal Zone Management Authority

The CZMAI developed the “*Tourism and Recreation Best Practice for Coastal Areas in Belize*”, which addresses best management practices for tourism ventures in coastal environments such as Caye Caulker. These practices should be adopted by the responsible authorities where possible.

### **Recommended Actions:**

1. Create small lodges, guesthouses and hotels, with a maximum of 20 rooms, for any new tourism-related developments
2. Encourage the creation of suitable parks and natural reserves, along with increased Belizean entrepreneurship and preparation
3. Planning and development of current and future tourism development in this area must be carried out via an integrated, and participatory approach, utilizing clear sustainable management criteria as guidelines.
4. There should be unimpeded access to the beach reserve, particularly at the split and other traditional recreational areas/sites, for public recreational use, provided that nuisances are absent, such as unkempt garbage, noise pollution by visitors
5. Emphasize that the tourism and recreation product of Caye Caulker is its natural and cultural assets, and as such must be safeguarded
6. All tourism facilities should meet BTB’s minimum standards, including disaster preparedness and evacuation plans; and also meet the “*Tourism and Recreation Best Practices Guidelines for Coastal Areas in Belize*” produced by CZMAI
7. BTB and/or DOE should not recommend or approve tourism facilities that do not conform to these coastal zone management guidelines.
8. The recommendations of the National Sustainable Tourism Master Plan for this region are to be supported in order to encourage a long-term sustainable tourism future
9. Implement the Recreation informed management zoning scheme for this region (**Map 4**)

### 6.3 *Land-Use*

In the past, Caye Caulker was developing on a small and local scale. This form of development was unlike that of San Pedro, where foreign investment is said to have resulted in the alienation of land and business interests. The village proper is almost totally locally owned and every effort should be made by current owners to maintain it as such. This difference is what distinguishes Caye Caulker from neighboring San Pedro, and makes it a unique destination. An area in private ownership, west of the village and north of the airstrip called Sunset Enterprises, is a mixed residential and commercial subdivision. The other main section is partially occupied by the Bahia Puesto del Sol, which is a mixed residential and commercial subdivision. South of the airstrip, which is presently mostly undeveloped and private, has been subdivided for residential and commercial development with some land proposed as an informal nature reserve/wildlife sanctuary. This portion of the island is owned by Eden Isles Inc.

The remaining majority of the land composition on the southern portion of the island is contained in the village core. The lands in the north and south west end of the island are not suitable for development. Yet, they have already been subdivided by the government for eventual distribution. The Caye Caulker Forest Reserve, located on the northern tip of the northern section of the island contains approximately 0.4 square kilometers. Approximately 0.2 square kilometers immediately south of the Forest Reserve is being proposed for subdivision into residential and commercial lots. The remaining property, for the most part, belongs to the Government of Belize. In addition, the GOB has subdivided a section of the northern portion of Caye Caulker for the provision of about 150 lots for local residents. A number of private properties also exist in this area.

An area of grave concern is the “Split”. Anecdotal information from residents suggests that this area is the upper part (roof) of an underwater cave. The level of development originally proposed for the village core portion of the “Split” suggests that the past developers are satisfied with the stability of the area and future proprietors may continue to invest in the area. Local residents, however, are concerned with this development due to the potential instability, mangrove clearance, erosion and subsequent widening of the “Split”. This concern is connected to the development of the north. Many residents and the Caye Caulker Village Council still question the means and methods of utility supply for those who live and may soon occupy the northern section of the island. Options suggested in the past for managing the “Split” have included the construction of a bridge, ferry, and the filling of the “Split”. Depending on which solution is chosen and realized, it is strongly recommended that an Environmental Impact Assessment be carried out, including a full Cost/Benefit Analysis to determine the feasibility and sustainability of such action since the “Split” is a very dynamic area.

A noticeable trend is that the density of units within individual lots is increasing. Many of the existing buildings are close to or on the lot boundary. The setbacks then are inadequate or non-existent in some cases. This condition reduces access, blocks ventilation, compromises privacy and is a recipe for disaster in the event of a fire. Regarding the latter, a fire station is

currently being constructed and equipment being received. However, the fire fighting capability on the island has never been seriously tested. Furthermore, as experienced in Belize City, when buildings are close to each other, mass destruction may occur even with professional fire fighting capabilities. In this regard, height is also of concern. The higher the building, the more difficult it is to reach the top.

Even though seawall and groyne construction is not a development trend today, it is important to note that, in the long run, this type of structure placed to protect the beach may result in accelerated beach loss as well as substantial financial losses. One of the most effective forms of protection is provided by natural vegetation such as mangroves. They protect beaches from wave action and should not be removed if the potential for erosion exists. In addition, shoreline protection techniques and structures stand a better chance of being successful and less detrimental to neighbors through continuous community projects versus private isolated ones. In any case, all applications for seawall construction and beach replenishment are required to be assessed by the Lands and Surveys Department.

The past proliferation of and continued demand for piers is also of concern. Poorly built and dilapidated piers pose a menace to coastal development during storms. Flying debris can damage buildings and threaten human life especially during storms. The building of palapas, dive shops, and sheds on piers compounds the problem with piers. Dive shops, in particular pose the problem of solid and liquid waste which may end up in the marine environment if improperly constructed and managed. Also, improperly designed or an excessive number of piers can disrupt the natural flow of water and sediment leading to stagnation or erosion. This type of development should be subject to close scrutiny on both the windward and leeward sides of the island, particularly in the village core. Furthermore, because piers are built on National Land (the sea floor), the law allows for the reasonable use by the public except where an exclusive use permit has been granted and, therefore, should not be gated and locked. All pier activities require permission from the Physical Planning Section of the Lands & Surveys Department.

In the case of privately held undeveloped lands, the development standards presented within these guidelines presents the most sustainable and appropriate future land use. Although the CZMAI recognizes the right of the landowner to develop their land in any matter they see fit there must be measures in place to steer future development in order to ensure sustained ecosystem services. Therefore, in the case of these lands, if there is no development activity within the first five (5) years of the passage of this planning document then all future development activities, after the time period, **MUST** follow development standards as outlined within this coastal development guideline.

### **6.3.1 Cayes Development Standards**

The existing standards for subdivision of land (Land Utilization Act, Chapter 188 of the Substantive Laws of Belize, Revised Edition 2000) did not anticipate the magnitude of urban **Caye Caulker Coastal Zone Management Guidelines**  
Belize Integrated Coastal Zone Management Plan  
Coastal Zone Management Authority & Institute 2016

expansion, tourism and other development that Belize has experienced over the past decade. In 2010, the National Guidelines for Subdivision and Consolidation of Land in Belize was revised to address such issues and provide transparency and equitability to the process of subdividing and developing land. Although revised, the amendments made were general in scope and lacked the specificity needed for sensitive areas such as the cayes and atolls.

Development on cayes and atolls require specific building standards since these areas are closer in proximity to important sensitive habitats such as sea grass beds, mangroves and coral reefs. Ad hoc or uncontrolled development in these areas can have severe negative effects on surrounding ecosystems. In 2004, CZMAI produced a set of development guidelines for the cayes within each planning region. These development guidelines were produced in consultation with stakeholders from each planning region along with technical input from government relevant agencies. Within the document land use classes were developed along with accompanying standards for the varying degrees of development that can occur on a caye. Use classes were also assigned to each caye according to suitability. The use class categories developed include residential, commercial and conservation, representing the various degrees of development intensities allows on cayes. Therefore CZMAI recommends the development standards in **Table 3** for developing the Caye Caulker Region.

The National Sustainable Tourism Master Plan for Belize 2030 recognizes the importance of maintaining the natural low-key allure of Caye Caulker Village. Therefore, it recommends infill and completion of existing village with **low impact/low-medium density scale** developments. Caye Caulker has among the highest lots per acre which has implications for privacy and safety. The master plan did not specifically state the number of hotel rooms to be constructed within Caye Caulker to 2025. Also, no mention was made about the development of Caye Chapel. However, as the majority of Caye Chapel is privately owned and mostly developed, no new major developments are anticipated or recommended for this caye. Thus development standards are maintain character with Resort/Hotel with **low to medium density**. These standards correspond to the recommended Informed Management Zoning Scheme for low-density, low-impact completion and infilling of the existing village (**Map 5**). The framework for implementing the zoning scheme for the development of coastal lands is found in **Table 4**.

**Residential Development:** Recommended for General residential purposes – permanent residence, vacation home, time share, fisherman camps and other home industries:

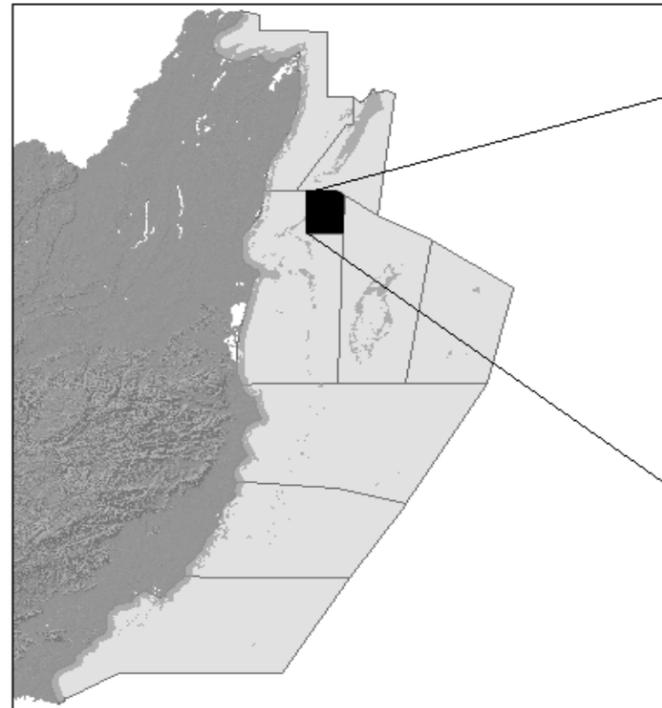
**Table 3: Development Standards for Completion of Existing Urban Areas at Caye Caulker**

<b>Subdivision Criteria</b>	<b>Residential Development Standard</b>
<b>Primary Permitted Use</b>	Single and Multi-Family Residential
<b>Secondary Use</b>	Commercial Low Density (convenience stores, small service shops, guest houses); Conservation, Parks/Playgrounds, Community Facilities
<b>Minimum Lot Size</b>	17000 sq. ft.
<b>Width/Length Ratio</b>	1:3
<b>Net Density (dwelling units per acre)</b>	2 du/acre
<b>Maximum Site Coverage</b>	25%
<b>Minimum Frontage</b>	65 feet
<b>Minimum Setbacks:</b>	
<b>Front</b>	30 feet
<b>Side</b>	25 feet
<b>Back</b>	50 feet
<b>Site Density (habitable rooms/acre)</b>	20
<b>Maximum Building Height</b>	34 ft.
<b>Maximum # of floors per building</b>	2
<b>Services</b>	Water, Electricity, Telecommunications, Sewerage Treatment, Waste Disposal

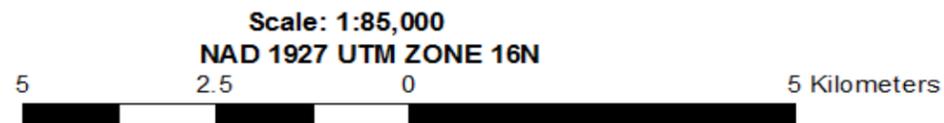
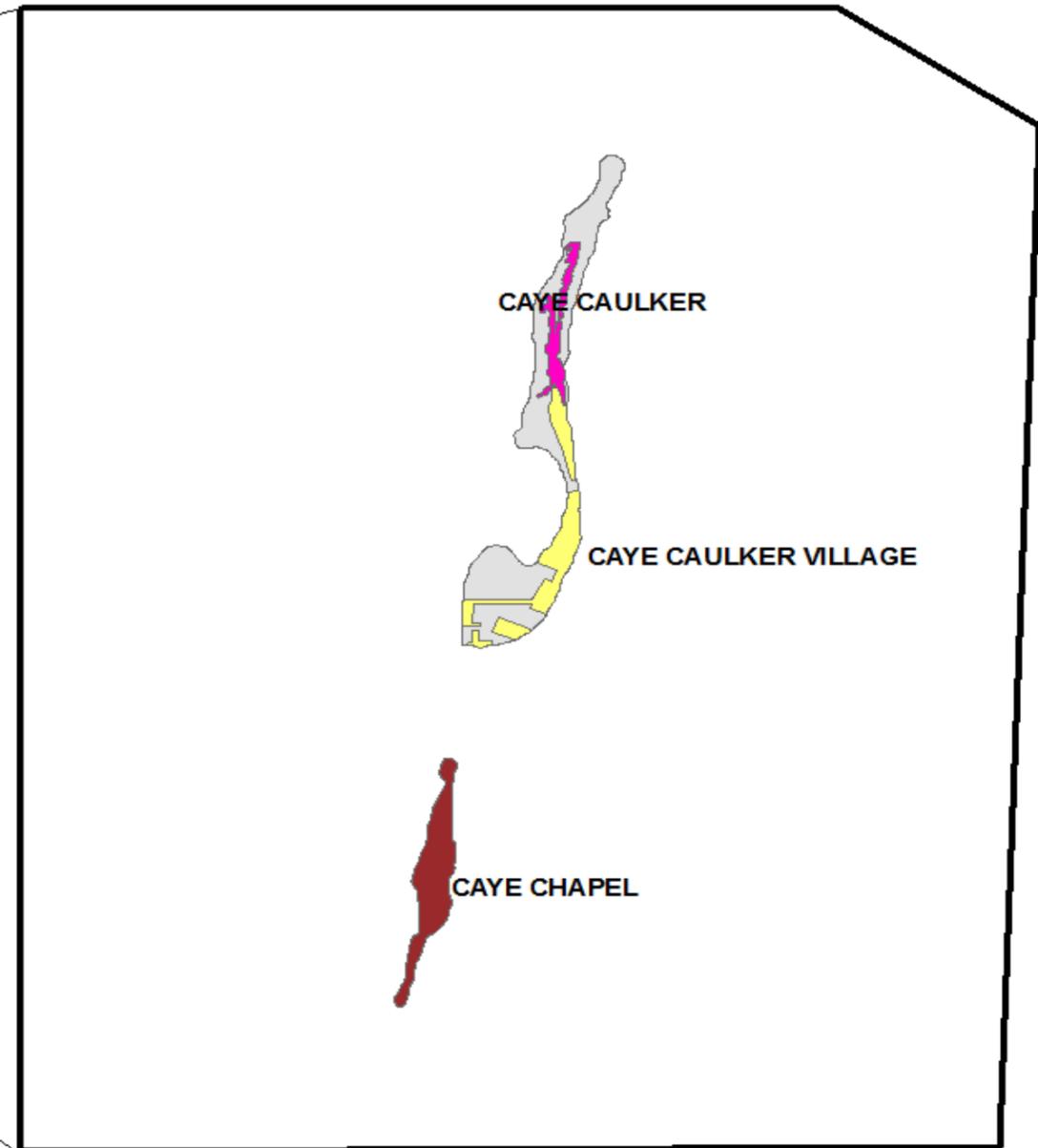
**Table 4: Table: Framework for Implementing Informed Coastal Development at Caye Caulker**

ZONE	CHARACTERISTICS OF ZONE	SCHEDULE OF PERMITTED USES			SCHEDULE OF RESTRICTED USES	SUPPORTING NATIONAL POLICIES	IMPLEMENTING AGENCY
		Dominant	Compatible	Regulated			
<b>Coastal Development</b>	Residential settlements, infrastructure, commercial/economic activities on land above water within 3km buffer of the coastline and offshore cayes	1. Expansion of existing communities 2. Small-medium scale residential development 3. Small-medium scale commercial development 4. Community facilities 5. Supporting infrastructure	Small-scale, light industry Tourism facilities, such as small guest houses Subsistence agriculture production, and landscaping with decorative, native, non-invasive crops	Subdivision of land Establishment of small and medium-scale commercial and light-industrial development Establishment of residential expansion Solid and liquid waste management	1. Large-scale coastal agriculture production 2. Coastal aquaculture 3. Dumping of solid, toxic, hazardous waste and untreated liquid wastes, including grey water and sewage 4. Commercial or light-industrial development within residential zone 5. Residential development within commercial or light industrial development zone 6. Squatting/informal settling 7. Unregulated clearing of mangrove forest, including the conversion of mangrove areas into other uses 8. Oil exploration, extraction and establishment of oil refinery 9. Dredging and Mining	Belize Building Act Cayes Development Policy Coastal Zone Management Act Environmental Protection Act Forest Act Hotels and Tourist Accommodation Act Housing and Town Planning Act Land Utilization Act Mines and Minerals Act Solid Waste Management Authority Act Water and Sewerage Act	Central Building Authority Coastal Zone Management Authority Coastal Zone Management Authority Department of the Environment Forest Department Belize Tourism Board Ministry of Housing Land Utilization Authority Mining Unit, Ministry of Natural Resources Solid Waste Management Authority Belize Water Services Limited

# INFORMED MANAGEMENT FOR COASTAL DEVELOPMENT: CAYE CAULKER



- Cayes
- Existing Conservation II
- Future Low Density Residential
- Existing Low Density Residential



Map 5: Informed Management Zoning Scheme for Coastal Development in the Caye Caulker Region

## **Recommended Actions:**

1. Implement setbacks and other related land development standards (e.g., lot size, site density, habitable room density, and building height) prescribed in the Land Utilization Authority's subdivision guidelines to ensure that the carrying capacity of the land is not exceeded. Stakeholders recommend that minimum setback distance of 4 feet for high density residential development be revisited and increased for the context of Caye Caulker
2. Environmental Impact Assessments, as well as full cost-benefit Analyses must be conducted to determine the feasibility and sustainability of any proposed management measures for the "Split" before implementation
3. All applications for seawall construction and beach replenishment are required to be assessed by the Lands and Surveys Department
4. Restrict new buildings to two stories or a maximum of twenty-eight feet
5. Develop and implement a policy on pier construction. All pier activities must continue to require permission from the Physical Planning Section of the Lands & Surveys Department
6. National lands that have not been subdivided as yet for future expansion of the village should be the focus of zoning and planning efforts to ensure that
7. Maintain the 66 feet reserve, and ensure that minimum setbacks from property lines and beaches, and minimum distances between buildings are enforced
8. Encourage "soft" and permeable coastal defense structures such as the planting of mangrove to avoid related erosion, the acceleration of off-shore currents, and impediments to wildlife. Should "hard" coastal defense structures become necessary, the construction of such structures will follow due process by the relevant permitting agency
9. Discourage heavy and unregulated use of herbicides, pesticides and fertilizers
10. Implement landscape design awareness that would facilitate the preservation of mangroves for shoreline protection
11. Support the institution of a system of restrictive code of covenants between land owners and developers that favor integrated development planning

12. Educate developers, contractors and real estate agents on the existence of all applicable legislation, processes and procedures pertaining to land development
13. Ensure the standards and engineering approval process established by the Central Building Authority for building construction are adhered to
14. Provide for low-density development with the least possible site clearance to maintain the characteristics of the natural environment as much as possible
15. Preserve remaining crown or government-owned lands in the region
16. Require that developers who remove habitats must finance their restoration

## **6.4 Marine Dredging & Mineral Extraction**

Large parcels have been subdivided and developed for residential purposes. This inevitably led to increased clearance of mangroves and littoral forest. The latter is expected to be affected more due to the potential for development of higher and drier ground compared with mangrove swamps. In the past, huge portions of mangrove areas have been cleared and developed without permission from the Forest Department. Many parcels issued are located in mangroves, and substantial filling may be required in the future. It is recommended that the fill should not come from between the Barrier Reef and the eastern coast of Caye Caulker. Removal of seagrass beds promotes increased erosion and decreases habitat for marine organisms. Additionally, the reef may be directly affected by the accumulation of sediments mobilized by inappropriate dredging activities.

In the wake of Hurricanes Mitch (1998), and Keith (2000) and subsequent storms, the Caye Caulker Village Council and local residents had supported the re-nourishment of the beach on the windward and leeward portions of the island. The previous trend of seawall construction, which was originally thought to be the best means of protecting property, has instead accelerated the erosion process. As a consequence, the new trend is now to dredge and fill. This phenomenon was highlighted in the community's beach replenishment programme of 2000. This method may aid temporarily in the protection of property but may also require continued replenishment. However, this will only become clearer over time with a sound monitoring programme. The supply for the replenishment project was made available by dredging from both sides of the island. The project is continuing today and will continue to just north of the airstrip. Dredging and filling is not the sole domain of beach projects. In fact, several subdivisions, due to their location in mangroves, which are generally poorly suitable for development, have and are being filled to ensure livability by residents. This huge demand will certainly place an additional stress on the available sediment supply that exists in the region. This demand for extract for both the project and filling subdivisions will certainly put a stress on the existing supply.

It must be noted that there are instances where dredging activities will be necessary for proper functioning of day to day activities. These instances include the maintenance of port of entry and navigational lanes. In these instances procurement of relevant approval and permits is necessary before undergoing such activity.

### **Recommended Actions:**

1. Dredging conflicts with the all of the management objectives for the Caye Caulker coastal planning region. Therefore, no dredging, sand mining, or land filling should be allowed at Caye Caulker or Caye Chapel without 1) a comprehensive Environmental Impact Assessment to include a vetting process involving relevant stakeholders and 2) compliance with these Guidelines.

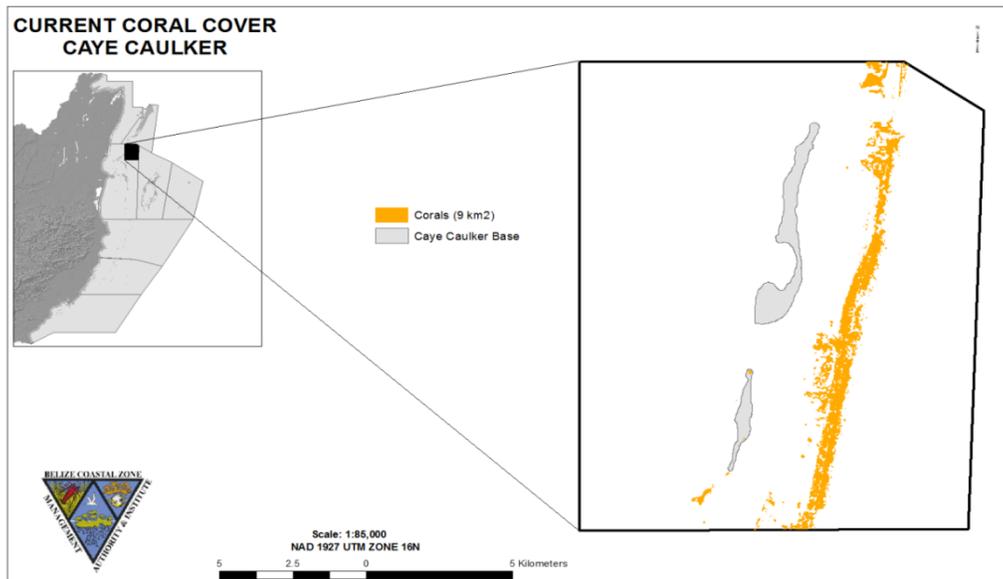
2. Future fill for lots in this region should not come from between the Barrier Reef and the eastern coast of the island
3. The Caye Caulker Village Council should address beach management, including but not limited to beach nourishment in consultation with the Lands & Surveys Department, Department of the Environment and the Coastal Zone Management Authority and Institute
4. Any reclamation of lost property, (after hurricanes) should only be done in consultation with the relevant authorities. Dredging for this purpose should be kept to a minimum while guaranteeing that native habitats are not damaged

## 6.5 Sensitive Habitats

Monitoring of the health of the terrestrial and aquatic environment is fundamental for maintaining biodiversity and ascertaining the development capability of the region. If there are mechanisms in place to make a determination of the impacts of human and other activity on the environment, mitigative measures can be introduced to reduce or prevent environmental degradation. Current arrangements between the Fisheries Department and other governmental and non-governmental organizations, such as FAMRACC for monitoring of the health of habitat and ecosystem within the region should continue and be strengthened, where necessary.

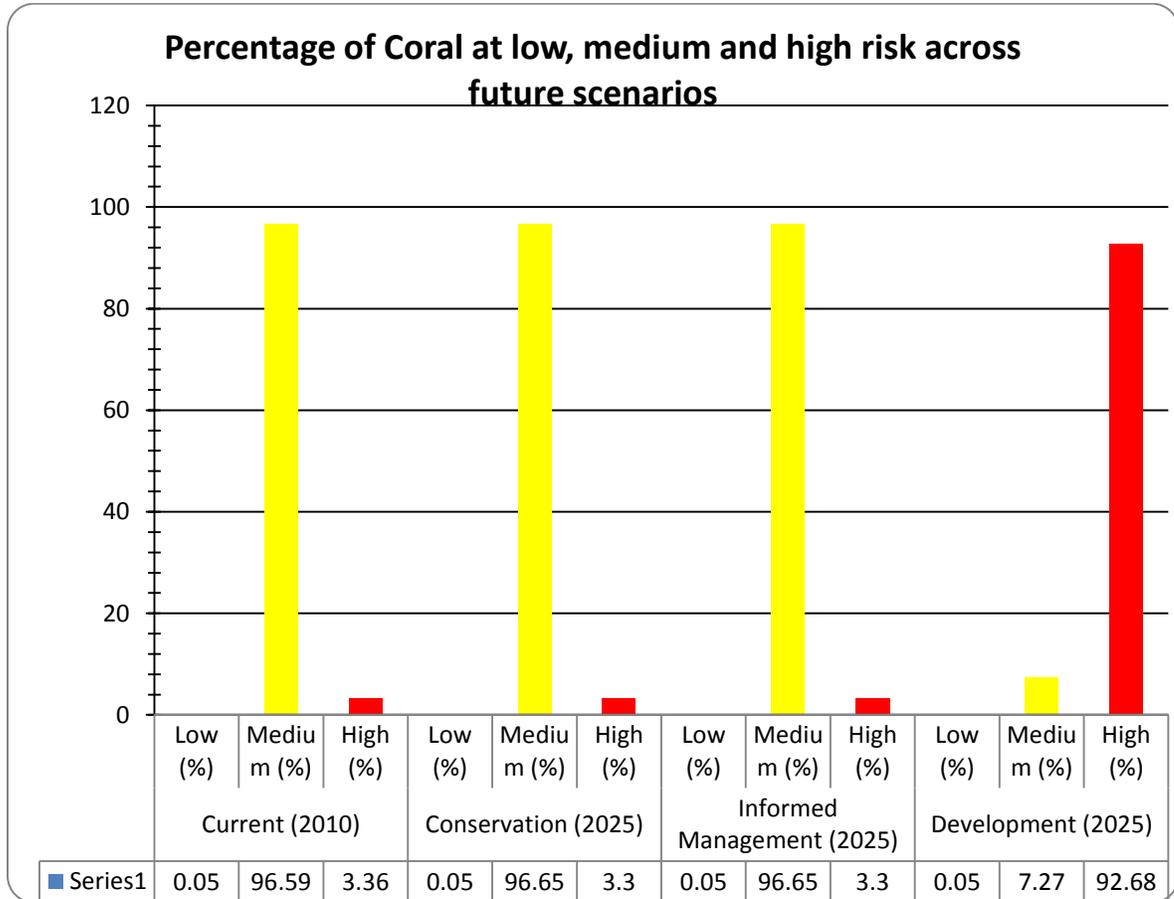
### 6.5.1 Corals

There are two principal types of reef systems in the waters of the region. These include a barrier reef system, popularly known as the Belize Barrier Reef Reserve System, and is characterized by a prominent reef crest. The second type of reef system is referred to as a patch reef system. The patch reefs are generally found on gently raised sub-tidal promontories in the immediate area of the back-reef, as well as the shallower areas of the barrier lagoon, including the nearshore areas surrounding various cayes. The reef crest is characterized by semi-emergent coral forms. The deeper fore reef areas are dominated by branching, bolder-type and plate-like corals. The reef crest and back-reef areas are characterized by palmate and bolder-type coral forms. The total coral cover in this region is approximately 9 km<sup>2</sup> (**Map 6**).



**Map 6: Coral Cover in the Caye Caulker Region**

Due to current pressures on corals, InVEST Habitat Risk Assessment (HRA) model results suggest that currently less than 1% of the region’s corals are at low risk, 96.6% at medium risk and 3.4% at high risk (**Fig 1**).



**Figure 1: Risks to Corals in the Caye Caulker Region by Scenario**

The results also suggest that there is no change in the proportion of corals at low, medium and high risk for both the Conservation and Informed Management Zoning Schemes (**Fig 1**). In a Development Zoning Scheme, however, HRA model results suggest that the threat to corals would become increasingly higher. Only 0.05% of corals would be at low risk whereas 7% and 93% of present corals would be at medium and high risk, respectively (**Fig. 1**).

## 6.5.2 Mangroves

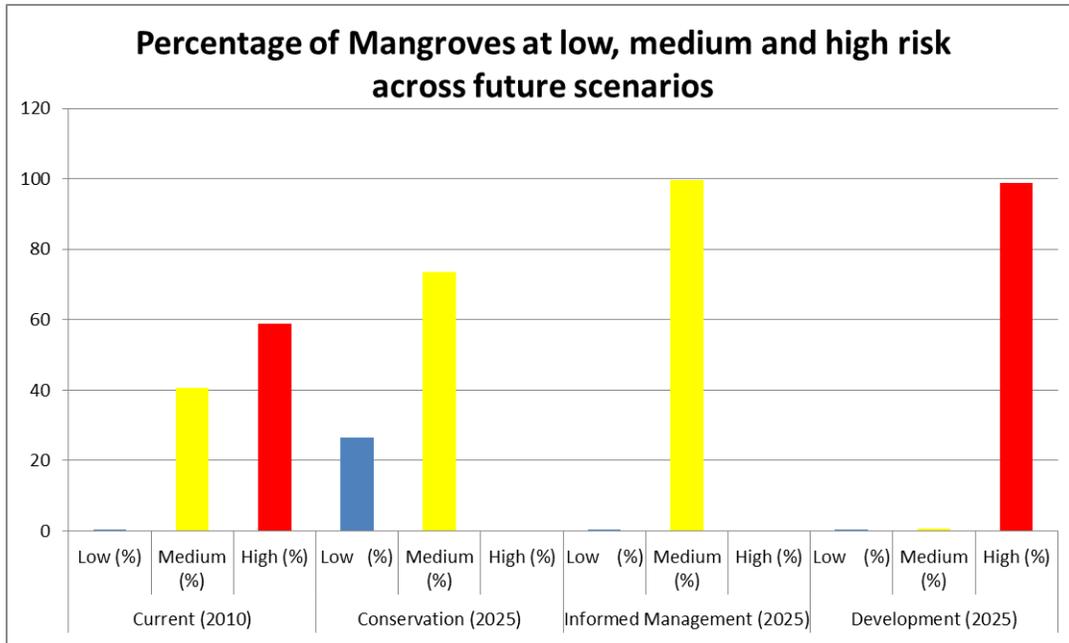
Mangroves are important in this region as they support a diverse range of coastal birds, mammals, fish and crustaceans. Their role is multi-functional in maintaining the integrity of coastal and marine ecosystems; they form the basis of a complex marine food web, create breeding habitat, stabilize bottom sediments and protect the shoreline from erosion. However, with the high market value of waterfront properties, mangroves are being cleared at a rapid rate, despite a moratorium on mangrove clearance. The total mangrove cover in this region was determined to be approximately 2 km<sup>2</sup> (**Map 7**).

**Map 7:**  
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the InVEST Habitat Risk Assessment model, and as a consequence of current pressures on mangroves, approximately 0.4% of the region's mangroves are at low risk, 40.7% at medium risk and 58.9% at high risk (**Fig. 2**). The results also suggest that in a Conservation Zoning Scheme, there no mangroves at high risk. Instead, 26% of current mangroves would be at low risk, and 74% at medium risk (**Fig. 2**). In a Development Zoning Scheme, HRA model results suggest that the threat to mangroves would become increasingly higher. Only 0.4% of mangroves would be at low risk, 0.8% at medium risk, whereas 98.8% of present mangrove would be at high risk (**Fig. 2**). In the proposed Informed Management Zoning Scheme, HRA results are indicating that no mangroves would be at high risk, 0.4% of present mangroves would be at low risk, and 99.6% of medium risk (**Fig.2**).

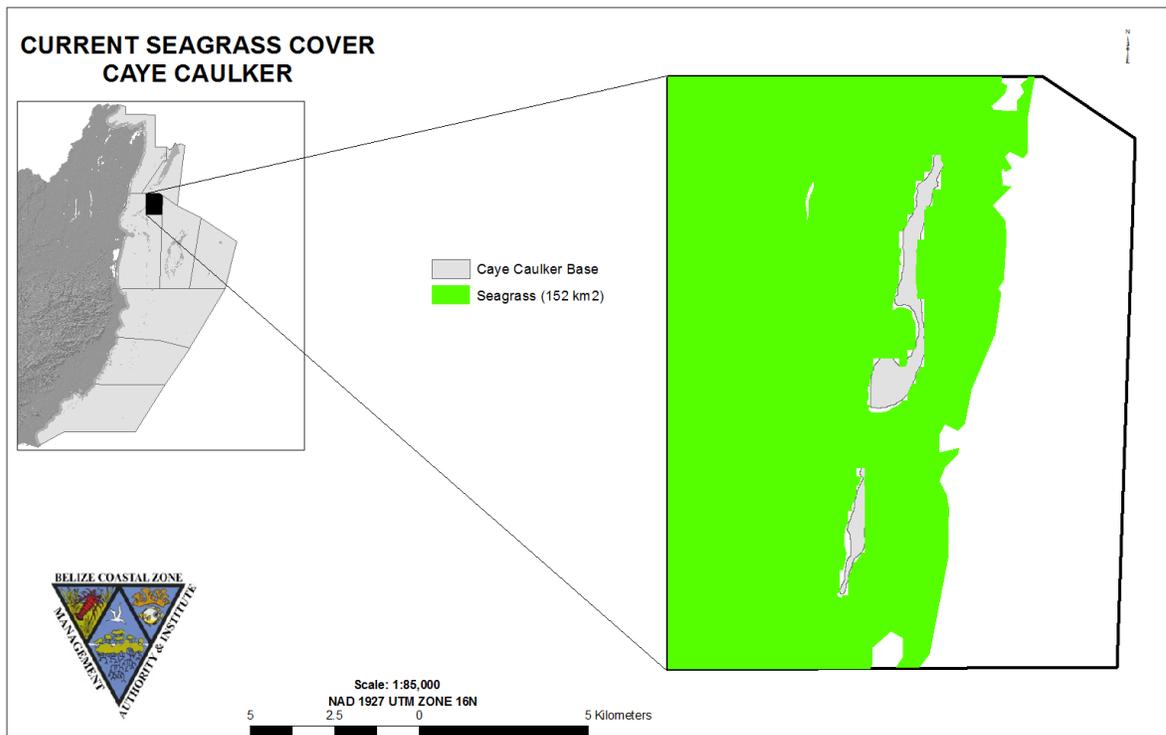


**Figure 2: Risks to Mangroves in the Caye Caulker Region by Scenario**

### 6.5.3 Seagrass

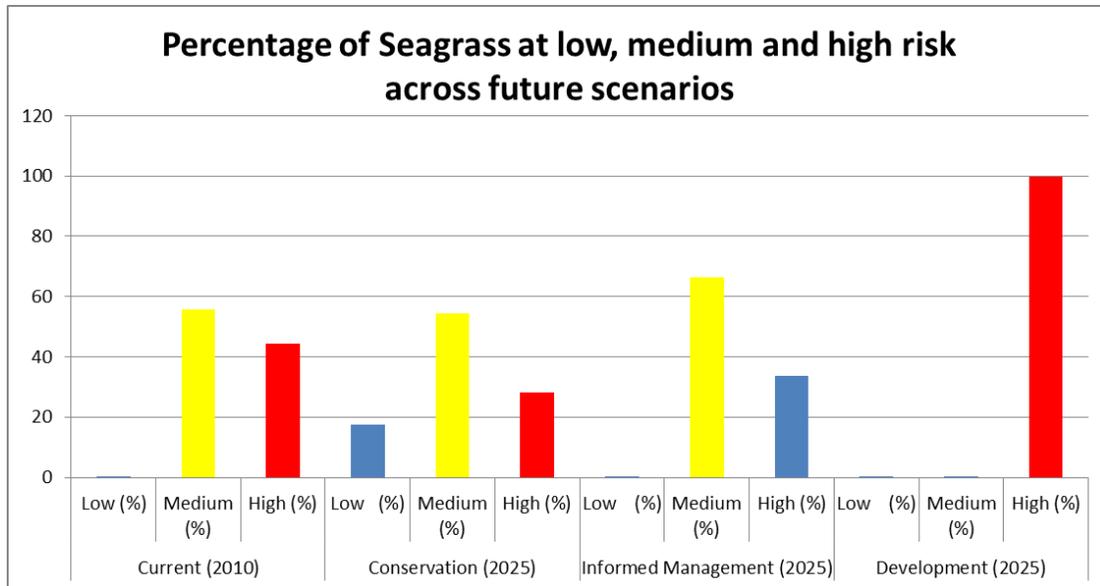
Seagrass is also an important component of marine flora within this region. Seagrass meadows are essential for the maintenance of ecosystem health through nutrient cycling and sediment stabilization. They also form a critical ecosystem for many fish and marine invertebrate species, and the endangered West Indian manatee population. Unfortunately, extensive information on seagrass beds in the region does not exist. Current efforts include efforts are being made by SeagrassNet and Wildtracks to collect baseline data.

The total seagrass cover for the Caye Caulker region is approximately 152 km<sup>2</sup> (**Map 8**).



**Map 8: Seagrass Cover in the Caye Caulker Region**

Results of the InVEST Habitat Risk Assessment (HRA) model suggests that currently 0.02% of the region’s seagrass are at low risk, 55.56% at medium risk, and 44.42% at high risk (**Fig. 3**). In a Conservation Zoning Scheme, HRA model results suggest that 28% of seagrass would be at high risk, 17% of seagrass would be at low risk and 55% at medium risk in 2025 (**Fig. 3**). In a Development Zoning Scheme, model results suggest that 99.73% of present seagrass would be at high risk. The results also suggest that in the Development Zoning Scheme, 0.25% of seagrass would be at medium risk and 0.02% at low risk in 2025 (**Fig. 3**). In the proposed Informed Management Zoning Scheme, the HRA model results suggest an improvement in the amount of seagrass that are currently at risk. Under this zoning scheme, 66.42% of present seagrass would be at medium risk. Additionally, the model results reveal that under this zoning scheme, 0.02% of present seagrass would be at low risk and 33.56% at high risk in 2025 (**Fig. 3**).



**Figure 3: Risks to Seagrass in the Caye Caulker Region by Scenario**

In discussing the results of the InVEST ecosystem models, and in particular the habitat risk assessment model, there is the need to consider limitations of the model, which are highlighted below:

- Results should be interpreted on a relative scale within a study region and across habitats and stressors, but not to results from separate analyses.
- Results do not reflect the effects of past human activities.
- Results are based on equal weighting of criteria unless the user weights the criteria by importance or data quality.
- Cumulative risk is additive (rather than synergistic or antagonistic)
- Climate change impacts are not directly accounted for in model

Additional information on how this model works can be found in **Appendix B.1** of the Belize Integrated Coastal Zone Management Plan.

**Recommended Actions:**

1. Analyze current human impacts on habitats in this region in order to prioritize areas requiring immediate management intervention
2. Enhance collaboration among management and permitting agencies to ensure impacts to critical habitats are reduced and controlled
3. Raise awareness and outreach in community stakeholders about the importance of reducing impacts to habitats
4. Implement the Informed Management Zoning Scheme that will support multiple human activities in the region while limiting activities in specific areas in order to reduce impacts to critical and sensitive habitats and to maintaining their integrity

## **6.6 Utilities**

### **6.6.1 Energy**

These guidelines address the issue of the supply of electricity and potable water in a residential/commercial setting, in addition to the disposal of sewage, solid and domestic liquid wastes. A reliable supply of electricity is absolutely necessary particularly to support the booming tourism industry. Electricity is currently supplied by Belize Electricity Limited's (BEL) generators on the caye. There is an extensive grid system supplying the village proper and south of the airstrip with electricity. However, a number of distribution problems exist in terms of the coast and inaccessibility (northern Caye Caulker) but these could be addressed with community cooperation. Conflicts have arisen in regard to proximity of buildings to power lines and the lack of easements for routing of these power lines.

In the case of northern Caye Caulker, the current level of development does not make electrical supply by BEL solely feasible. It has become evident that roads will need to be developed before electrical lines are placed on the north. In addition, due to the small demand, the cost of running lines to lots on the north side is more than most can afford. In the meantime, small generators may be the practical alternative.

Due to its smaller size and proximity to sensitive habitat and high vulnerability to the effects of climate change, Caye Caulker shows great potential to become a site for Low Carbon Development. By replacing/adding energy from renewable sources, Caye Caulker can be a model for low emission/energy efficient development. As a result, it can be marketed as a Low Carbon Development Tourism Destination.

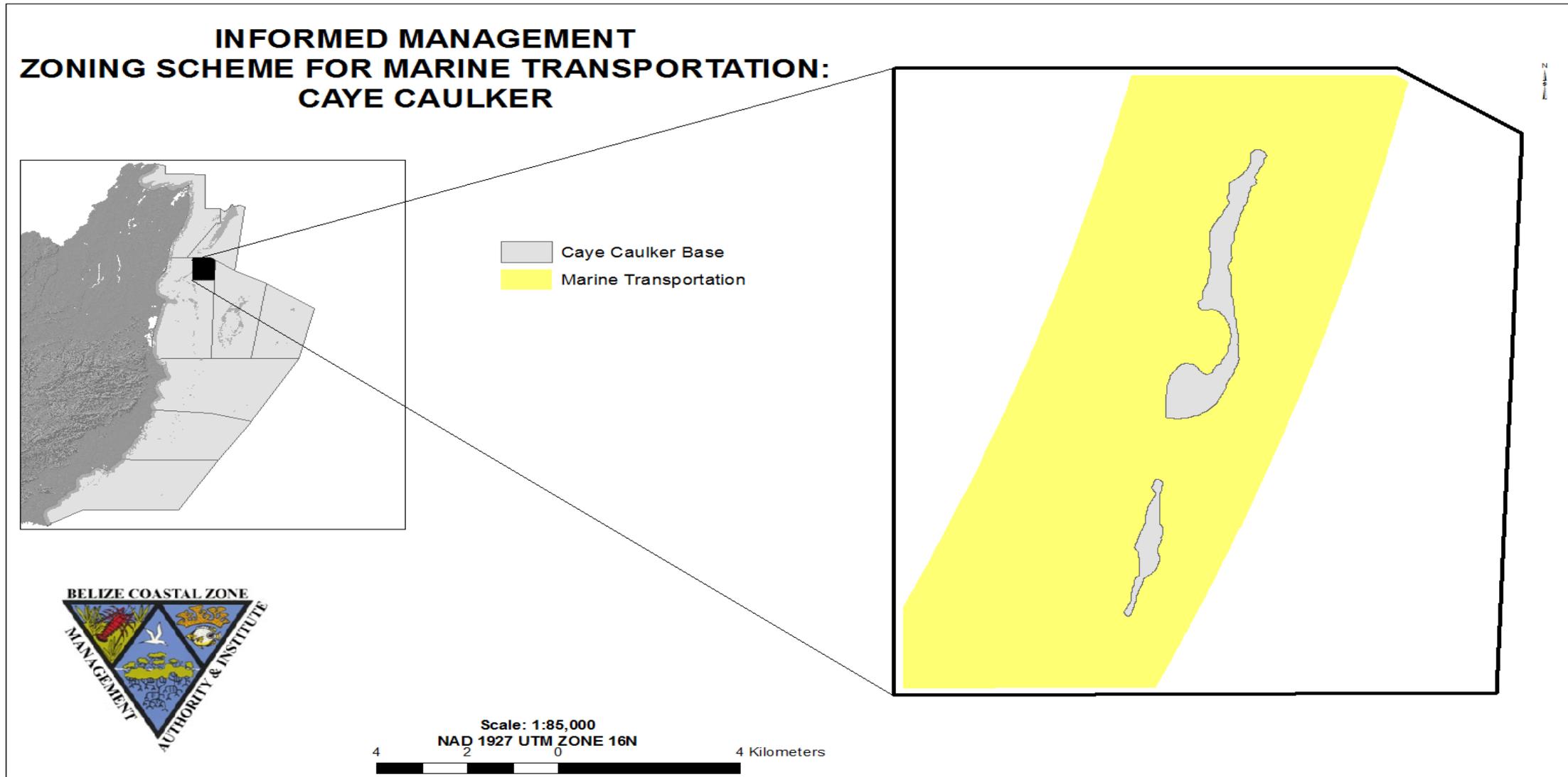
### **6.6.2 Water**

The problems of saltwater intrusion and possible contamination may arise if wells are placed too close to the sea or septic tanks. Some people have begun using bottled water for drinking and some cooking. A few hotels have small reverse osmosis (RO) plants, which supply them with potable water. In 2000, a feasibility study was conducted on the island to determine the options for potable water supply and wastewater treatment. This was done due to the realization of the importance of potable water to the community's health and tourism sustainability and surrounding marine environment. The study revealed that for potable water, the implementation of a community reverse osmosis generation and distribution system should be developed and utilized primarily during the dry season.

### **6.6.3 Marine Transportation**

Caye Caulker is easily accessible by sea through the services of several water taxi associations. By boat, it is a fairly short and very scenic forty five (45) minute ride. The entire

perimeter of the island is accessible by boat. The northern portion is relatively undeveloped and only accessible by boat. The eastern side of the island is used primarily for water taxis, snorkeling/diving boats, leisure vessels and other small fishing vessels. The western side of the island houses the Bowen and Bowen factory, gas depot and electricity station. It is more often used as a small port. Major conflicts arise due to the many activities within the areas such as leisure swimming and kayaking. Therefore regulation of boating activities is important for the stakeholders of Caye Caulker, and the Informed Management Zoning Scheme for Marine Transportation (**Map 9**), and Framework for Implementation of the zone (**Table 5**) in these guidelines are recommended.



**Map 9: Informed Management Zoning Scheme for Marine Transportation at Caye Caulker**

Table 5: Framework for Implementing Informed Marine Transportation in the Caye Caulker Region

ZONE	CHARACTERISTICS OF ZONE	SCHEDULE OF PERMITTED USES			SCHEDULE OF RESTRICTED USES	SUPPORTING NATIONAL	IMPLEMENTING AGENCY
		Dominant	Compatible	Regulated			
<b>Marine Transportation</b>	Marine area delineated for the use of watercraft, such as water taxis, cruise ships, etc, to transport people, goods and cargo between multiple destinations	1. Shipping operation activities 2. Port development and operation 3. Vessel traffic use	Dredging for the maintenance of navigational lanes and ports of entry	Passage/entry of vessels Operation and construction of ports	1. Fishing 2. Marine recreational activities 3. Anchoring that leads to disturbance and destruction marine habitats, including but not limited to, coral reef system, seagrass beds, etc 4. Exploration and extraction of petroleum 5. Construction of any illegal structure that would obstruct shipping and navigation 6. Disposal of solid and liquid wastes from boats and ships 7. Transportation of illegal goods, such as drugs and weapons, and human trafficking	Belize Port Authority Act Belize National Coast Guard Service Act Customs Regulation Act Defence Act Environmental Protection Act Harbours and Merchant Shipping Act Immigration Act Maritime Areas Act Marine Dredging Policy (Draft) Mines and Minerals Act	Belize Port Authority Belize National Coast Guard Customs Department Belize Defence Force Department of the Environment Belize Port Authority Immigration Department Ministry of Foreign Affairs Mining Unit, Ministry of Natural Resources Geology and Petroleum Department

## **Recommended Actions:**

1. The placement and height of buildings adjacent to power lines must be controlled so that a safety zone remains. BEL utilizes the National Electrical Code of North America, which specifies a vertical clearance of 10.5 feet and 12.5 feet and a horizontal clearance of 5.5 feet and 7.5 feet for low voltage and high voltage lines respectively
2. Also, in some areas, the lack of roads has resulted in the placement of poles and lines through lots. Easements must be regularized if roads are not possible
3. Generating systems in Northern Caye Caulker may be shared to ensure the avoidance (or at least to minimize) of pollution and noise. However, solar energy, if affordable, should also be a priority as it is clean and efficient and cheaper in the long run
4. The recommendations of the study of 2000 regarding a potable water system should be pursued. This could be complemented with the expansion of water catchment facilities. Well-water may still be used for current usage, however, it is recommended that wells are chlorinated and aerated on a regular basis
5. With regard to the airstrip, it is recommended that the safety buffer zone be maintained in the interest of travelers and residents alike.
6. Ensure that social amenities are provided for the island community for any for future development, which must include but not be limited to schools, health care facilities, access roads with proper drainage
7. Develop and implement a management plan for the disposal of treated brine produced from any water desalination process using reverse osmosis.
8. Close collaboration with relevant agencies to ensure that water and energy supply, and sewage and solid waste management in the region are provided through environmentally friendly and cost effective means
9. Formalize and implement the Belize Pier and Construction Management Program
10. Close collaboration with relevant agencies in the placement and maintenance of buoys, lighthouses and protected area boundary markers in the sea
11. Upgrade existing power network to accommodate certain increased energy needs as the area develops and expands

12. Extend and upgrade existing water supplies in order to meet future demand
13. Encourage the use of solar and wind power in the case of resorts and any residential development, as they are unlikely to cause the environmental problems (spillage, fumes, noise) associated with diesel generators
14. Take all precautions to avoidance of pollution and noise generation in accordance with the Pollution Regulations, 1996 of the Department of the Environment
15. Centralize maritime activities under the Port of Belize to maintain lanes specific for boating activities as well as clearly identified swimming and leisure areas.

## **6.7 Pollution Control**

The improper disposal of garbage at Caye Caulker is a major concern for the residents and the village council. This concern has been expressed multiple times at community meetings. The main problem is the garbage site. All solid waste is disposed of in a man-made lagoon. The main concerns include the pollution of surface and ground water, odor, breeding flies and mosquitoes, unsightly accumulation of rubbish and the attraction and proliferation of crocodiles next to the airstrip. In 2001, the Caye Caulker Village Council (CCVC) revealed a plan to beautify the site through an Inter-American Development Bank beautification project. In addition, under the National Solid Waste Management Project, non-biodegradable garbage would be shipped to mainland Belize City. In order to fulfill this opportunity, a management system will have to be developed to ensure that garbage is separated, stored and disposed of adequately. This system should also cater for garbage produced in the northern portion of the island. Also of concern is the lack of a garbage separation system where biodegradable, hazardous materials and non-hazardous, non-biodegradables are stored separately and disposed of by different methods.

The disposal of sewage is also of serious concern. The local population and the number of tourists have increased to a point where bottomless septic tanks and open pits are no longer acceptable. The volume of waste requires increased retention time for acceptable breakdown of sewage. The feasibility study conducted in 2000 by the Belize Water Services Limited (BWS) recommended that a community sewer-bore be developed. This should be a requirement for existing and new developments. Larger developments should consult with the Department of the Environment (DOE) to address waste disposal. Because the use of sealed aboveground septic tanks with soakaways is only the interim measure, it is recommended that the tourism industry, CCVC and the residents should continuously lobby for the sewer-bore system with the relevant government agencies (Public Health Bureau, DOE, BWS) and their area representative as the future of the island's economy and sustainability relies highly on safe wastewater disposal. Public health, waste disposal, and environmental concerns should be referred to the appropriate agencies. Meaningful and enforced buffer zone activities, for example, controlled proximity of development, presence of cats and other pets, and pesticide use are recommended to be addressed by the management authority of the reserves.

## Liquid Waste Management

The Central Building Authority (CBA) is the agency mandated by the Belize Building Act 2003 to control building operations in the interest of public safety and health. In 2010, CBA produced detailed specifications for the construction of soak-aways and septic tanks for residential and other low impact buildings. Detailed diagrams found in **Figure 10** of the Appendix of this document. A summary of required specifications for septic tanks servicing residential and other low impact buildings can be seen in **Table 6**. The CZMAI recommends that these standards be used for construction of septic tanks and soak-aways.

**Table 6: Specifications for Residential and Low Impact Septic Tanks and Soakaways**

MAX # OF PERSONS SERVED	LIQUID CAPACITY OF TANK		INTERNAL DIMENSIONS							
	GALLONS (Approx.)	CUBIC FT.	LENGTH (L)		WIDTH (W)		LIQUID DEPTH (LD)		TOTAL DEPTH (H)	
			FT.	IN.	FT.	IN.	FT.	IN.	FT.	IN.
<b>4</b>	500	67	6	0	3	0	4	0	5	2
<b>6</b>	600	81	7	0	3	0	4	0	5	2
<b>8</b>	750	101	7	0	3	6	4	0	5	2
<b>10</b>	900	121	7	6	3	6	4	6	5	8
<b>12</b>	1100	148	8	6	4	0	4	6	5	8
<b>14</b>	1300	174	10	0	4	0	4	6	5	8
<b>16</b>	1500	201	10	0	4	6	4	6	5	8

## **Recommended Actions:**

### **Sewage Waste**

1. Pending the realization of the community sewer-bore recommended by the 2000 feasibility study, residential areas on high land (land not waterlogged or subject to flooding) should utilize sealed aboveground septic tanks with soakaways. The Public Health Bureau (PHB) has specifications for the sizes of these facilities based on expected usage. Given the proximity of lots to the sea, particularly of beachfront lots, the furthest possible distance from the sea and well is recommended where feasible.
2. Sewage should be diverted to a constructed mangrove wetland to facilitate secondary treatment.
3. Compost toilets are encouraged in lowland areas.
4. In developments such as resorts, which are likely to produce high volumes of waste, the PHB and DOE should be consulted before the installation of any system. A written record of this consultation and recommendations should be kept by the developer.

### **Grey Water**

1. Grey water (dish washing, laundry, shower, etc.) should not be discharged directly into the sea or lagoons. It is recommended that digestion chambers (septic tanks) along with leach fields be used for addressing all grey water where possible.
2. Light industries (e.g. laundromats) discharging large volumes of grey water should divert the outfall for their liquid wastes to a constructed wetland. However, laundromat establishments are required to consult with the PHB and DOE regarding the treatment of grey water prior to the installation of any treatment system.
3. The use of phosphate-free detergents is encouraged because their use reduces the nutrient load reaching the marine environment.

## **Solid Waste Management**

1. The National Solid Waste Management Plan should be realized as soon as possible by the Government of Belize, and should also cater for garbage generated in the north of the island
2. In the interim that the National Solid Waste Management Plan is not realized, then the island authorities, in consultation with the Ministry of Sustainable Development and the people of Caye Caulker, should seek to acquire a more suitable site for the storage and disposal of garbage on the island. This site should not allow direct connection with the island's water table and marine waters
3. Households should be encouraged to maintain a compost heap for the decomposition of vegetable and other biodegradable waste matter. An educational programme from experienced composters should be encouraged for Caye Caulker. The disposal of hazardous materials (e.g., batteries, spent oil, thinner, paint and oil containers) should be coordinated with the DOE. A system of collection of these wastes has been developed, and may already be tested in Ambergris Caye
4. Compaction of non-combustible waste is recommended
5. In the future, removal of both hazardous and non-hazardous wastes to Belize City may be the only acceptable alternative
6. The CCVC and the CCCAC should liaise with the DOE for the implementation of the litter ticketing system in the caye. Wanton disregard for human health and safety as well as for the environment should be penalized. The throwing of garbage at unapproved sites puts added strain on the village council, is an eyesore for tourists and residents, and causes the proliferation of pests.

## **6.8 Social Amenities**

The village of Caye Caulker is known for its very “low key” lifestyle and pace which acts as a lure to tourists seeking rest and relaxation along with sun and beach activities. As result development on Caye Caulker has been very slow paced creating a major gap in social services. Existing major social services in Caye Caulker includes a police station, library, health centre, post office, small fire station, one primary school and one high school amongst others. For services not available in Caye Caulker, villagers normally travel to nearby San Pedro town or to Belize City.

### **Employment Services – Industry and Population**

With the growth of the tourism industry in Belize, many employment services on Caye Caulker have shifted away from the traditional fishing industry. Although conducted on a relatively smaller scale, many job opportunities have been created by tourism and related activities and services which have attracted many individuals from throughout the country and abroad for work. A large majority of workers on the island are self-employed or work within family owned businesses. Outside of that skilled workers occupy various niches such as taxi drivers, hotel managers and personnel, restaurant workers, etc. Due to saturation and relatively limited resources, it is not expected that the population of Caye Caulker will increase dramatically. Upgrades to social services are expected to occur due to a steady increase in tourism.

### **Emergency Services**

The one clinic on the island includes one doctor which does not satisfy the daily population and/or emergency needs. The one doctor is also the only doctor on call on the island. There is no overnight hospitalization. All emergencies are treated on the mainland in Belize City for emergency and hospitalization services.

### **Communication and Services**

Communication and services in Caye Caulker is similar to that of many towns and villages in Belize. Fax machines, fixed regular land line telephones and cellular, Belize Direct and internet and email services exist. Communication services are available at the current site.

### **Recommended Actions:**

1. Discourage further development outside existing areas as defined by the present boundaries unless the necessary infrastructure and social amenities are installed for communities, at the developer’s expense.

## 6.9 Conservation

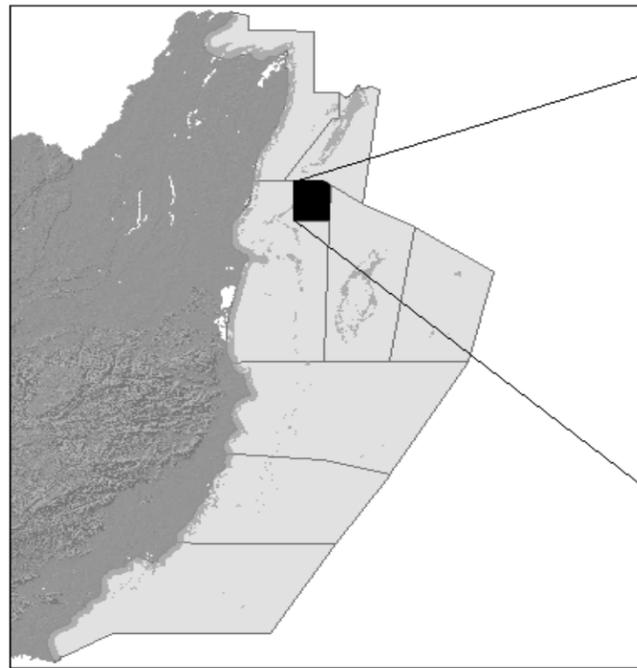
The conservation of the natural environment, particularly the island's vegetation, is important to ensure that nutrients, which affect the area's fishery stock, are maintained. In addition vegetation, particularly the littoral forest, provides habitat for several species of birds and other wildlife. The 66' reserve and areas that were deemed as geologically sensitive, among other considerations, were used to determine which portions of the island were suitable for development. These considerations were taken into account to ensure the protection of natural features, wildlife and most important, the protection of human life and investments, particularly after considering hurricane storm events and inevitable sea level rise and erosion.

The main function of the "Protection/Conservation" areas is to safeguard the natural buffer that mangroves maintain which offer some protection against storm events, reduce coastal erosion, builds land, filter land based discharges and provide habitat for terrestrial and marine fauna. In an effort to support continued national efforts to conserve biological diversity and reduce the pressures impacting them to ensure their long-term ecological integrity, the CZMAI supports stakeholders' recommendations for the protection of specific areas that can benefit from conservation efforts (**Map 10**) on the basis of the sensitivity of habitats and future threats from human activities. The framework for implementing the Informed Management Zoning Scheme for Conservation in the Caye Caulker Region is found in **Table 8**.

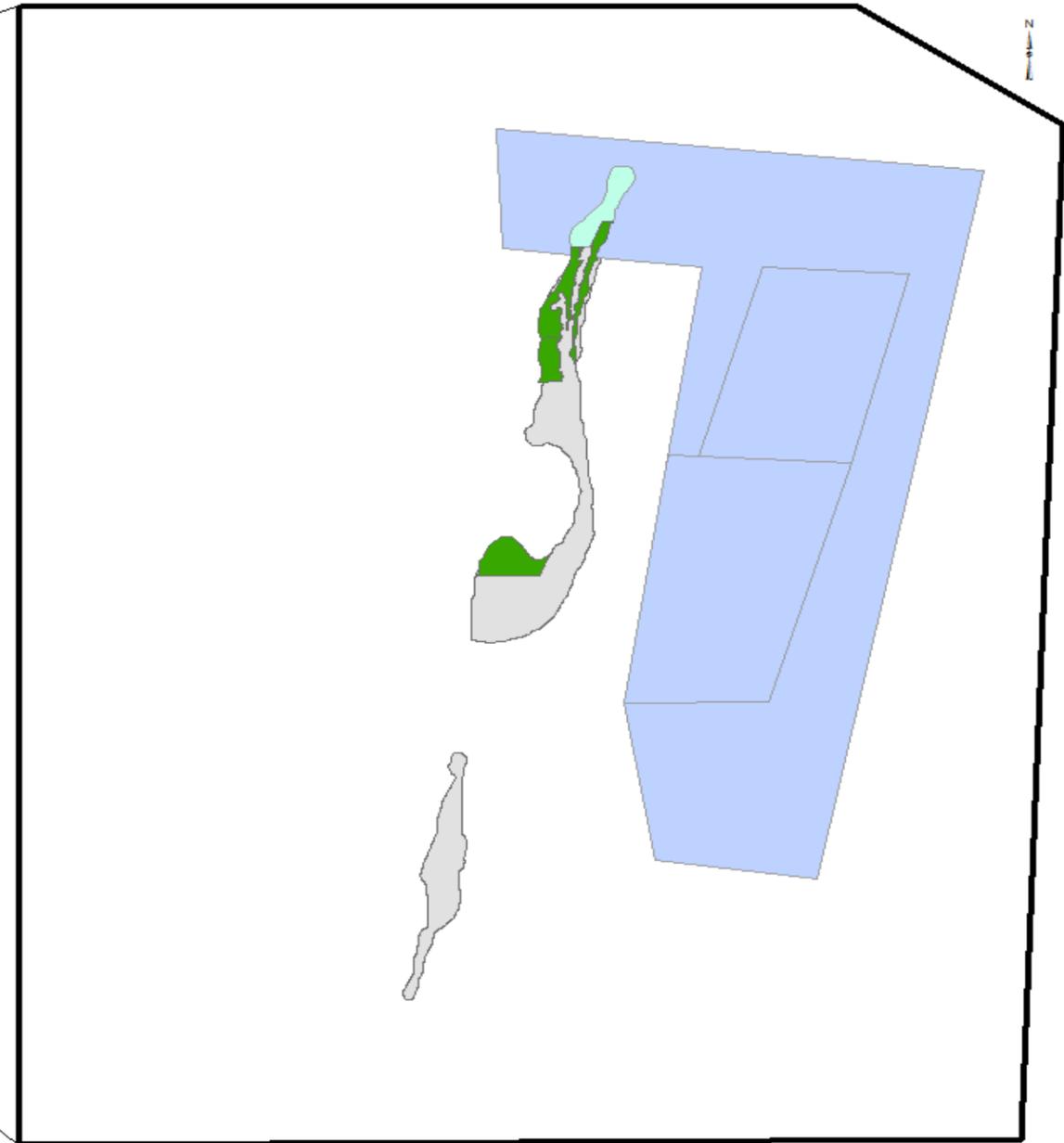
### **Recommended Actions:**

1. The Caye Caulker Forest Reserve be developed only where it complements the objectives of these guidelines and the Belize Integrated Coastal Zone Management Plan.
2. Other areas are identified as having very low development potential and recommendations reflect this observation. These are typically the areas that have poor access and ground stability, which may be characterized by low-lying and overwashed areas, where marshes and mangroves occupy. The conservation focus in these areas should be to protect and properly manage the species diversity, critical habitats and ecosystems present.

# INFORMED MANAGEMENT ZONING SCHEME FOR CONSERVATION: CAYE CAULKER



- Existing Coastal & Marine Reserves**
- Caye Caulker Forest Reserve
  - Caye Caulker Marine Reserve
- Future Conservation**
- Future Conservation



Scale: 1:78,000  
NAD 1927 UTM ZONE 16N  
4 2 4 Kilometers

Map 10: Informed Management Zoning Scheme for Conservation in the Caye Caulker Region

**Table 7: Framework for Implementing Informed Conservation Management at Caye Caulker**

ZONE	CHARACTERISTICS OF ZONE	SCHEDULE OF PERMITTED USES			SCHEDULE OF RESTRICTED USES	SUPPORTING NATIONAL POLICIES	IMPLEMENTING AGENCY
		Dominant	Compatible	Regulated			
<b>Marine Conservation</b>	Coastal and marine areas delineated for the retention of critical habitats and ecosystems for a diversity of marine life, fish spawning aggregation sites, replenishment zones, biodiversity areas	1. Coastal and marine reserves 2. Breeding, spawning, feeding area for marine life 3. Replenishment zones 4. Seagrass rehabilitation 5. Mangrove planting 6. Foraging area for manatees, dolphins, crocodiles 7. Nesting beaches for sea turtles	1. Research and education 2. Marine Recreation and Tourism	Tourism and recreation (snorkeling and diving) Research and education Establishment of new reserves	1. Fishing within “no-take”/replenishment zones, and spawning aggregation sites 2. Development of shoals 3. Anchoring that leads to disturbance and destruction marine habitats, including but not limited to, coral reef system, seagrass beds, mangrove forests, etc 4. Exploration and extraction of petroleum 6. Disposal of solid and liquid wastes from boats and ships 7. Shipping	Belize Port Authority Act Belize National Coast Guard Service Act Customs Regulation Act Defence Act Environmental Protection Act Harbours and Merchant Shipping Act Immigration Act Maritime Areas Act Marine Dredging Policy (Draft) Mines and Minerals Act	Belize Port Authority Belize National Coast Guard Customs Department Belize Defence Force Department of the Environment Belize Port Authority Immigration Department Ministry of Foreign Affairs Mining Unit, Ministry of Natural Resources Geology and Petroleum Department

### **6.10 Scientific Research and Education**

The Caye Caulker Forest and Marine Reserves does not have established terrestrial and marine monitoring programmes. The reserves could benefit from terrestrial and marine monitoring programmes that would include regular assessments of key terrestrial and marine conservation targets. The terrestrial monitoring programme should be developed and implemented in collaboration with the Forestry Department and the marine monitoring programme with the Fisheries Department.

#### **Recommended Actions:**

1. Implement an integrated research and monitoring programme for the region as a strategy to maintain the long-term ecological integrity of biological diversity and sustainable resource use by dependent communities. Research and monitoring programmes must outline a framework for effective integrated research and monitoring of conservation targets, the development of a data management facility and the incorporation of educational activities and involvement from the Caye Caulker community

## 7.0 IMPLEMENTATION STRATEGY

The Caye Caulker Coastal Zone Management Guidelines form a part of the Belize Integrated Coastal Zone Management Plan being developed by the CZMAI. After approval of the Plan by CZMAI's Board of Directors, it will be offered to the House of Representatives for endorsement. Implementation of these coastal management guidelines will be undertaken through two mechanisms: (a) centralized statutory control through the various Government departments, and (b) localized community and stakeholder participation. Following the mechanism of centralized statutory control, the regulatory and permitting agencies with management mandates for the coastal zone will implement the specific policy actions and informed management spatial zoning scheme that are recommended in the Plan.

While the government agencies have the authority of the law to back up its procedures, it is constrained by limited resources. In several instances, however, local NGOs and community-based stakeholder organizations have greater access to, and knowledge of, local conditions and activities, though they have no statutory powers to either assist or control development beyond those available through the Village Councils and Towns Councils Acts. For this reason, it is recommended that localized community and stakeholder participation complement the management efforts of centralized government and statutory agencies in implementing integrated coastal zone management. The Caye Caulker Coastal Advisory Committee (CCCAC), and other interested stakeholders of this region, will work closely with the Coastal Zone Advisory Council (CZAC) regarding monitoring and implementation of the guidelines.

The reformation of the Caye Caulker Coastal Advisory Committee (CCCAC) is recommended subsequent to Cabinet's adoption of the Belize Integrated Coastal Zone Management Plan. The CCCAC would be locally based and largely constituted of voluntary organizations charged with the role of monitoring the state of the coast and development of the region, making reports and recommendations on issues they identify. This region's CAC will work closely with the Coastal Zone Advisory Council (CZAC) to monitor the implementation of the guidelines. The proposed membership of the reformed CCCAC is drawn from the following sources:

1. CC Housing and Planning Committee
2. CC Tour Guide Association
3. CC Business Association
4. CC Village Council
5. Fisheries Department (including the Caye Caulker Forest & Marine Reserve)
6. CC Park Development Committee
7. Physical Planning Section/ Lands & Surveys Department
8. CC BTIA

9. Northern Fishermen Cooperative
10. Siwa-Ban Foundation
11. Beltraide
12. FAMRACC
13. CC Lots Committee
14. Housing & Planning Department
15. Belize Tourism Board
16. Forest Department
17. Belize Rural South Area Representative

Objectives of the Caye Caulker Region CAC include, *inter alia*, contributing to the drafting of the coastal zone management guidelines for their coastal region, supporting their initial approval, and monitoring and reporting to the Coastal Zone Advisory Council (CZAC) on the implementation of the guidelines. This means that the Committee will be expected to undertake the following tasks:

1. Develop, assess and approve the draft guidelines;
2. Forward the approved draft guidelines to CZMAI for approval;
3. Monitor the implementation and effectiveness of the guidelines;
4. Identify the appropriate time for a review of all or part of the guidelines;
5. Review and update the guidelines.

Planning is a continual process of recommendation, participation, implementation and review. These guidelines shall be monitored on a continual basis in order to establish its strengths and weaknesses. Through a management planning mechanism, the CCCAC, along with CZMAI, will regularly update the guidelines, which will hopefully set a good example of representative, cooperative and adaptive management that is environmentally sound, rational and equitable.

Additional studies are needed in liaison with the relevant authorities and region's stakeholders. Such studies should reveal information which may help to further support sustainable development and to address the social, cultural and economic human use of the region and its resources.

## **8.0 CONCLUSIONS**

The coastal zone management guidelines recommended for the region are not intended to be rigid, as changing socio-economic, cultural and environmental conditions may necessitate modifications. Similarly, changing shapes of the cayes and the health of habitats of the terrestrial and aquatic environments may also require this. As well, land tenure needs to be clarified.

Noteworthy however, is that it has resulted in the identification of sites for uses which may not otherwise have been considered for such, and the disqualification of sites for intended uses not conducive to sustainable development. This can transfer and disperse certain activities from accumulated point impacts, to the wider and other areas to reduce the pressures on environments that apparently are under stress from over use.

It is hopeful that the objectives outlined at the beginning can be realized through the recommended sector policies and management guidelines. More importantly though, is that the formulation of coastal zone management guidelines is a starting point to ensuring the sustainable use and development of the Caye Caulker Region.

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## **10.0 APPENDICES**

### **10.1 Background**

The coastal zone is one of Belize's greatest assets and its magnificent Barrier Reef Reserve System is a renowned World Heritage Site. It is the longest barrier reef in the Western Hemisphere, extending approximately 280 km from the northern to southern borders of the country (Cooper et al. 2009). Belize's coastal zone has complex and dynamic marine ecosystems that support innumerable ecological processes and a vast array of marine life and habitats. In addition to its important ecosystem functions, the coastal zone is vital to the Belizean way of life. The highly productive coastal zone is the resource base for a broad range of economic activities. In fact, approximately thirty-percent of the country's gross domestic product is directly linked to these commercial activities that take place within the coastal zone (Cho 2005). The coastal zone also has important social and cultural values to the Belizean people, especially to approximately 40% of the population that reside on the coast and in offshore areas (SIB 2010).

Over the past decades, rapid economic development and population growth have taken place in the coastal zone and inland areas of Belize. World-renowned snorkeling and diving draw over 800,000 tourists to the region annually, driving the construction of new development (BTB 2008). These occurrences have led to increasing pressures on coastal and marine resources, with implications to the livelihoods of those that depend upon them. These anthropogenic threats stem from various developmental activities associated with tourism and recreational facilities, population growth and expansion, utility supply, dredging and mineral extraction, land clearance, pollution, waste disposal, fisheries and aquaculture. These threats are compounded by natural hazards, global warming, rising sea levels, and the vulnerability of sensitive ecological systems to climate change. Thus, it is imperative now more than ever to ensure that the coastal zone is utilized in a manner that will continue to support important ecological functions, as well as social, cultural and economic prosperity for current and future generations.

For many years, and even today, management of the Belizean coastal zone has been under the regime of sectoral planning. However, The need for an integrated approach to optimally manage Belize's coastal resources was made resoundingly clear at a historic meeting in 1989 when a wide cross-section of stakeholders from various sectors, including scientists, marine managers, private sector, and coastal communities converged in San Pedro, Ambergris Caye (Gibson 1989). Integrated coastal zone management (ICZM) brings together all decision-making agencies to ensure integration among their policies and management plans, to ultimately improve and maintain the quality of coastal and marine ecosystems. A defining feature of Belize's ICZM plan is balancing national economic development needs with conservation priorities within a spatially defined area over a specified timeframe. The development of site-specific coastal zone management guidelines, as a component of the Belize ICZM Plan, serves as a means to guide management decisions and to form the basis on which decisions are made to regulate the development and use of coastal and marine resources within the coastal zone.

## **10.2 Summary Of Enabling Legislation And Implementing Agencies For Enforcement Of The Informed Management Zoning Scheme**

The various governmental organizations and agencies with management mandates for the coastal zone that are needed to implement these guidelines, to synchronize the efforts of the CZMAI via the Belize Integrated Coastal Zone Management Plan, and to strengthen inter-agency coordination for integrated coastal zone management include:

*Belize Agricultural Health Authority* – The Belize Agricultural Health Authority Act requires applications for licenses, permits or certificates to import and export animal products, animal feed, and plant products into and out of Belize following inspection as it affects the region. The Caye Caulker Region CAC should be included in any discussion on policy formulation on agricultural import and export as it affects the region.

*Belize Port Authority* – The Belize Port Authority Act requires applications for boat and captain licenses and for the construction and operation of private ports for the region. Also, The Harbors and Merchant Shipping Act requires the Authority to regulate the passage of vessels in and out of Belizean waters as well as the maintenance and delineation of vessel routes, lighthouses and wharfs. The Caye Caulker CAC should be included in any discussion on policy formulation on vessel licencing and shipping as it affects the region

*Belize Tourist Board* – The Belize Tourist Board Act requires applications for hotel licenses for the region. The Caye Caulker Region CAC should be included in any discussion on policy formulation on hotel development as it affects the region.

*Belize Trade and Investment Development Service (BELTRAIDE)* – The Belize Trade and Investment Development Service Act requires that foreign trade and investment be liaised through the BELTRAIDE organization. The Caye Caulker Region CAC should be included in any discussion on policy formulation on major developments as it affects the region.

*Central Building Authority* – The Housing and Town Planning Act provides for the regulation of the use and development of land through qualitative measures that is, building densities, land use class assignments etc. However, it does not address the structural integrity of buildings, a component of the development. The Central Building Authority, by way of the Belize Building Act, is legislated specifically to address this, and provides for the appointment of Local Building Authorities to administrate the Act. Thus, the Caye Caulker Region CAC can be appointed as the Local Building Authority for the Caye Caulker Region. However, this may require strengthening the Caye Caulker Region CAC with technical expertise to do this. The alternative is to coordinate this function with the Caye Caulker Village Councils.

*Caye Caulker Village Council* – The Village Councils Act requires applications for liquor licenses for the region. The Caye Caulker Region CAC should be included in any discussion on policy formulation on issuing of liquor licenses as it affects the region.

*Department of Environment* – The Environmental Protection Act requires applications for environmental clearance for the region. The Caye Caulker Region CAC should be included in any discussion on policy formulation on environmental protection as it affects the region.

*Fisheries Department* – The Fisheries Act requires applications for fishing license for the region. The Caye Caulker Region CAC should be included in any discussion on policy formulation on fisheries as it affects the region.

*Forest Department* – The Forest Act requires applications for the removal of mangroves in coastal areas for the region. The National Parks System Act requires the establishment of National Parks, Nature Reserves, Wildlife Sanctuaries, and Natural Monuments to preserve ecologically important and sensitive areas. The Wildlife Protection Act empowers the Forest Department to determine species to be prohibited from hunting practices as it sees fit. The Caye Caulker Region CAC should be included in any discussion on policy formulation on mangrove removal and designation of protective status to sensitive areas and species as it affects the region.

*Geology & Petroleum Department* – The Petroleum Act requires applications for oil exploration and issuing of parcel contracts for the region. The Caye Caulker Region CAC should be included in any discussion on policy formulation on petroleum activities as it affects the region.

*Hydrology Unit, Ministry of Natural Resources* - The Water Industry Act requires all entities to apply for a Water Abstraction License where the water source is limited to a natural water body: surface or groundwater. The Caye Caulker Region CAC should be included in any discussion on policy formulation on water use as it affects the region.

*Lands and Surveys Department* - The Land Utilization Act requires applications for subdivisions for the region, any demarcation of special development areas, any allocation of land in the coastal region, this includes any construction on seabed. The Caye Caulker Region CAC should be included in any discussion on policy formulation on land as it affects the region.

*Mining Unit, Ministry of Natural Resources* – The Mines and Minerals Act requires applications for dredging, oil exploration and sand mining permits for the region. The Caye Caulker Region CAC should be included in any discussion on policy formulation on dredging and oil exploration as it affects the region.

*Ministry of Health* – The Public Health Act requires the Director of Health to make arrangements for health inspectors to enforce building and health standards for the region. The Caye Caulker Region CAC should be included in any discussion on policy formulation on public safety as it affects the region.

*Ministry of Housing and Urban Development* – The Ministry of Housing & Urban Development formulates policy for housing and human settlements. Its added function is to assist with the alleviation of poverty due to urban growth. The Ministry coordinates planning and development control functions through municipal bodies. The Ministry also provides the services of Planners, Building inspectors and Engineers to provide the required necessary assistance. In accordance with Section 6 of the Act, the Caye Caulker Region CAC can be delegated the powers and duties of the Central Housing and Planning Authority (CHPA) with regard to approving, with or without conditions, and prohibiting further development in the region as well as powers to serve prohibition notices. This delegation should be supported by the Solicitor General’s Office or an Attorney at Law for the enforcement of the provisions of the Act.

*National Emergency Management Organization* – The National Emergency Management Act requires that sites be declared as vulnerable areas for the region and policy formulation on disaster management be effectuated. The Caye Caulker Region CAC should be included in any discussion on policy formulation on issues of national preparedness as it affects the region.

*Solid Waste Management Authority* – The Solid Waste Management Act requires the Solid Waste Management Authority to make arrangements for garbage collection or the engagement of contractors for the region. The Caye Caulker Region CAC should be included in any discussion on policy formulation on garbage collection as it affects the region.

### 10.3 Checklist For Human Use/Development Of The Coastal Zone

Development Activity/Human Use	Responsible Agencies
<b>1. Coastal Agriculture</b>	
<b>Governing Legislation/Policy:</b>	
<b>Banana Industry Act</b>	<input type="radio"/> Banana Control Board <input type="radio"/> Banana Growers Association <input type="radio"/> Ministry of Agriculture
<b>Belize Agricultural Health Authority Act</b>	<input type="radio"/> Belize Agricultural Health Authority
<b>Citrus (Processing and Production) Act</b>	<input type="radio"/> Citrus Control Board <input type="radio"/> Citrus Growers Association <input type="radio"/> Ministry of Agriculture
<b>Environmental Protection Act</b>	<input type="radio"/> Department of Environment
<b>Land Utilization Act</b>	<input type="radio"/> Land Utilization Authority <input type="radio"/> Ministry of Natural Resources
<b>Meat and Livestock Act</b>	<input type="radio"/> Belize Livestock Producers Association <input type="radio"/> Belize Agricultural Health Authority <input type="radio"/> Ministry of Natural Resources
<b>Papaya Growers Association Act</b>	<input type="radio"/> Papaya Growers Association <input type="radio"/> Ministry of Agriculture
<b>Pesticide Control Act</b>	<input type="radio"/> Pesticide Control Board <input type="radio"/> Ministry of Agriculture
<b>Sugar Cane Industry (Control) Act</b>	<input type="radio"/> Belize Sugar Cane Board

**DEVELOPMENT ACTIVITY/HUMAN USE****RESPONSIBLE AGENCIES****1. Coastal Aquaculture****Governing Legislation/Policy:**

Fisheries Act

National Aquaculture Policy (Draft)

Environmental Protection Act

Belize Trade and Investment Promotion Service Act

 Fisheries Department Aquaculture Unit, Ministry of Agriculture Department of the Environment Belize Trade and Investment**DEVELOPMENT ACTIVITY/HUMAN USE****RESPONSIBLE AGENCIES****2. Coastal Development****Governing Legislation/Policy:**

Belize Building Act

Belize City Council Act

Belize Trade and Investment Promotion Service Act

Cayes Development Policy  
Coastal Zone Management Act

Disaster Preparedness and Response Act

Electricity Act

Environmental Protection Act

Forest Subsidiary Act

Hotels and Tourist Accommodation Act

Housing and Town Planning Act

Land Utilization Act

Mines and Minerals Act

Private Works Construction Act

Public Health Act

Public Utilities Commission Act

Solid Waste Management Authority Act

Telecommunications Act

 Central Building Authority Belize City Council Belize Trade and Investment Development Services Coastal Zone Management Authority National Emergency Management Organization Belize Electricity Limited Department of the Environment Forest Department Belize Tourism Board Ministry of Housing Land Utilization Authority Mining Unit, Ministry of Natural Resources Ministry of Works and Transport Ministry of Health Public Utilities Commission Solid Waste Management Authority Belize Telemedia Limited

Town Councils Act	<input type="radio"/> Town Councils
Trade Licensing Act	<input type="radio"/> City/Town Councils
Water and Sewerage Act	<input type="radio"/> Belize Water Services Limited
Water Industry Act	<input type="radio"/> Hydrology Unit, Ministry Natural Resources

**DEVELOPMENT ACTIVITY/HUMAN USE**

**RESPONSIBLE AGENCIES**

**3. Conservation**

**Governing Legislation/Policy:**

Fisheries Act	<input type="radio"/> Fisheries Department
Forest Act	<input type="radio"/> Forest Department
Private Forests (Conservation) Act	<input type="radio"/> Forest Department
National Parks System Act	<input type="radio"/> Ministry of Agriculture, Fisheries, Forestry, the Environment and Sustainable Development
National Protected Areas Policy and System Plan	<input type="radio"/> National Protected Areas Secretariat
Wildlife Protection Act	<input type="radio"/> Forest Department
Coastal Zone Management Act	<input type="radio"/> Coastal Zone Management Authority

**DEVELOPMENT ACTIVITY/HUMAN USE**

**RESPONSIBLE AGENCIES**

**4. Marine Dredging**

**Governing Legislation/Policy:**

Mines and Minerals Act	<input type="radio"/> Mining Unit, Ministry of Natural Resources
Dredging Policy	<input type="radio"/> Geology and Petroleum Department
Environmental Protection Act	<input type="radio"/> Department of the Environment

**DEVELOPMENT ACTIVITY/HUMAN USE**

**RESPONSIBLE AGENCIES**

**5. Fishing**

**Governing Legislation/Policy:**

Fisheries Act	<input type="radio"/> Fisheries Department
Coastal Zone Management Act	<input type="radio"/> Coastal Zone Management Authority

**DEVELOPMENT ACTIVITY/HUMAN USE**

**RESPONSIBLE AGENCIES**

**6. Marine Transportation**

**Governing Legislation/Policy:**

Belize Port Authority Act  
Harbours and Merchant Shipping Act

Belize Port Authority

Private Works Construction Act

Ministry of Works and Transport

Customs Regulation Act

Belize Customs Department

Maritime Areas Act

Ministry of Foreign Affairs

Defence Act

Belize Defence Force

Immigration Act

Immigration Department

Dredging Policy

Mining Unit, Ministry of Natural Resources

Environmental Protection Act

Department of the Environment

**DEVELOPMENT ACTIVITY/HUMAN USE****RESPONSIBLE AGENCIES****7. Marine Recreation****Governing Legislation/Policy:**

Fisheries Act

Fisheries Department

Ancient Monuments and Antiquities Act

Archaeology Department

National Institute of Culture and History Act

National Institute of Culture and History

Belize Tourism Board Act

Belize Tourism Board

Public Health Act

Ministry of Health

**DEVELOPMENT ACTIVITY/HUMAN USE****RESPONSIBLE AGENCIES****8. Oil Exploration****Governing Legislation/Policy:**

Environmental Protection Act

Department of the Environment

Petroleum Act

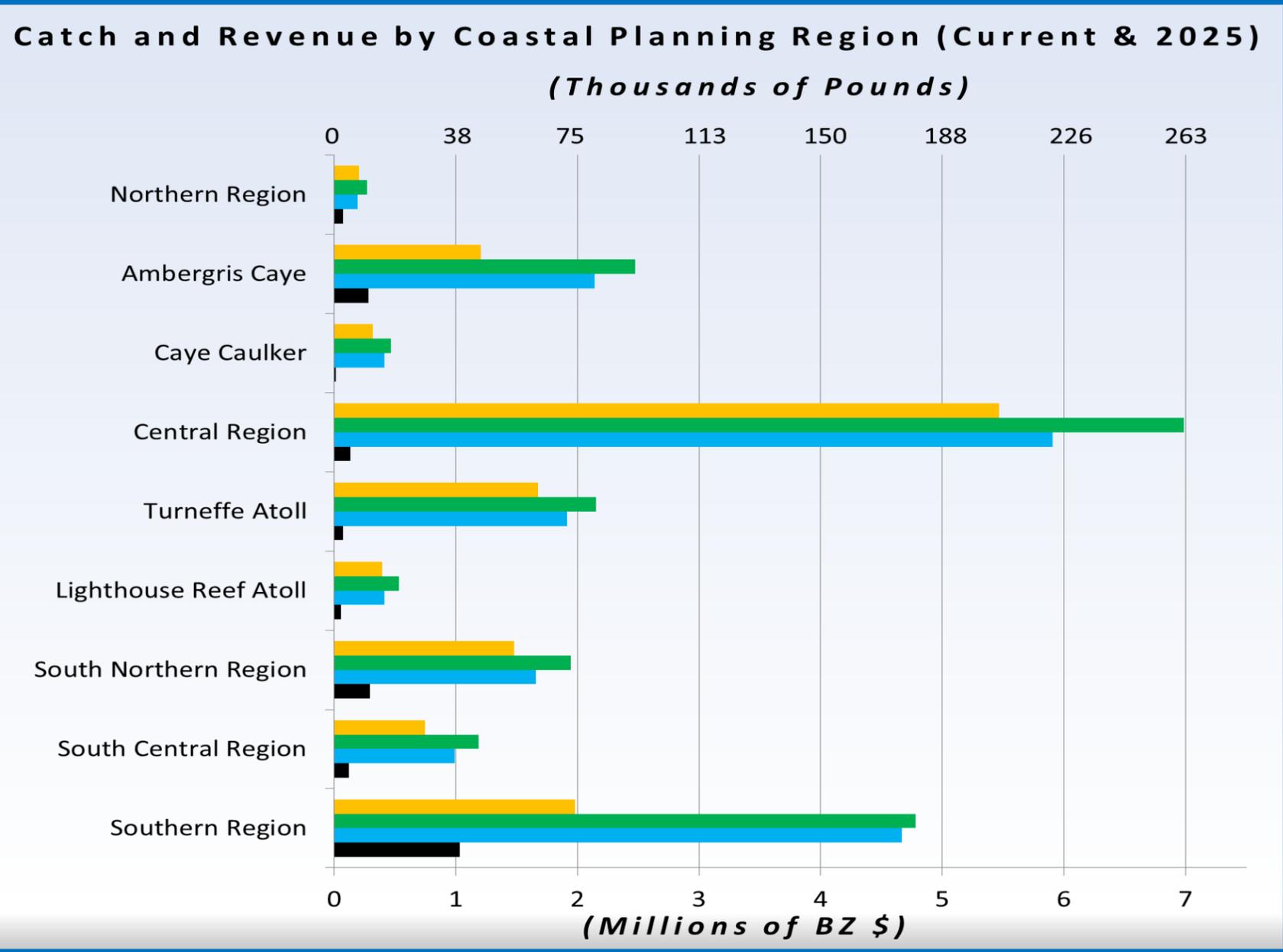
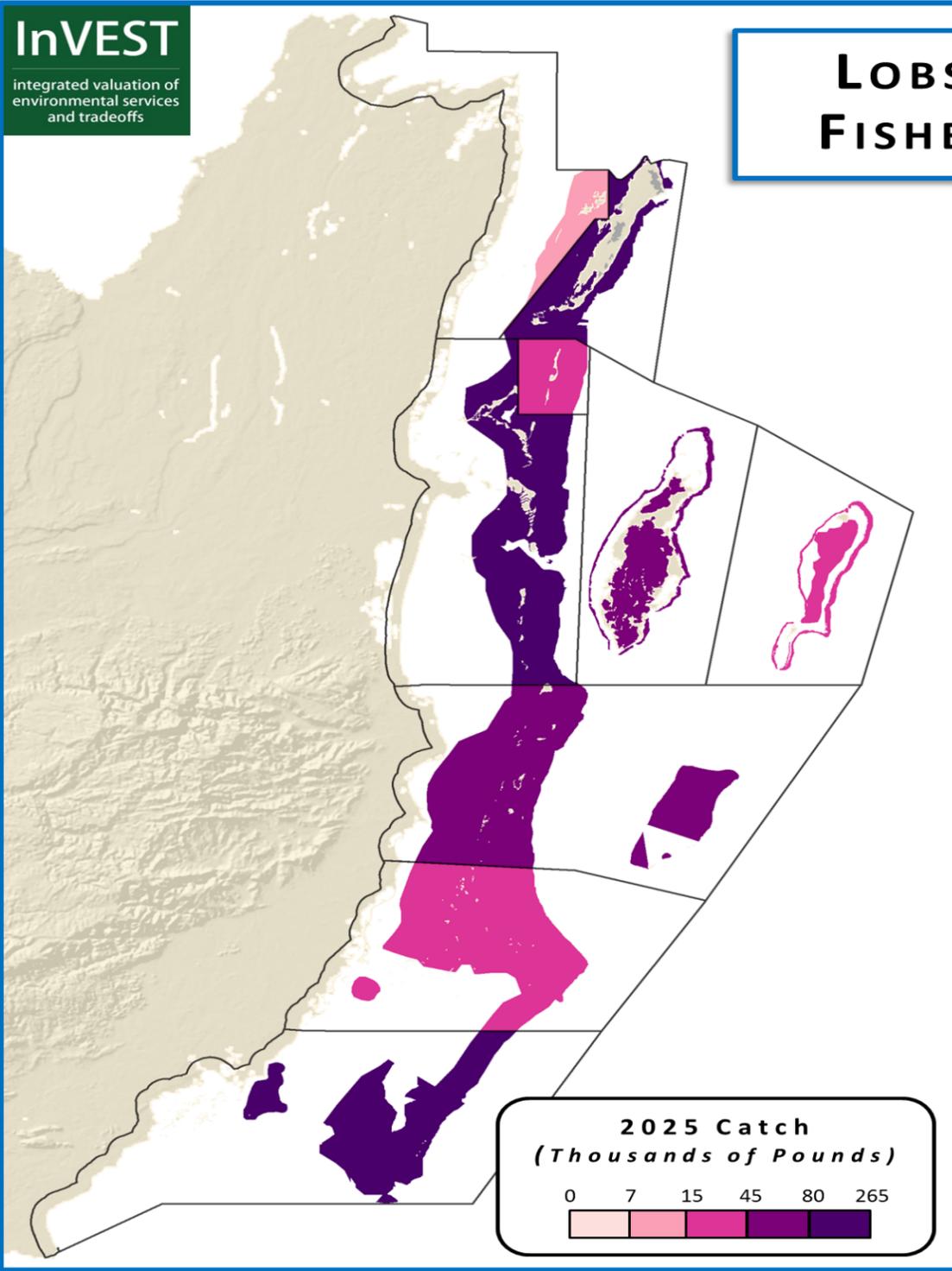
Geology and Petroleum Department

# 10.4 Figures

# LOBSTER FISHERIES

**SCENARIOS**

- Current (Yellow)
- Informed Management (Blue)
- Conservation (Green)
- Development (Black)



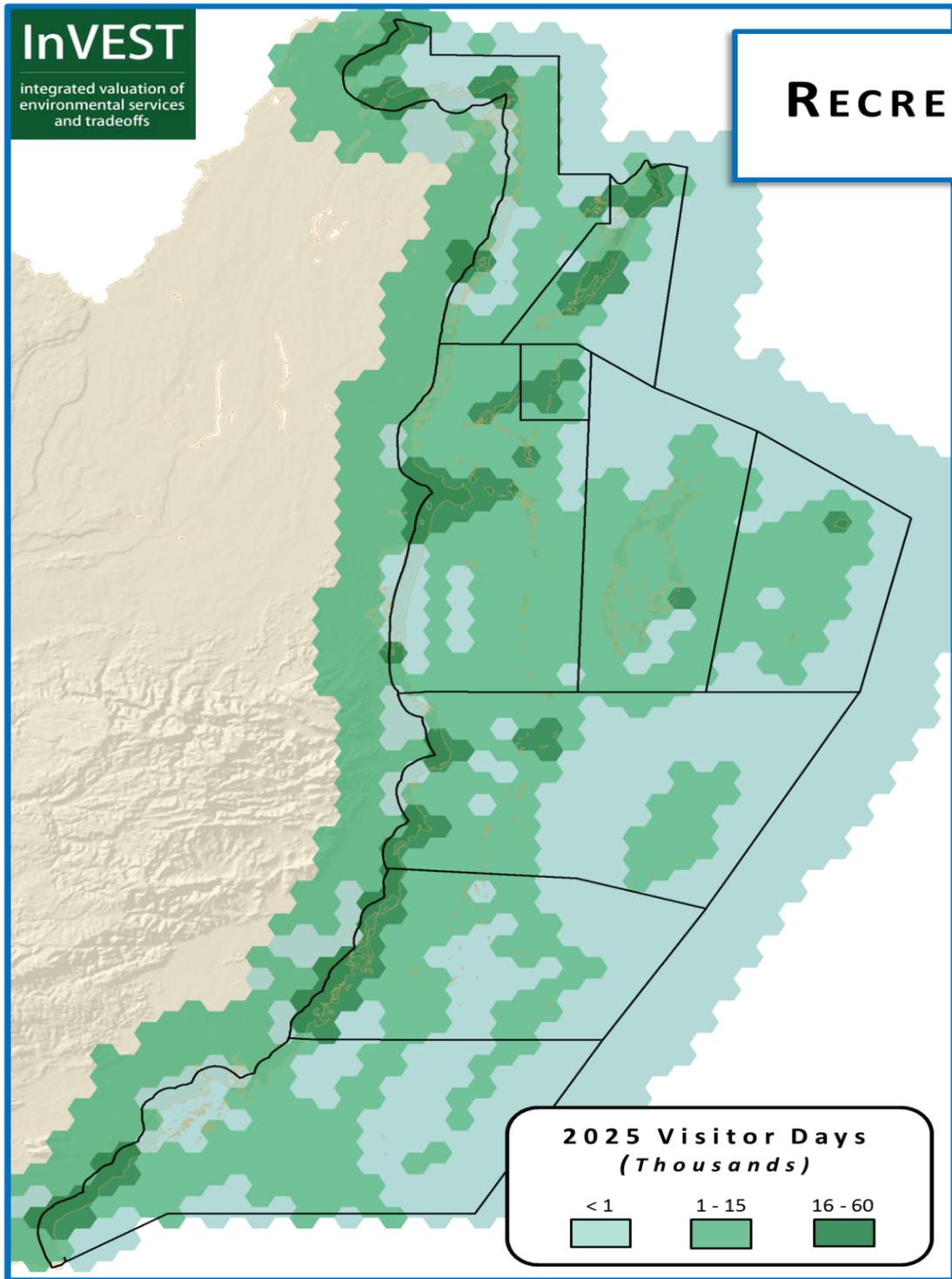
## INFORMED MANAGEMENT

Figure 4: Lobster Fisheries Catch and Revenue by Scenario

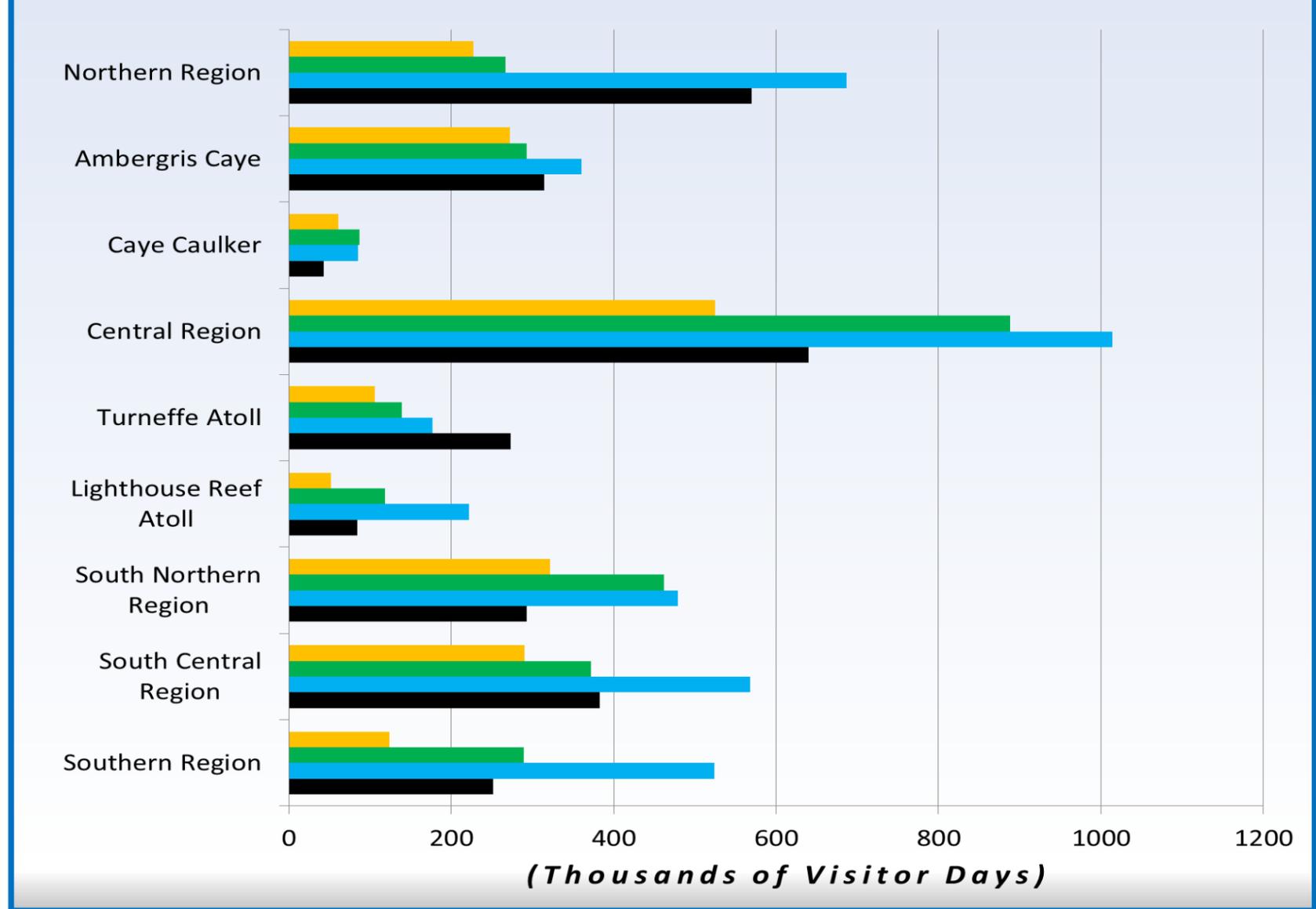
**RECREATION**

**SCENARIOS**

- Current
- Conservation
- Informed Management
- Development



**Current & 2025 Visitor Days by Coastal Planning Region**



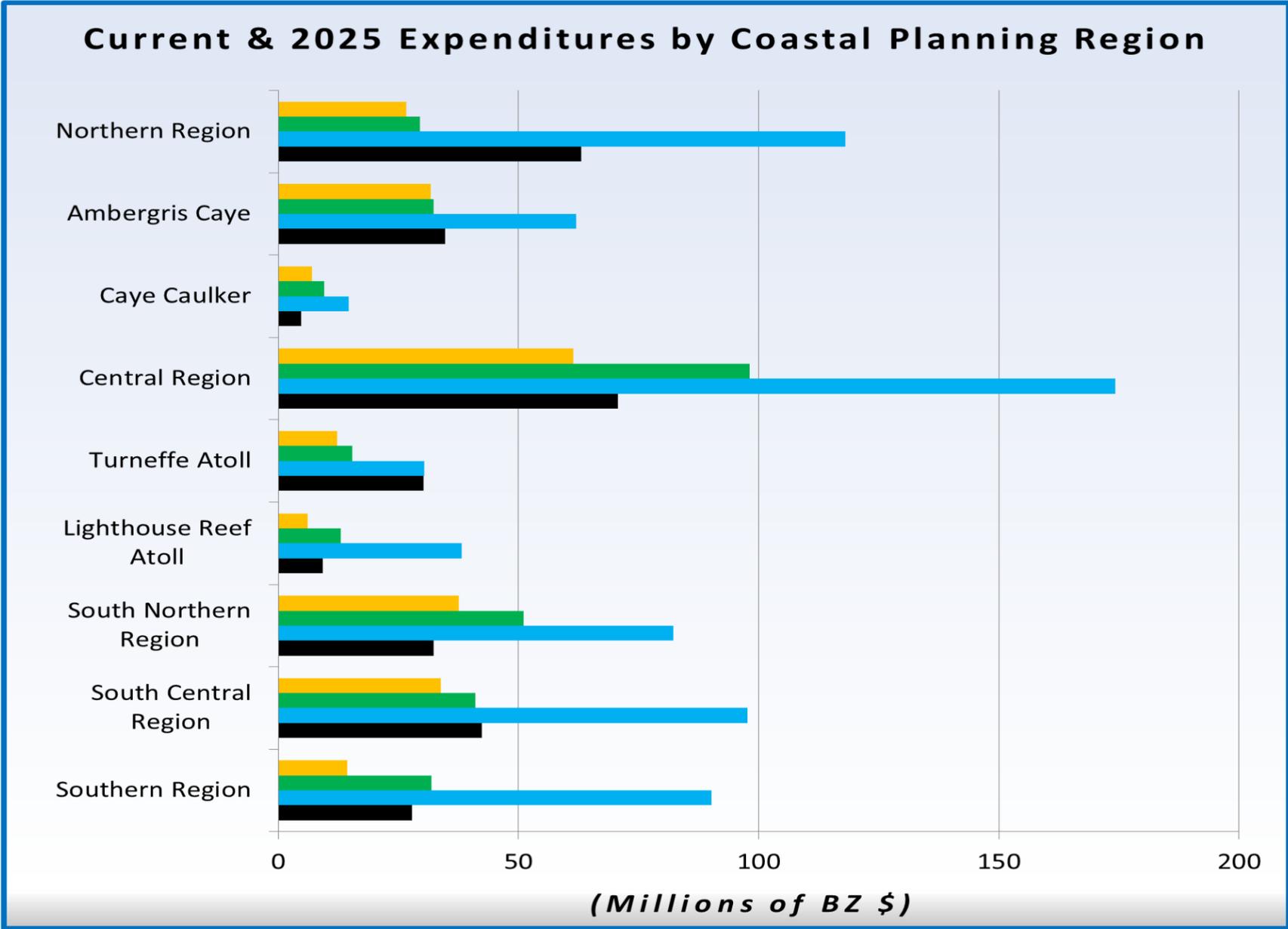
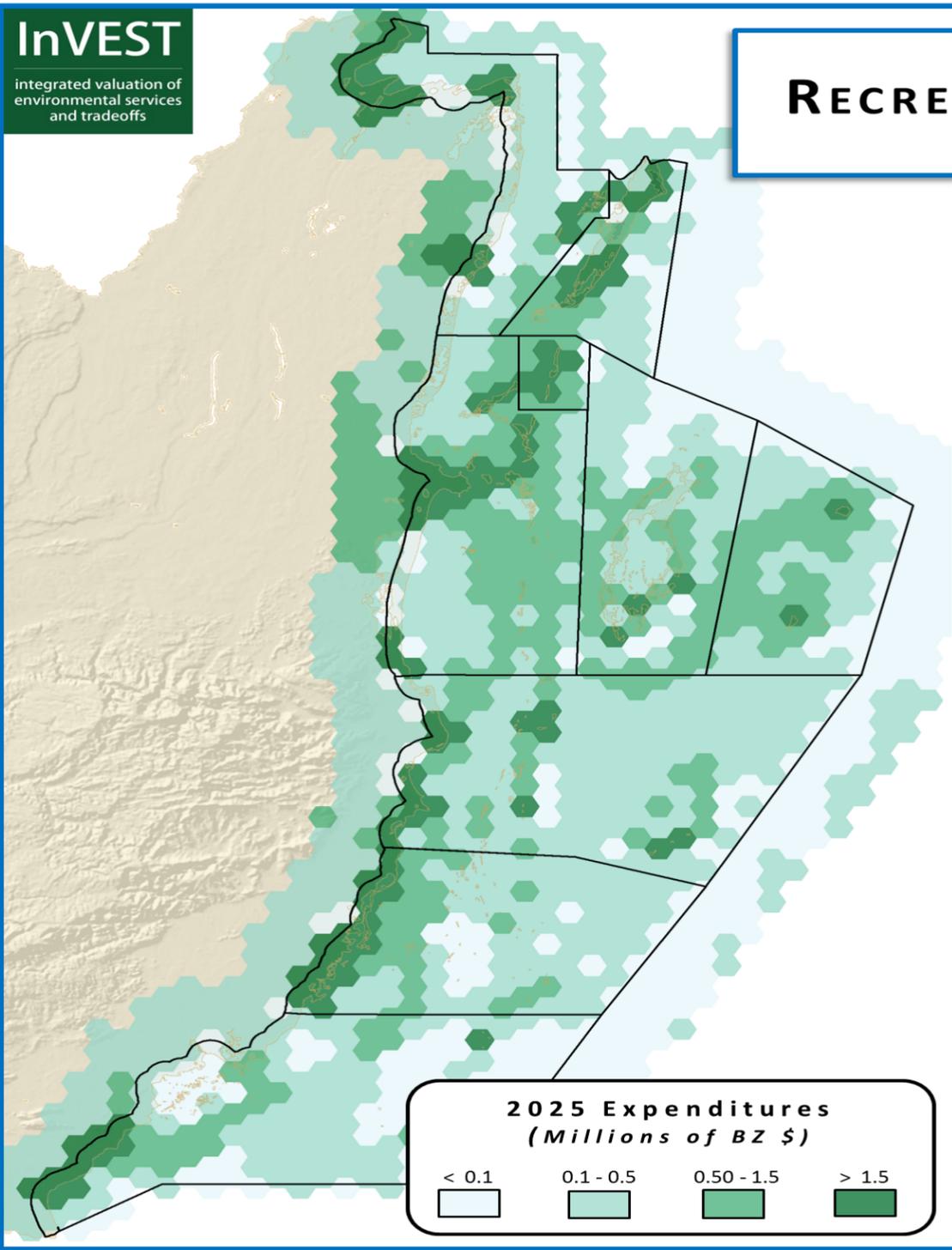
**INFORMED MANAGEMENT**

**Figure 5: Annual Visitation for Marine Tourism and Recreation by Scenario**

**RECREATION**

**SCENARIOS**

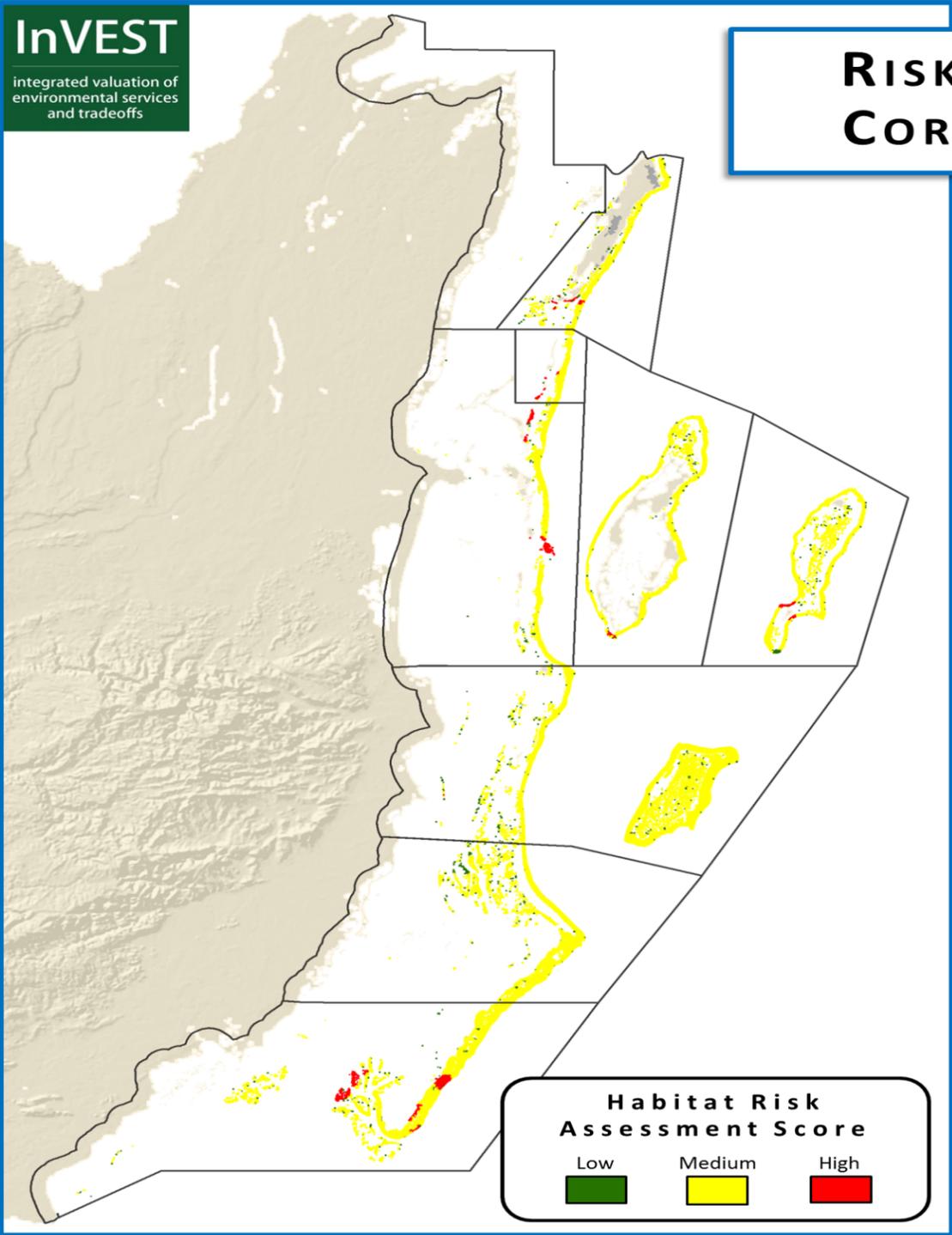
- Current
- Conservation
- Informed Management
- Development



**INFORMED MANAGEMENT**

**Figure 6: Annual Expenditures for Marine Tourism and Recreation by Scenario**

**RISK TO  
CORALS**



**INFORMED MANAGEMENT**

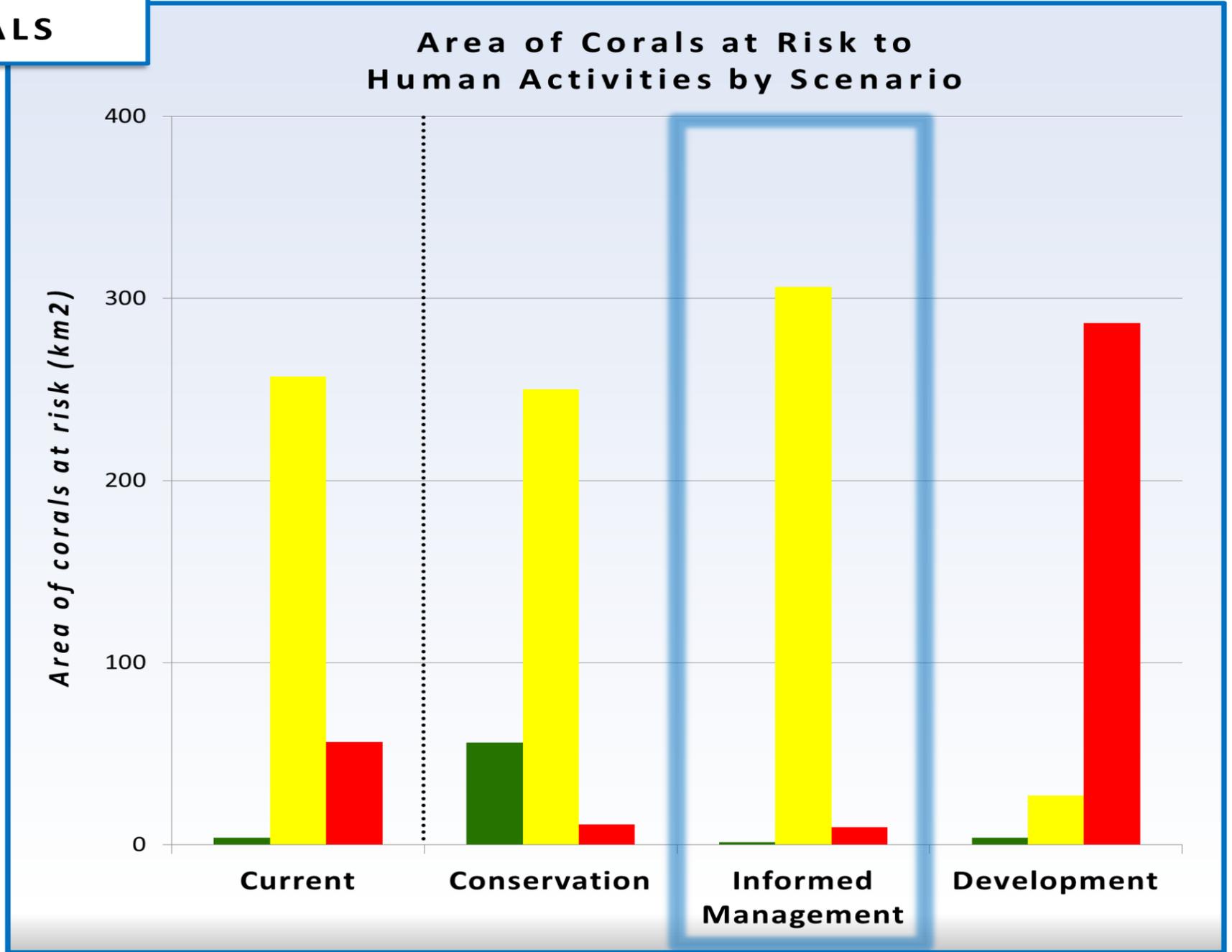
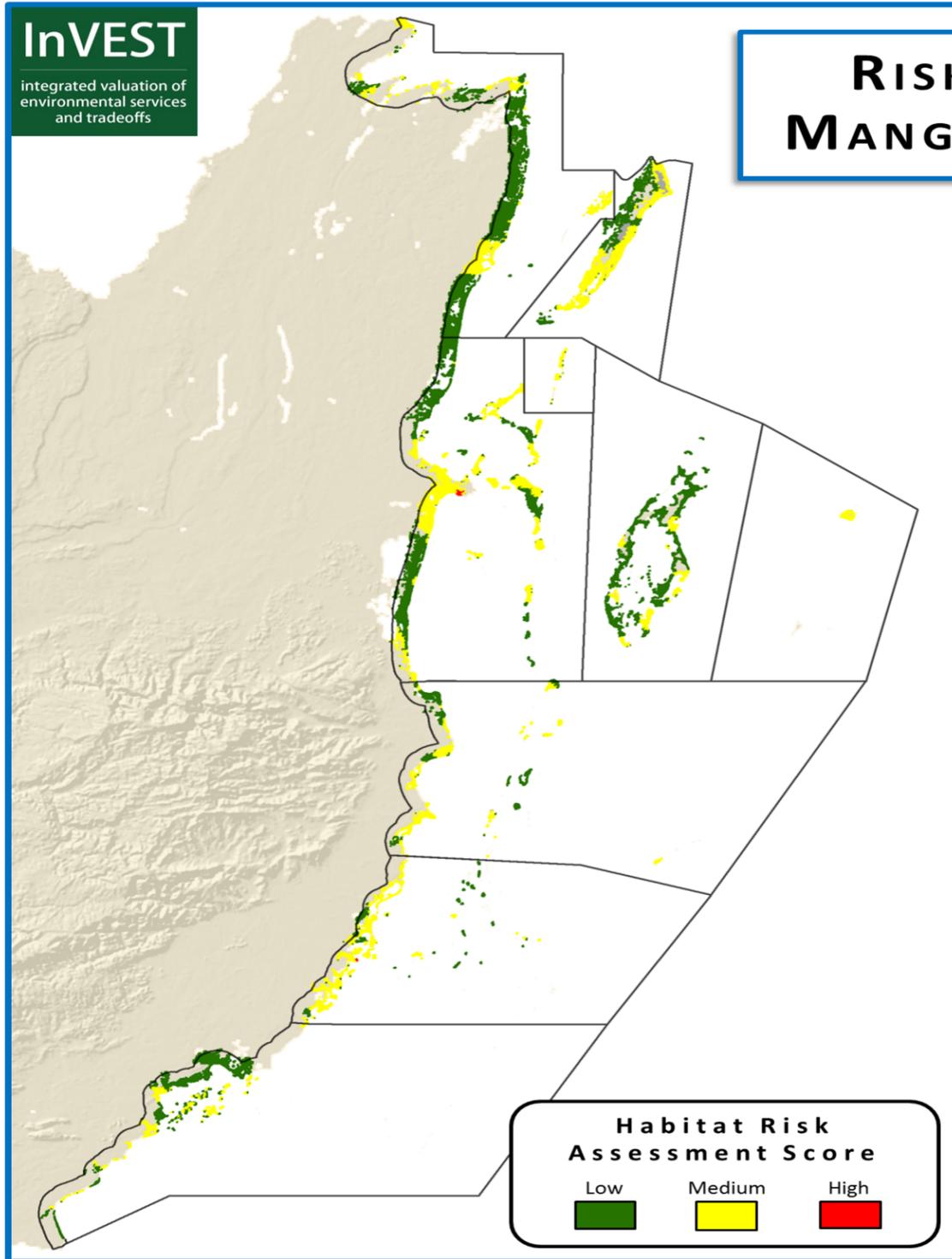


Figure 7: Area of Corals at Risk from Human Activities by Scenario

**RISK TO  
MANGROVES**



**INFORMED MANAGEMENT**

**Area of Mangroves at Risk to Human Activities by Scenario**

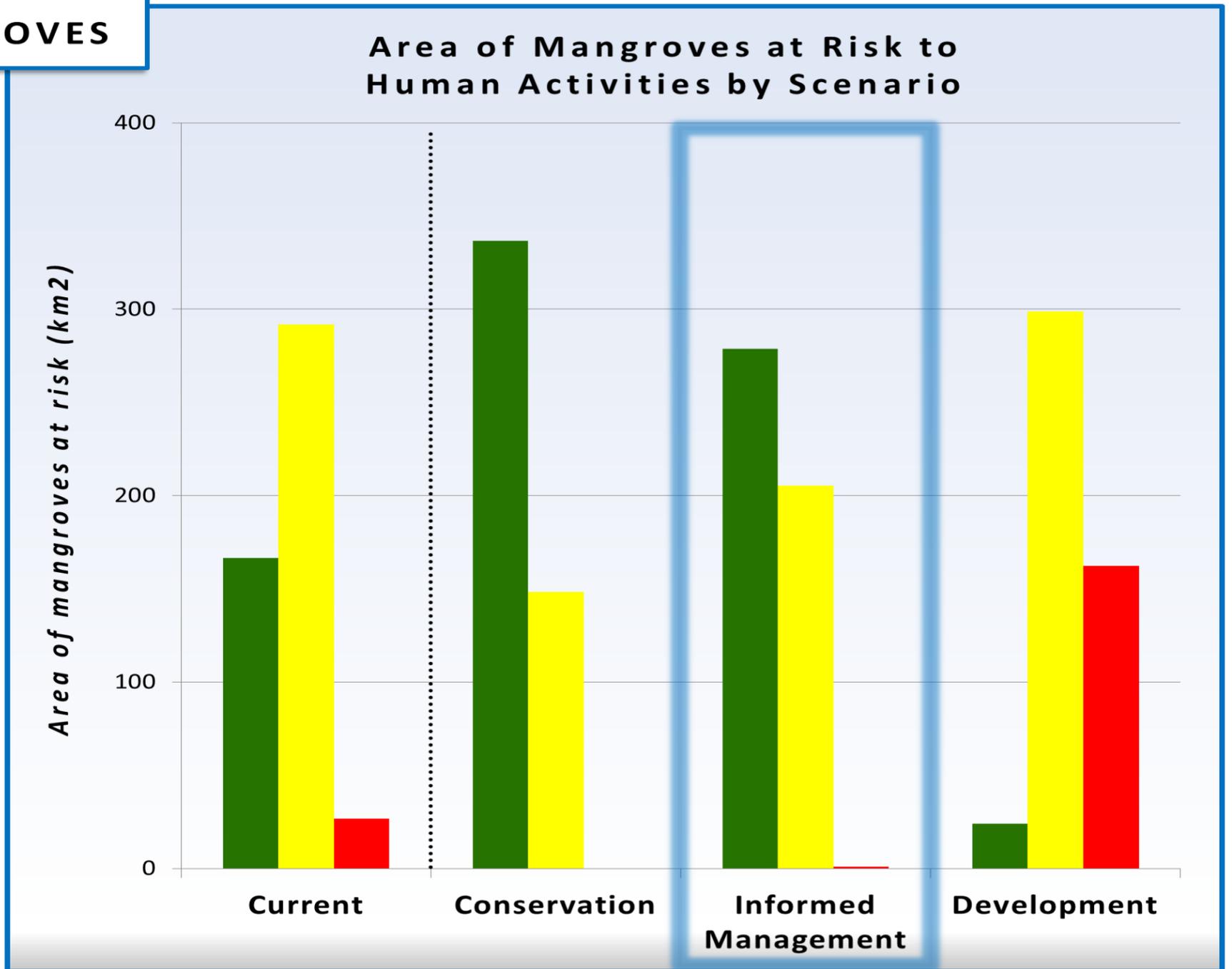
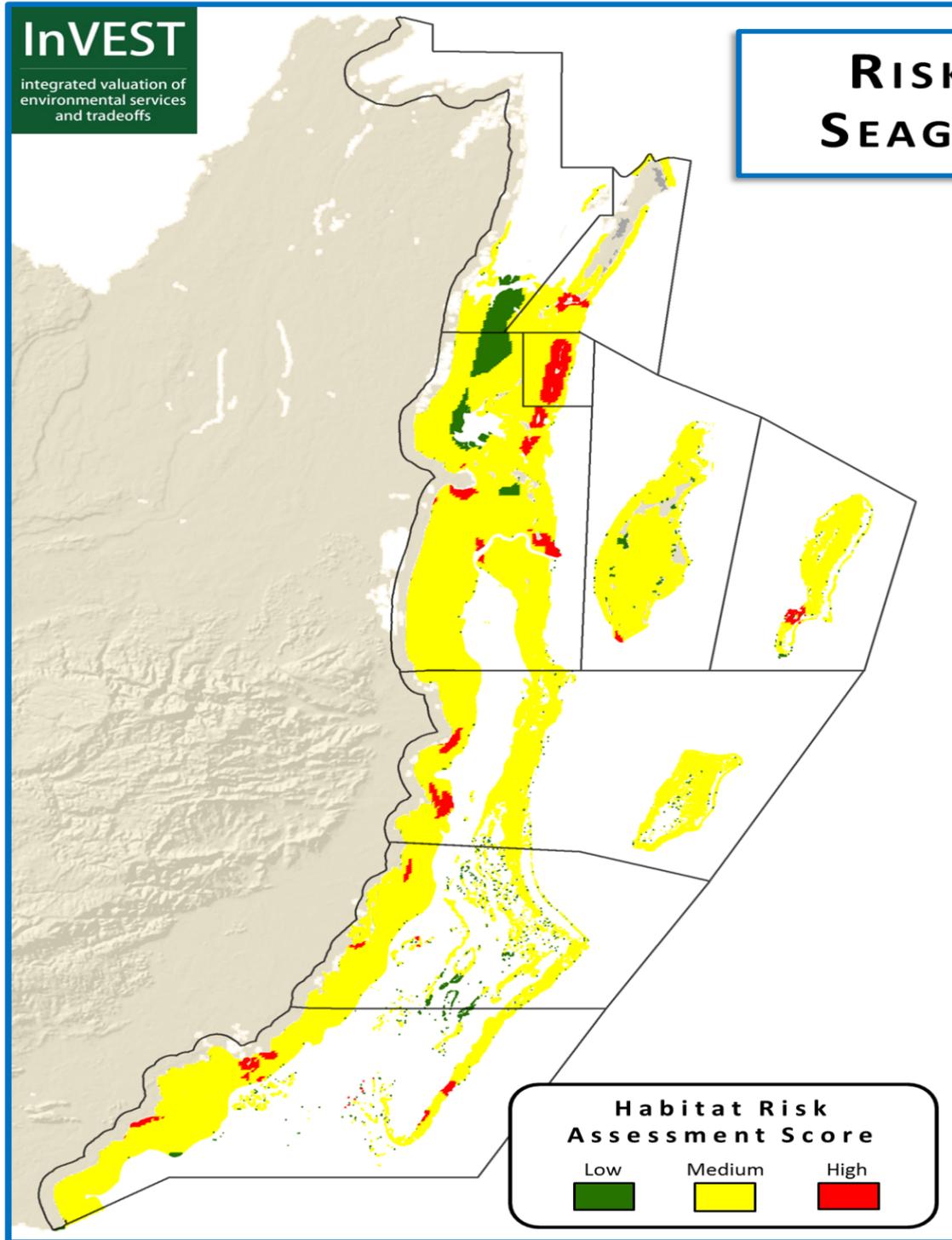


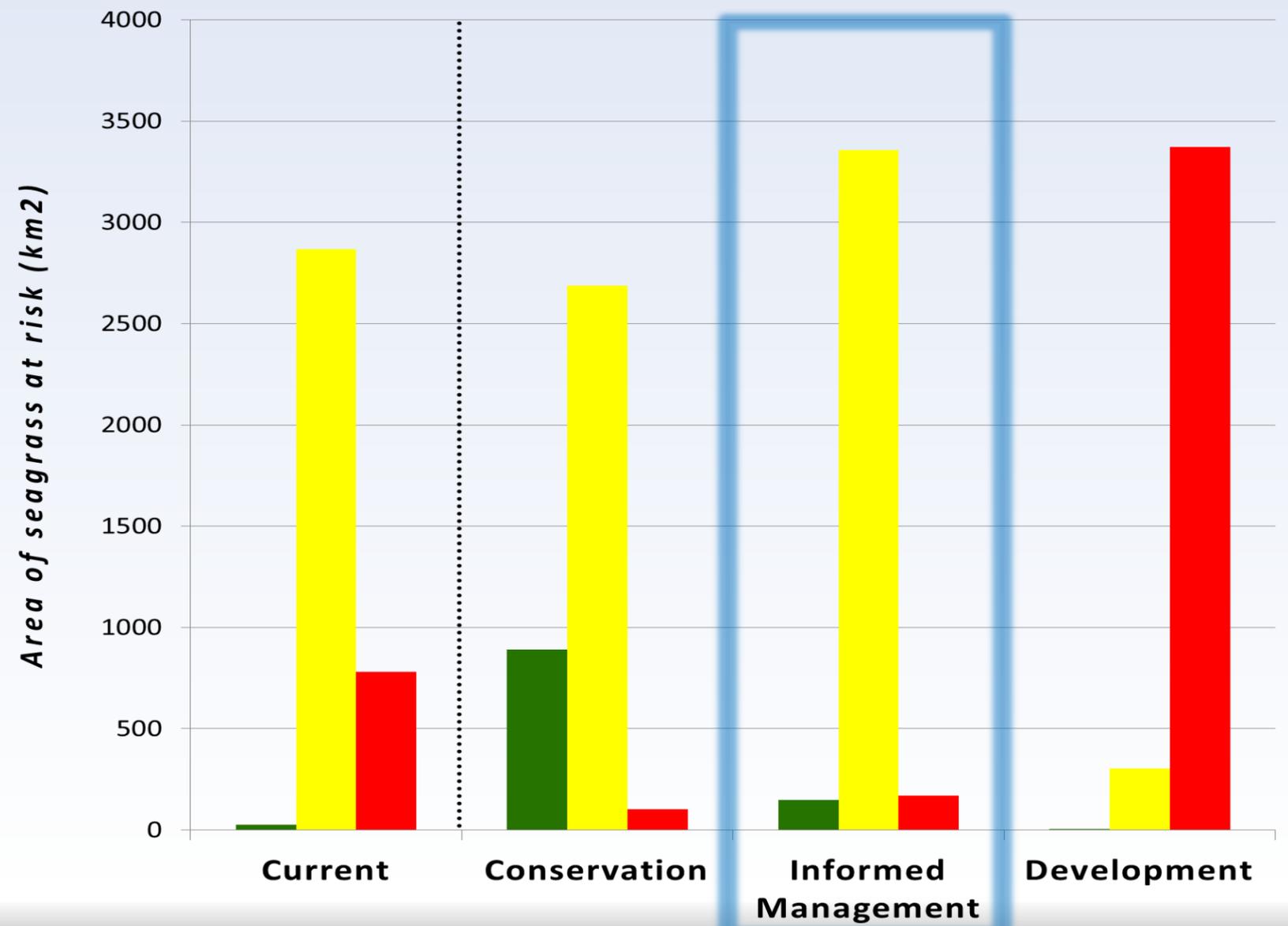
Figure 8: Area of Mangroves at Risk from Human Activities by Scenario

**RISK TO SEAGRASS**

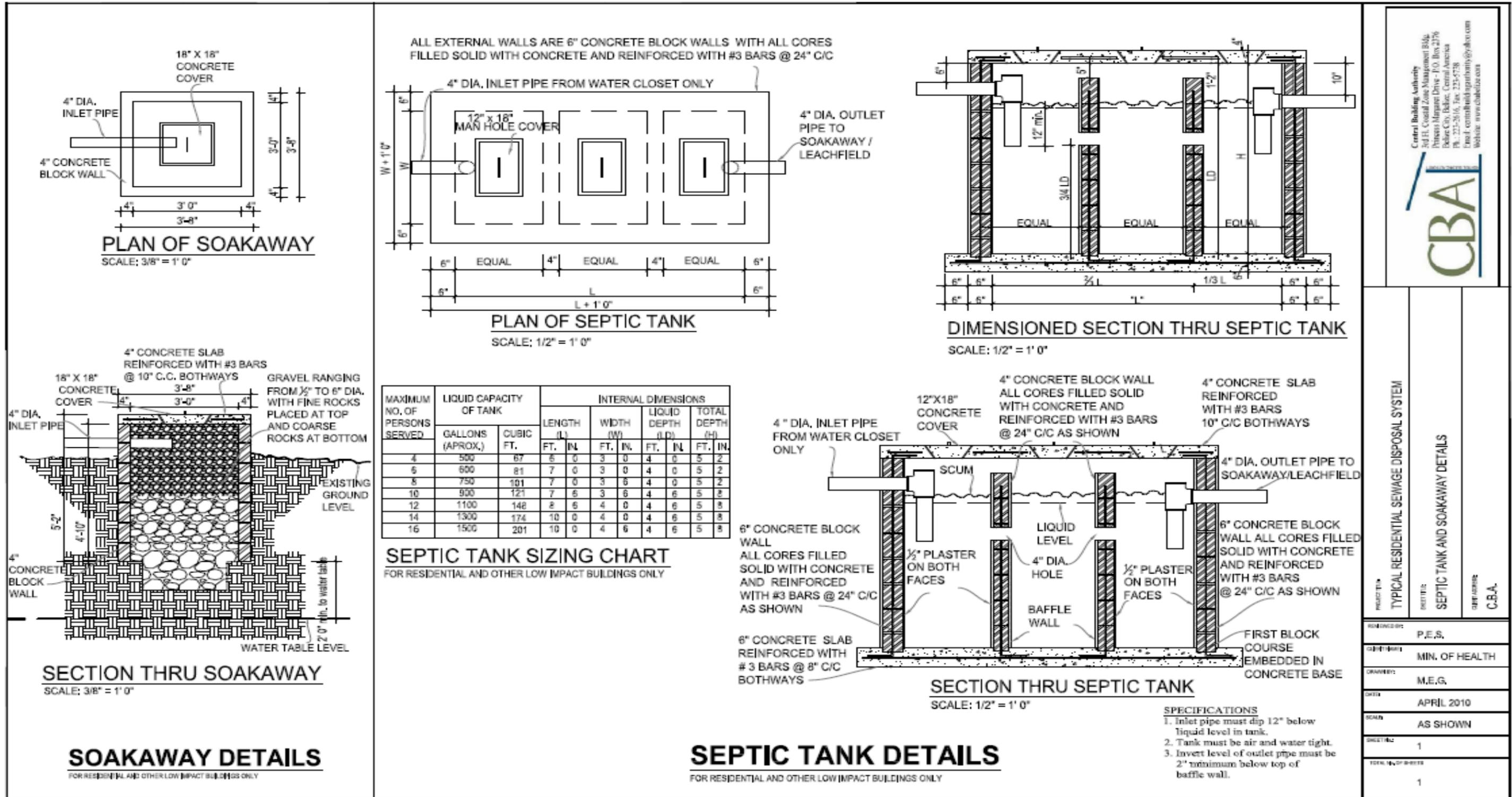


**INFORMED MANAGEMENT**

**Area of Seagrass at Risk to Human Activities by Scenario**



**Figure 9: Area of Seagrass at Risk from Human Activities by Scenario**



PROJECT TITLE: TYPICAL RESIDENTIAL SEWAGE DISPOSAL SYSTEM

DRAWN BY: SEPTIC TANK AND SOAKAWAY DETAILS

DATE: APRIL 2010

SCALE: AS SHOWN

PROJECT NO: 1

TOTAL NO. OF SHEETS: 1

DESIGNED BY: P.E.S.

CHECKED BY: MIN. OF HEALTH

DATE: APRIL 2010

SCALE: AS SHOWN

PROJECT NO: 1

TOTAL NO. OF SHEETS: 1

C.B.A.

Figure 10: Septic Tank and Soakaway Details for Residential and Low-Impact Buildings