DRAFT BELIZE INTEGRATED COASTAL ZONE MANAGEMENT (ICZM)PLAN 2025-2029

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The Belize National Integrated Coastal Zone Management Plan (2025-2029) was prepared in fulfilment of the Government of Belize's commitment to deliver Conservation Milestone 5 under the Belize Blue Bond for Ocean Conservation. The Coastal Zone Management Authority and Institute (CZMAI), in collaboration with the Environmental Hydraulics Institute of the University of Cantabria (IHCantabria), and the participation of a multiple national agencies and key stakeholders country wide, have developed this document. Financial support for the preparation of the document was provided by the Government Strategic Allocation funding mechanism created under the Belize Fund for a Sustainable Future ("the Belize Fund").

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FOREWORD

HON. Andre Perez

Minister of Blue Economy & Marine Conservation

EXECUTIVE SUMMARY

Belize's coastal zone is home to one of the world's longest coral reef systems—the Belize Barrier Reef—and diverse marine and coastal ecosystems that provide critical services supporting the livelihoods of over 40% of the population. These natural assets underpin key economic sectors such as fisheries, tourism, and other emerging Blue Economy activities. However, competing demands, environmental pressures, and climate change impacts pose significant challenges for sustainable coastal resource management.

This National Integrated Coastal Zone Management (ICZM) Plan builds upon Belize's existing Coastal Zone Management (CZM) Act (1998), the proposed updated CZM Act (2025), and the Draft ICZM Policy (2025). This ICZM Plan also builds on Belize's first National ICZM Plan endorsed by the Government in 2016. The Interim National ICZM Plan (2020-2025), which outlines key strategies for responding to evolving environmental, social, and economic dynamics relevant to Belize's coastal zone , was also critically important for the updating process.

This updated National ICZM Plan represents a comprehensive, science-informed roadmap for protecting and managing the country's invaluable coastal and marine resources A thorough diagnosis conducted for Belize's coastal zone identified critical strengths—including rich biodiversity, and active governance structures—alongside weaknesses such as environmental impacts from coastal developments and limited enforcement capacity. The SWOT analysis highlights opportunities in international partnerships, innovative management tools, and increased local involvement, while threats include coral reef degradation, climate hazards, and governance challenges.

To address these challenges, the ICZM Plan prioritizes seven strategic objectives:

1. Enhance inter-agency coordination to harmonize policies and strengthen enforcement.
2. Strengthen public participation of local communities and stakeholders.
3. Centralize and improve access to coastal data and information systems.
4. Develop capacities to monitor and analyze coastal processes and ecosystem services.
5. Apply the mitigation hierarchy and biodiversity offsets to reduce environmental impacts.
6. Increase human resources and technical capabilities within institutions.
7. Establish sustainable funding mechanisms to support long-term ICZM implementation.

Each objective is supported by targeted actions designed to ensure effective delivery. The ICZM Plan further defines critical institutional arrangements—particularly related to capacity building and sustainable financing—to enable successful implementation. A detailed implementation strategy guides the execution of actions with clear timelines, assigned responsibilities, and budget provisions. Complementing this, a robust monitoring and evaluation framework tracks progress, measures outcomes, and facilitates adaptive management to ensure continuous improvement.

By fostering collaboration among government agencies, communities, and stakeholders, the ICZM Plan seeks to safeguard coastal ecosystems while supporting economic development and resilience in the face of climate change. This commitment positions Belize to maintain its natural heritage and ensure sustainable prosperity for present and future generations.

OUTLINE

ACRONYMS

AC	Advisory Committee
API	Application Programming Interface
AR	Assessment Report
BBOP	Business and Biodiversity Offsets Programme
BDEPS	Blue Economy Development Policy and Strategy
BLA	Blue Loan Agreement
BMEP	Blue Maritime Economy Plan
BoD	Board of Directors
BSOP	Belize Sustainable Ocean Plan
CAC	Coastal Advisory Committees
CBD	Convention on Biological Diversity
CDEMA	Caribbean Disaster Emergency Management
CDM	Comprehensive Disaster Management
CFA	Conservation Funding Agreement
CPR	Coastal Planning Region
CRED	Centre for Research on the Epidemiology of Disasters
CRS	Coordinate Reference System
CZ	Coastal Zone
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Authority
CZMAC	Coastal Zone Management Advisory Council
CZMAI	Coastal Zone Management Authority and Institute
DOE	Department of the Environment
DRM	Disaster Risk Management
ECP	Environmental Clearance Process
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
GFDRR	Global Facility for Disaster Reduction and Recovery
GIS	Geographic Information Systems
GML	Geography Markup Language
GSDS	Growth and Sustainable Development Strategy
HRA	Habitat Risk Assessment
HWM	High Water Mark
ICZM	Integrated Coastal Zone Management
ID&M	Institutional Development and Management Consultants Limited
IFC	International Finance Corporation
IPCC	Intergovernmental Panel on Climate Change
IUU	Illegal, Unregulated, and Unreported
MSDI	Marine Spatial Data Infrastructure
MSP	Maritime Spatial Planning
NBSAP	National Biodiversity Strategy and Action Plan
NCRIP	National Climate Resilience Investment Plan

NDC	Nationally Determined Contribution
NDPBA	National Disaster Preparedness Baseline Assessment
NEMO	National Emergency Management Organization
NGO	Non-governmental organization
NPASP	National Protected Areas System Plan
NSTMP	National Sustainable Tourism Master Plan
OGC	Open Geospatial Consortium
PACT	Protected Areas Conservation Trust
PDNA	Post Disaster Needs Assessment
PSO	Priority Strategic Objective
RCP	Representative Concentration Pathways
RHI	Reef Health Index
SDGs	Sustainable Development Goals
SDI	Spatial Data Infrastructure
SIB	Statistical Institute of Belize
SLR	Sea Level Rise
SWOT	Strengths, Weaknesses, Opportunities and Threats
UNDRR	United Nations Office for Disaster Risk Reduction
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
WFS	Web Feature Service
WMS	Web Map Service
ZoI	Zone of Influence

GLOSSARY

Adaptation to Climate Change. The adjustment in natural or human systems in response to the effects of actual or expected climatic stimuli, which moderates harm or provides beneficial opportunities.

Biodiversity offsets: measurable conservation outcomes designed to compensate for adverse and unavoidable impacts of projects, in addition to prevention and mitigation measures already implemented. Biodiversity offsets are only appropriate for projects which have rigorously applied the mitigation hierarchy framework**.**

Blue Economy: is the sustainable use of ocean resources for economic growth, improved livelihoods, and jobs while preserving the health of ocean ecosystem (World Bank, 2017).

Climate resilient ICZM: is an ecosystem - based approach to the sustainable development of coasts that incorporates: assessment, maintenance and restoration of coastal ecosystem services, disaster risk management, climate change adaptation including policy reforms, physical solutions, behavioral campaigns and economic and financial tools for evidence - based decision making and investment (IDB, 2020).

Disaster Risk Management: Disaster risk management is the application of disaster risk reduction policies and strategies to prevent new disaster risk, reduce existing disaster risk and manage residual risk, contributing to the strengthening of resilience and reduction of disaster losses.

Exposure: denotes the presence of people, infrastructure, assets, or natural systems in areas likely to be affected by the hazard. Vulnerability and capacity relate to the characteristics of the exposed elements that may increase the susceptibility of being damaged by an event and the capacity of these exposed elements to anticipate, resist, and recover from the impacts (adapted from UNDRR, 2025).

Hazard: refers to natural events that can cause significant harm to people, assets, or the environment (adapted from UNDRR, 2025).

Integrated Coastal Zone Management: a dynamic process for the sustainable management and use of coastal zones, taking into account at the same time the fragility of coastal ecosystems and landscapes, the diversity of activities and uses, their interactions, the maritime orientation of certain activities and uses and their impact on both the marine and land parts (Protocol on ICZM in the Mediterranean, 2008).

Maritime Spatial Planning: is a public process that analyses and allocates the spatial and temporal distribution of human activities in marine areas. It seeks to achieve ecological, economic, and social objectives—typically defined through a participatory political process—to ensure the sustainable use of marine resources while protecting ecosystems (adapted from Ehler and Douvere, 2009; UNESCO-IOC/European Commission, 2023).

Mitigation hierarchy framework: decision-making framework to mitigate projects impacts involving a sequence of steps starting with the avoidance of impacts, followed by the minimization of inevitable impacts, on-site restoration and finally, where feasible and necessary, biodiversity offsets.

Risk: the concept of risk in the context of natural disasters is widely understood as the probability of harmful consequences or expected losses determined by a function of hazard, exposure, vulnerability and capacity (adapted from UNDRR, 2025).

1 SETTING THE SCENE FOR ICZM IN BELIZE

Belize's coastal and marine ecosystems are crucial to the country's environmental sustainability, economic prosperity, and social well-being. These ecosystems, which include coral reefs, mangroves, seagrass beds, estuaries, and coastal wetlands, provide essential services such as shoreline stabilization, carbon sequestration, fisheries, and tourism. Collectively, they contribute significantly to Belize's national economy and support the livelihoods of thousands of Belizeans. However, increasing human activities and the escalating impacts of climate change, are placing these ecosystems and economic activities at risk.

In response to these challenges, the need for an updated Integrated Coastal Zone Management (ICZM) Plan has emerged. The rising threats from climate change, habitat destruction due to unregulated coastal development, increased fishing pressure, and weaknesses in the enforcement of existing regulations require a comprehensive, adaptive management approach. The ICZM Plan aims to address these issues by providing a science-based, participatory framework for the sustainable management of Belize's coastal and marine resources.

This ICZM Plan focuses on strengthening coastal governance, promoting sustainable economic opportunities, and ensuring that local communities are actively involved in decision-making processes. Additionally, it seeks to align national coastal management strategies with international commitments, such as the United Nations Sustainable Development Goals (SDGs) and the Convention on Biological Diversity (CBD).

Furthermore, this ICZM Plan is a strategic tool to safeguard Belize's natural resources and ensure that future generations can continue to benefit from the rich resources of the country's coastal zone. By fostering collaboration among government agencies, local communities, and international partners, the ICZM Plan seeks to protect Belize's blue economy while promoting long-term sustainability.

This first section of the ICZM Plan presents the vision for ICZM in Belize, the process for developing the ICZM plan, the policy framework and the geographical scope of application.

1.1 INTRODUCTION TO THE ICZM PLAN

1.1.1 Vision statement

The vision statement for ICZM in Belize was defined based on the vision of the proposed Draft ICZM Policy (CZMAI, 2025) and the preliminary draft vision agreed upon by the members of the CZM Advisory Council Subcommittee. It also reflects the contributions collected through a participatory process involving key constituents who participated in the multi-stakeholder National ICZM Workshop held in Belize City on April 3, 2025. The following rational captures the guiding principles and aspirations that underpin the final vision. Accordingly, Belize's coastal zone is envisioned as one of resilience, sustainability and equity.

The aim is a coastal and marine environment in which ecosystems are safeguarded, restored and managed in harmony with thriving local communities and a dynamic, evidence-based blue

economy. By fostering a balance between conservation and development, we envision a prosperous and inclusive where biodiversity is abundant, marine resources are preserved, and the needs of present and future generations are met."

Based on this rationale, the vision for ICZM in Belize is:

"A sustainable coastal zone where healthy ecosystems support, and are supported by, thriving local communities and a vibrant, resilient blue economy for future generations".

1.1.2 Purpose and structure of the ICZM Plan

The ICZM Plan is a comprehensive framework that combines baseline data, national and regional strategies, and an action plan to guide sustainable coastal management across Belize's nine Coastal Planning Regions. Additionally, the ICZM Plan incorporates modelling results to support decision-making by identifying permissible activities and land uses within designated zones.

The ICZM Plan is structured around the ICZM planning cycle (Figure 1) beginning with an integrated diagnosis of the coastal area. This initial stage identifies key issues and management priorities that guide the subsequent planning phase. In this phase, targeted actions are defined to address the challenges highlighted in the diagnosis. Furthermore, the ICZM Plan defines the necessary institutional arrangements and an implementation roadmap to ensure the effective execution of proposed actions. It also establishes a robust monitoring and evaluation framework to measure the ICZM Plan's success and support adaptive management.

The overall structure of the ICZM Plan sets out specific strategies, priority actions and a phased implementation strategy, providing a coordinated and responsive approach to managing Belize's coastal and marine resources following the ICZM principles.

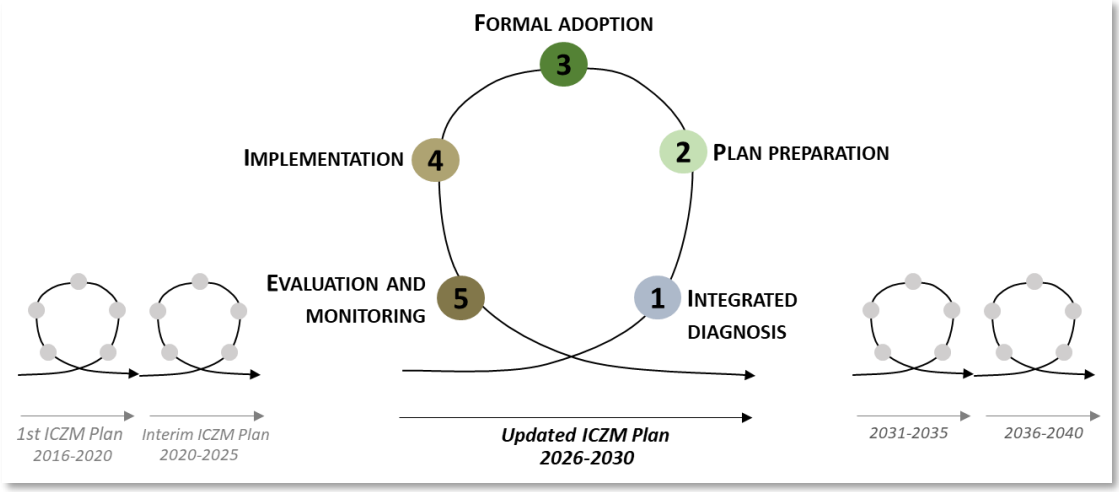


Figure 1. ICZM planning cycle in Belize. Adapted from GESAMP 1996.

1.1.3 ICZM Plan planning process

The development and update of the ICZM Plan has followed a comprehensive science-based and participatory approach.

The technical process included:

- review of the external evaluation report of the 2016 ICZM Plan (CZMAI, 2021), to ensure that that this updated version addresses key gaps and areas of improvement identified;
- literature review and data collection, giving special attention to the status of the coastal subsystems;
- Geographic Information Systems (GIS) analyses and modelling exercises;
- review of international best practices, including other ICZM Plans in Caribbean countries (Barragán (2009), CZMU-IHCantabria (2022), Cicin-Sain (1998), Halassani (2015), etc.).

Then, stakeholder engagement was essential to collect feedback, identify potential conflicts of interest regarding resource use, and ensure that the perspectives of various sectors were considered in the planning process. The participatory process included:

- organization of meetings and workshops with multiple agencies at national level, including DOE, Physical Planning Unit and Fisheries department, among others;
- online surveys and meetings with the CZMAI internal constituents (i.e. Board of Directors, Coastal Zone Management Advisory Council, Key Members of Staff) and other stakeholders;
- a first round of consultations in Coastal Planning Regions, coordinated through the Coastal Advisory Committees (CACs), to identify key challenges and concerns to inform the Regional Guidelines for the Coastal Planning Regions;
- a second round of consultations in Coastal Planning Regions with CACs to validate recommendations for the Coastal Planning Regions.

This process was crucial to ensure that the ICZM Plan was scientifically grounded and aligned with the needs and priorities of local communities and stakeholders.

Figure 2. First round of consultations - meeting with Ambergris Caye CAC (December 2024).

Figure 3. National Workshop (April, 2025)

1.2 POLICY CONTEXT FOR ICZM IN BELIZE

1.2.1 Legal and institutional framework for ICZM

The management of Belize's coastal zone is governed by an intricate network of regulatory and institutions that work in tandem to ensure sustainable, risk-resilient development.

The Draft ICZM Policy (CZMAI, 2025) constitutes the policy framework for ICZM in Belize. Its primary objective is to ensure the sustainable management of Belize's coastal resources by integrating environmental, governance, and socioeconomic considerations into planning and decision-making processes. The Draft ICZM Policy identifies key challenges and opportunities of the coastal zone of Belize, sets guiding principles and primary goals and objectives for the sustainable management of the coast. This policy document presents a set of management instruments for the effective governance of Belize's coastal zone, that are further detailed in this ICZM Plan.

Among the regulatory instruments, the Coastal Zone Management Act, Chapter 329, Substantive Laws of Belize, Revised Edition 2020 (hereafter the "CZM Act"), establishes the legal basis for managing Belize's coastal areas, ensuring balanced resource use while preserving coastal and marine ecosystems. In parallel to the elaboration of this ICZM Plan, the CZM Act is being revised and updated to ensure the alignment between regulatory and planning instruments.

The CZM Act, enacted in 1998, establishes the Coastal Zone Management Authority and Institute (CZMAI) as the leading agency for coordinating programs and activities for ICZM, defining its specific functions.

The CZMAI, established in 1998, is an autonomous statutory body, governed by a Board of Directors (BoD) and guided by technical advice from the Coastal Zone Management Advisory Council (CZMAC). The CZM Authority develops the ICZM Plan, advises other key institutions for coastal management, fosters regional and international collaboration, commissions research and monitoring, and maintains national coral reef and coastal water quality monitoring programs. Its scientific branch, the CZM Institute, conducts marine research, maintains a data center, supports training, and assists in ICZM Plan preparation. At the regional level, Coastal Advisory Committees (CACs) bring together municipalities, NGOs, producer associations, and government representatives to advise on coastal issues, recommend policy improvements, promote sustainable management, and support ICZM implementation (CZMAI, n.d.).

Under the CZM Act, CZMAI´s central mandate is the preparation of the ICZM Plan, following the process presented in Figure 4.

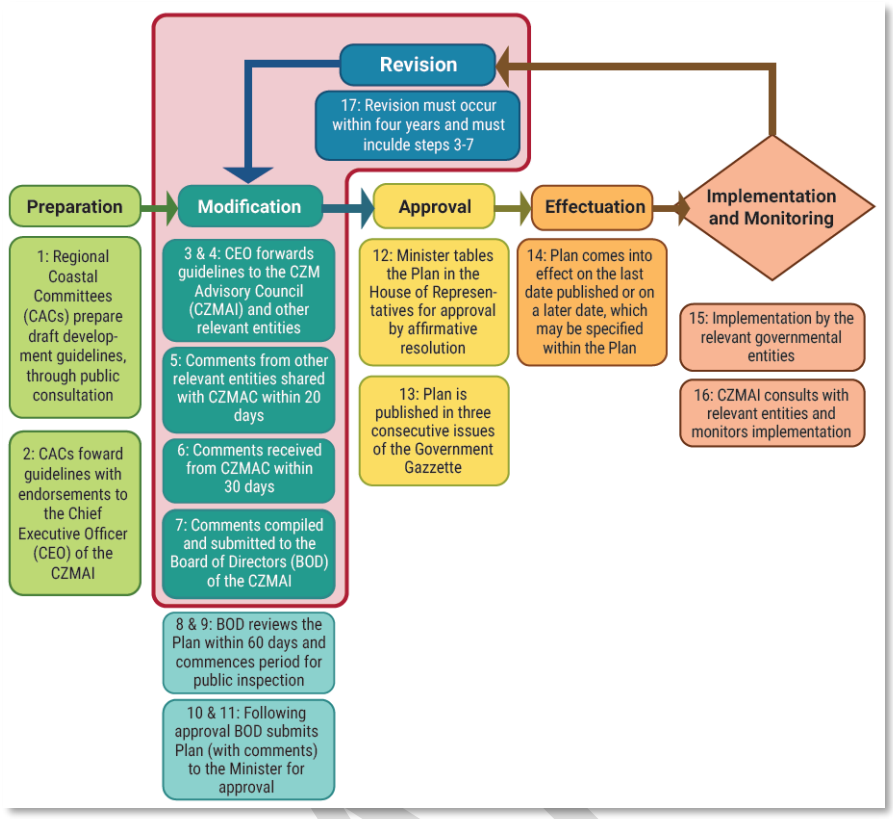


Figure 4. Summary of planning process, with steps for revision highlighted in red. Source: CZMAI, 2023.

The first ICZM Plan was endorsed by the government in 2016. While the CZM Act prescribes modifications to the plan every four years, the ICZM Plan was prepared with a fifteen-year vision of sustainable marine and coastal resources use and management. In 2023, CZMAI developed the Interim ICZM Plan (2020-2025), which constitutes a key foundational document for the development of this updated ICZM Plan.

1.2.2 Blue economy and Marine Spatial Planning framework

The Blue Loan and Conservation Funding Agreements

In 2021, the Government of Belize signed the Blue Loan Agreement (BLA) and Conservation Funding Agreement (CFA). The deal commonly referred to as "Blue Bonds" was essentially a debt for nature swap, where savings realized after paying off sovereign debt will be invested in marine conservation actions. The BLA and the CFA are contingent on Eight Primary Conservation Commitments/Targets and an agreed payment schedule to be realized by the Government of Belize by the 8th anniversary of the Agreements. The Belize Fund for a Sustainable Future was established to manage the funds that will be invested in marine conservation, more specifically, the resources necessary to support Belize's successful delivery of the Eight Primary Conservation Commitments.

The CZMAI plays a major role in the delivery of some of these commitments, most of which are centered around the delivery of the ICZM Policy, this updated ICZM Plan, the revised CZM Act and Regulations and the elaboration of the MSP policy, as part of the Belize Sustainable Ocean Plan (BSOP).

The Marine Spatial Planning process for the development the BSOP

The BSOP is Belize's plan for MSP, designed to guide the sustainable use, protection, and development of the country's marine resources. Led by the CZMAI, the BSOP is a central component of Belize's conservation commitments under the 2021 BLA and provides a robust policy and institutional basis for advancing MSP. These initiatives have laid the groundwork for the implementation of legal and governance structures, stakeholder engagement strategies, and conservation targets. Notably, as of October 2024, informed by the MSP process, up to 25% of Belize's ocean space has been designated as medium Biodiversity Protection Zones. The BSOP outlines the goal of designating up to 30% of Belize's ocean area as Biodiversity Protection Zones, and the delimitation of the ocean space where permissible activities can be lawfully carried out, by 2026. The BSOP process is inclusive and participatory, involving over 1,500 stakeholders through public consultations, community meetings, and surveys across coastal communities. This engagement ensures that the BSOP reflects the diverse interests and knowledge of Belize's population.

The link between the ICZM and MSP processes

ICZM and MSP are complementary approaches which, when effectively integrated, promote holistic management of coastal and marine environments. ICZM is a dynamic, continuous, and iterative process designed to promote sustainable management of coastal zones, addressing both terrestrial and marine components. It focuses on harmonizing the interests of various stakeholders, including local communities, industries, and governmental agencies, to achieve balanced development and conservation objectives. MSP, on the other hand, is a public process of analysing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives. It emphasizes the spatial allocation of marine uses, ensuring that activities such as fishing, shipping, and conservation occur in designated zones to minimize conflicts and environmental impacts.

The integration/complementarity of ICZM and MSP is essential due to the interconnectedness of land and sea, avoiding overlapping functions and promoting synergies. While ICZM plays a coordinating role, promoting coordination between public policies and the participation of different actors, the MSP complements this approach by establishing, thought a participatory process, specific zones for different uses and activities in the marine environment. This integration ensures that land-based activities are harmonized with marine uses, promoting a holistic approach to coastal and marine management.

In terms of jurisdiction and coordination, ICZM typically operates at local and regional levels, involving local governments and stakeholders in decision-making processes. MSP often functions at national or broader regional scales, requiring coordination among various governmental agencies and sectors. The complementary nature of ICZM and MSP allows for a comprehensive governance structure where ICZM addresses immediate coastal issues, while MSP provides a structured vision for sustainable ocean use.

	ICZM	MSP	COMPLEMENTARITIES / LINKAGES
SCOPE	Focuses on **both terrestrial and marine** components of coastal zones.	Focuses specifically on **marine areas**.	Together they address the **land-sea interface**, ensuring integration of land-based and marine activities.
PURPOSE	Promotes **sustainable management** of coastal zones through coordination and balancing of development and conservation.	**Allocates spatial and temporal distribution** of marine uses to minimize conflicts and achieve sustainability.	MSP gives spatial structure to the sustainability goals and coordination promoted by ICZM.
APPROACH	A **dynamic, continuous, and iterative** process.	A **public and participatory planning** process.	MSP operationalizes ICZM's broader policy goals through spatial planning.
STAKEHOLDER INVOLVEMENT	Emphasizes **harmonizing interests** of multiple stakeholders including local communities.	Involves **stakeholders in spatial planning** to designate zones for activities.	Both are **participatory** and enhance governance through inclusive processes.
MAIN FUNCTIONS	**Coordinates policies and actors**, aiming to reduce conflicts and enhance sustainable use of coastal resources.	**Designates specific zones** for marine uses (e.g., fishing, conservation, shipping).	ICZM sets the coordination framework; MSP implements spatially distinct uses.
JURISDICTION	Operates at national and Coastal Planning Regions.	Functions at **national or broader regional levels**, involving various sectors and ministries.	Multi-level coordination is enhanced when ICZM and MSP are implemented in a complementary fashion.
TEMPORAL FOCUS	Ongoing and responsive to **long-term and short-term** coastal challenges.	Plans for **medium- to long-term** spatial arrangements of marine activities.	Temporal planning by MSP benefits from ICZM's adaptive, ongoing process.
KEY OUTPUT	**Strategic and policy frameworks**, plans, and actions integrating various sectoral interests.	**Marine zoning plans**, maps, and regulations specifying use areas.	ICZM provides the context and strategy; MSP provides the spatial tools to realize that strategy.
LIMITATIONS (WHEN USED ALONE)	May lack **spatial specificity** for marine use conflicts.	May not adequately consider **land-based influences** or involve local coordination mechanisms.	Integration is essential to **avoid overlaps**, fill gaps, and ensure coherent management across land and sea.

Table 1. Complementarities/linkages between ICZM and MSP.

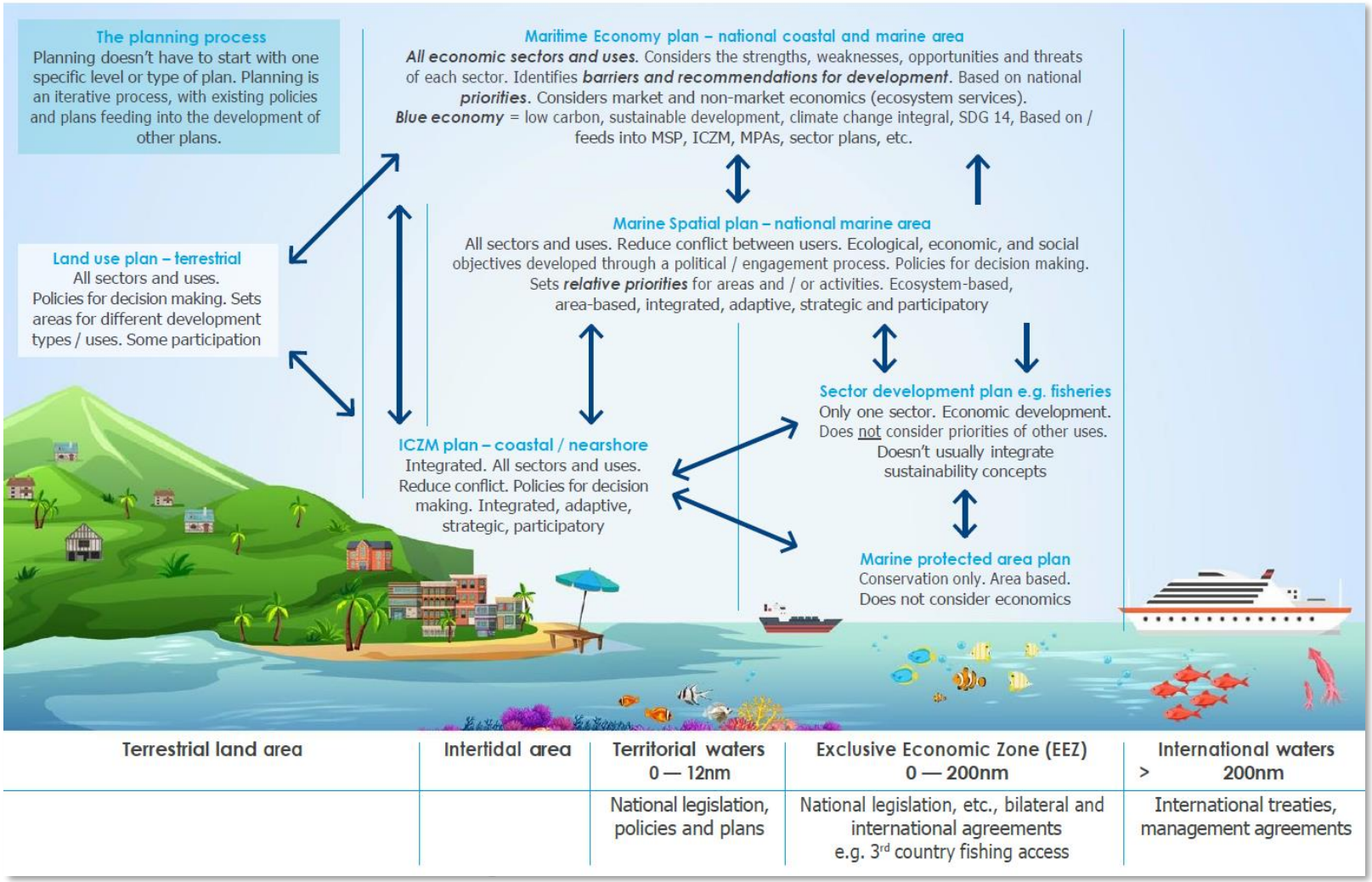


Figure 5 Types of marine plans and how they relate to each other. Source: Ministry of and Blue Economy and Civil Aviation, 2022.

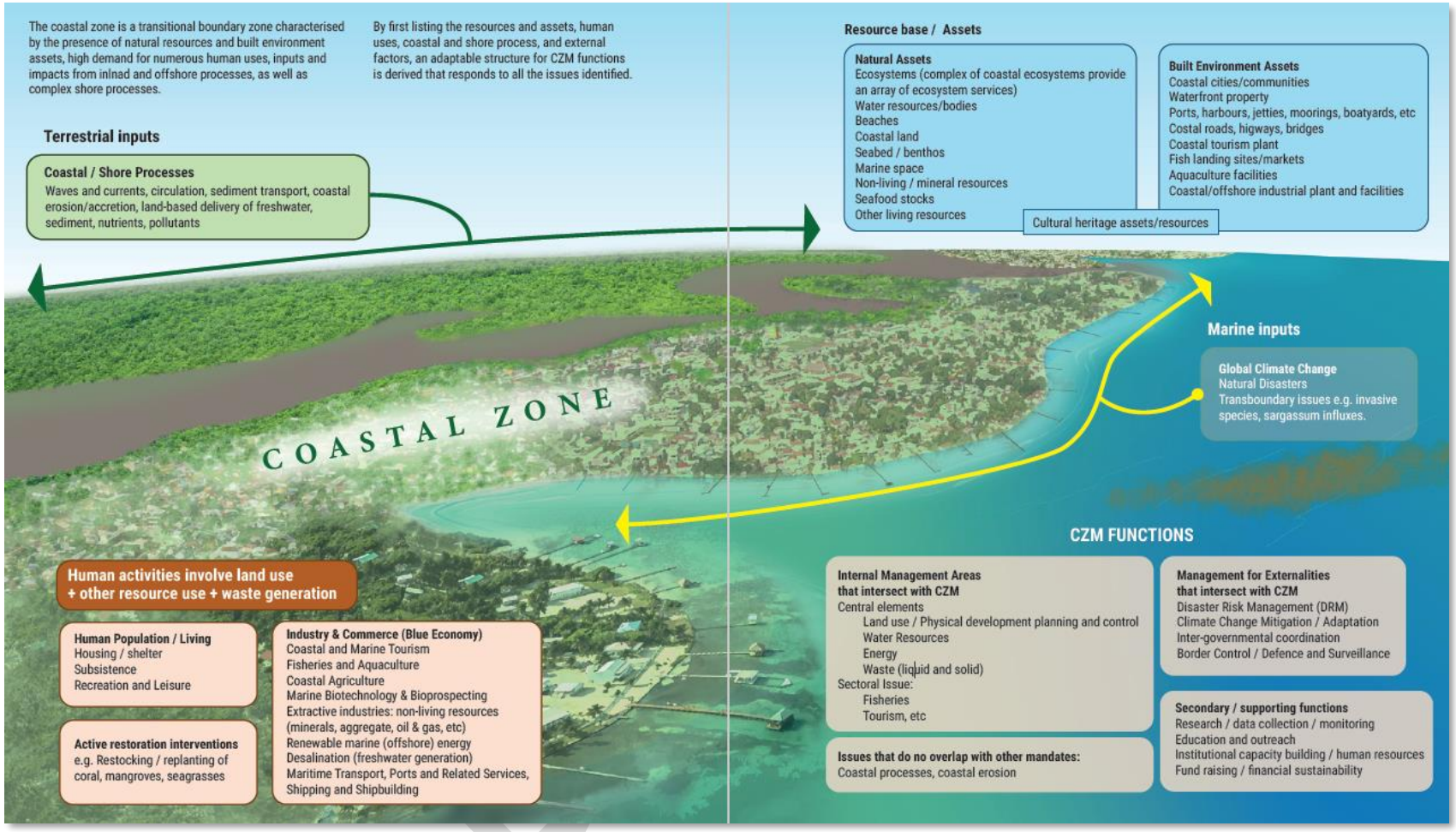


Figure 6. Draft Proposed Management Framework for coastal zone management in Belize. Source: CZMAI, 2023.

1.2.3 National sectoral policies

The ICZM Plan aligns with key and national and international policies to ensure sustainable coastal and marine management, summarized in the following paragraphs:

Blue Economy and Marine Management:

- The *#PlanBelize Medium Term Development Strategy (2022-2026)* is in line with ICZM principles, as it promotes a balance between economic development and natural resource protection, while addressing climate change adaptation and good governance. In terms of environmental protection, it recognizes Belize's transition to green and blue economies, and the protection of its natural resources and biodiversity as a priority. This includes improving the management of coastal, marine, forestry, biodiversity and water resources, as well as addressing issues such as waste management, pollution and climate change.

- The *Belize Blue Economy Development Policy, Strategy and Implementation Plan (2022-2027)* promotes an integrated, multisectoral approach to ocean management, emphasizing MSP, ecosystem-based management, climate adaptation, and financial tools like blue bonds.

- The *Blue Maritime Economy Plan* (Ministry of and Blue Economy and Civil Aviation, 2022) supports economic growth, job creation, and climate resilience across traditional sectors like fisheries and tourism, as well as emerging industries such as offshore renewable energy and marine biotechnology.

Climate Resilience and Environmental Protection:

- The *National Climate Resilience Investment Plan (NCRIP)* enhances resilience to extreme weather, emphasizing infrastructure strengthening, sustainable development, and disaster risk management. Similarly, the *National Climate Change Policy, Strategy, and Master Plan* focuses on protecting coastal ecosystems as natural barriers against climate impacts and aligns with international frameworks like the UNFCCC.

Tourism and Land Use:

- The *Draft Updated National Land Use Policy (2025-2035)* addresses climate resilience, resource management, and ecosystem preservation, supporting ICZM to prevent unplanned coastal development.
- The revised *National Sustainable Tourism Master Plan (NSTMP) 2030* refines tourism policies, destination-specific strategies, infrastructure, and resource management to enhance Belize's global competitiveness.
- The *Fisheries Policy, Strategy, and Action Plan 2020-2024* prioritizes an ecosystem-based approach and precautionary principles, focusing on designation of Fisheries Priority Areas, sustainable fisheries management, capacity building, and blue economy integration.
- Additional relevant policies, plans and guidelines that the Draft ICZM Policy and ICZM Plan align with include the *Growth and Sustainable Development Strategy (GSDS), 2016-2019,* the *National Guidelines for Subdivision and Consolidation of Land in Belize,* the *National Cruise Tourism Policy for Belize,* the *National Integrated Water Resources*

Management Policy (Including Climate Change) for Belize, the *Horizon 2030 National Development Framework for Belize 2010-2030* and the *National Protected Areas System Plan (NPASP).*

International commitments:

Additionally, Belize is a signatory member of several international conventions regarding climate change adaptation, sustainable coastal development and biodiversity conservation. The *Belize Mangrove Alliance Action Plan (2022-2027)*, part of the Global Mangrove Alliance, promotes mangrove conservation for climate adaptation and coastal resilience through governance, community engagement, and nature-based solutions. The *Updated Nationally Determined Contribution (NDC)* under the UNFCCC enhances the country's climate goals by incorporating more robust data and projections, assessing key areas like land use, emissions reductions, and nature-based solutions. It reflects a commitment to increasing climate ambition, aligning with long-term strategies for net-zero emissions by 2050, and supporting sustainable development across all sectors. The *National Biodiversity Strategy and Action Plan (NBSAP)* supports the Convention on Biological Diversity (CBD) by protecting ecosystems, mainstreaming biodiversity, and promoting sustainable resource use.

1.3 GEOGRAPHIC SCOPE OF THE ICZM PLAN

The proposed updated Draft CZM Act (under review, 2025) defines the coastal zone as the land area extending 3 kilometers inland from the high-water mark (HWM), the cayes and the marine area extending to the territorial sea boundary (see Figure 7). That is, the coastal zone encompasses the total area of the nine Coastal Planning Regions, including their land and marine territories. This definition includes, for the first time, a stretch of continental land in which the main coastal features, ecosystems and communities are included. The inclusion of this strip of land allows land-sea interactions to be considered in the management of the coast, and is better aligned with ICZM principles.

In addition, the updated draft CZM Act establishes a Zone of Influence (ZoI), acknowledging the interconnectedness of coastal and inland systems and the importance of considering key coastal hazards and the impacts of climate change in coastal management. The ZoI varies in extent across different regions due to the variation of coastal characteristics and topography. In the Northern Region, the ZoI extends 20 kilometers inland from the mean HWM, while in the Central, South Northern, South Central, and Southern Regions, it extends 10 kilometers inland. The ZoI ensures adequate coverage of most wetlands and their proximity to agricultural activities, mangroves, and flood-prone areas associated with a 100-year return period and IPCC AR5 RCP8.5 sea level rise (SLR) projections by 2050 (0.275 m).

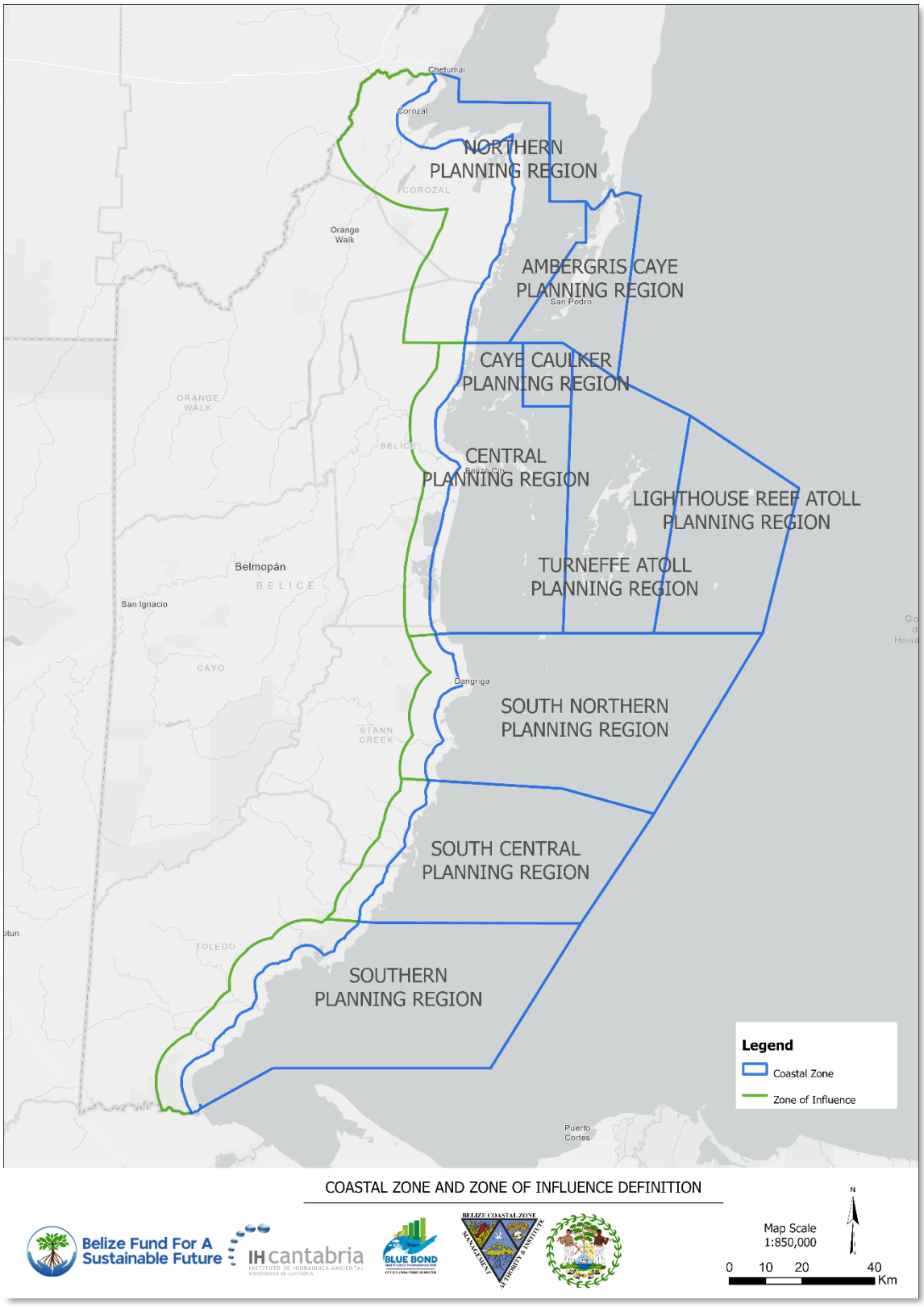


Figure 7. Delimitation of the Coastal Zone (blue line) and the Zone of Influence (green line), as per the proposed definition in the Draft Updated CZM Act (2025).

2 INTEGRATED DIAGNOSIS OF BELIZE COASTAL ZONE

The update of the ICZM Plan requires setting the baseline conditions of the coastal zone and identifying its managerial Key Issues. The methodological approach followed during the diagnosis phase aims at understanding the functioning of the complex coastal system as a whole to avoid sectoral biases.

Four main subsystems were used to compiled the information to assembly the system, i.e.: (i) the natural environment, (ii) the socioeconomic context, (iii) disaster risk management (DRM) and climate change adaptation, and (iv) the governance for ICZM.

Once the system was represented, the use of a SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis contributes to interpret it holistically and identify a set of Key Issues to consider when planning. These Key Issues for coastal management have been identified through combining technical and participatory approaches. The following sections clarify this process and its outcomes.

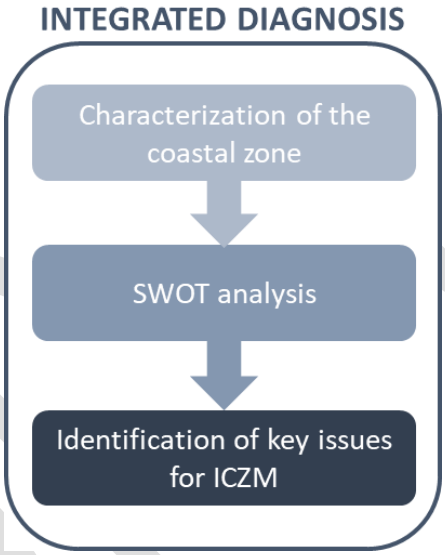


Figure 8. Steps of the Integrated diagnosis

2.1 CHARACTERISTICS OF THE COASTAL ZONE

2.1.1 The natural environment

Belize's coastal zone is a biologically rich environment that sustains diverse ecosystems, including coral reefs, seagrass beds, mangrove forests and estuaries and coastal lagoons. These habitats provide essential ecosystem services such as fisheries, coastal protection, carbon sequestration, and tourism. The Belize Barrier Reef Reserve System, a UNESCO World Heritage Site, is the largest barrier reef in the Western Hemisphere and a key economic driver for fisheries and tourism. Despite their ecological and economic value and their blue carbon potential to contribute to Belize´s climate change adaptation and mitigation efforts, Belize's coastal ecosystems face significant threats from climate change, coastal development, habitat degradation, pollution and high fishing pressure.

This chapter examines the ecosystem services provided by Belize's coastal habitats and presents an updated assessment of their risk levels using the Habitat Risk Assessment (HRA) tool from the InVEST model. This tool is very useful in environmental management, as it evaluates the risk to each habitat from various human threats, considering both the exposure and the consequences of the impact. Some of its applications include:

- Identification of sensitive areas: It helps to map vulnerable habitats that could be affected by an operation or construction, supporting decision-making on where to locate projects to minimize their impacts.
- Assessment of different human threats: It supports decision-making when there are multiple sources of pressure whose effects may be cumulative.
- Prioritization of mitigation actions: Spatial knowledge of impact risk (probability and magnitude) helps guide the most effective mitigation and compensation measures.
- Coastal planning: It facilitates the identification of areas with high ecological value that should be protected, for example, by including them in Marine Protected Areas (MPAs).

Coral Reefs

The Belize Barrier Reef System stretches approximately 300 kilometers along the coast, forming part of the Mesoamerican Barrier Reef System. It provides habitat for over 500 fish species, invertebrates, and marine mammals, with hard corals like *Acropora palmata* (Elkhorn coral) and *Acropora cervicornis* (Staghorn coral) forming its structural foundation.

Ecologically, they support marine biodiversity, function as nurseries for fish, and play a role in regulating oceanic carbon cycles. The reef provides essential ecosystem services, which include the provision of habitat for commercially valuable fish (such as groupers, snappers, and lobsters), opportunities for recreation and tourism, and protection from coastal erosion and hurricanes (Cooper et al. 2009), thereby supporting a wide range of marine species. The coral reef provide and sustain essential ecosystem services such as diving, snorkeling, and sport fishing industries, generating employment and revenue, food security, and cultural identity.

Despite their significance, Belize's coral reefs are under considerable stress from climate change impacts, habitat degradation, coastal development, and overfishing. According to the 2024 Mesoamerican Reef Report Card by the Healthy Reefs Initiative (McField, 2024), Belize's Reef Health Index (RHI) was rated at 2.5 ("poor"), down from 3.0 ("fair") in 2018. The RHI is a composite measure based on coral cover, macroalgae presence, herbivorous fish biomass, and commercial fish abundance. The 2022 Report Card (McField, 2022) attributed the downward trend primarily to a reduction in fish populations, a key indicator of reef resilience and ecosystem balance.

Subregion *Nombre de la Subregión*	2018 Report Card *Reporte*	2020 Report Card *Reporte*	2022 Report Card *Reporte*	2024 Report Card *Reporte*	Live Coral (% cover) *Corales Vivos (% cobertura)*	Fleshy Macroalgae (% cover) *Macroalgas Carnosas (% cobertura)*	Herbivorous Fish (g/100m²) *Peces Herbívoros (g/100m²)*	Commercial Fish (g/100m²) *Peces Comerciales (g/100m²)*
BELIZE *BELICE*	**2.8**	**3.0**	**2.0**	**2.5**	**15**	**17**	**2528**	**791**
North Barrier Complex *Norte de la Barrera*	2.8	2.3	2.3	2.3	**8**	**28**	**3025**	**504**
Central Barrier Complex *Barrera Central*	1.8	3.0	2.5	2.3	**15**	**16**	**1657**	**447**
South Barrier Complex *Sur de la Barrera*	3.8	3.3	1.8	3.0	**18**	**13**	**4214**	**710**
Turneffe *Turneffe*	2.5	2.5	2.5	3.0	**17**	**10**	**1948**	**946**
Lighthouse Reef *Arrecife Lighthouse*	3.3	3.0	2.0	2.8	**11**	**21**	**1604**	**1352**
Glover's Reef *Arrecife Glovers*	2.3	2.8	2.0	3.3	**25**	**18**	**4802**	**687**

Table 2. Evolution of RHI in Belize. Extracted from the Mesoamerican Reef Report Card (M. McField, 2024).

Seagrass Beds

Seagrass meadows thrive in shallow coastal waters and sheltered lagoons, composed of species such as *Thalassia testudinum* (turtle grass) and *Syringodium filiforme* (manatee grass). They are critical nursery habitats for juvenile fish, crustaceans, supporting fisheries, while also stabilizing sediments, preventing erosion, improving water quality and contributing to carbon sequestration. Key species such as the West Indian manatee and green sea turtles rely on them as feeding grounds.

Although data on seagrass in Belize is limited, there are comprehensive studies on habitat distribution and potential carbon sequestration in Turneffe Atoll, including those by Price et al. (2022), Carpenter (2022) and Felgate et al (2024).

The primary threats to seagrass in Belize are coastal pollution, agriculture and aquaculture, sediment inputs from deforestation, dredging and hardening, coastal development and marine transportation.

Mangrove Forests

Covering approximately 77,000 Ha, mangroves along Belize's coastline include species such as *Rhizophora mangle* (Red mangrove) and *Avicennia germinans* (Black mangrove).

A national economic valuation study carried out by World Resources Institute found that Belize's mangroves contribute a value approximately equivalent to 25% of Belize's annual gross domestic product, through the provision of nursery areas for fish and invertebrates, habitat for wildlife, and physical buffers against pollution, extreme weather and coastal erosion (Cooper *et al*. 2009).

Because of the essential role that mangrove forest play in protecting the coast against coastal flooding and extreme events, provide natural landscapes for tourism and nursery and breeding grounds for fisheries, stakeholders have expressed their concerns for the clearance and destruction of these forests.

Estuaries, coastal lagoons and beaches

Other coastal ecosystems are also essential for supporting biodiversity and wellbeing of Belizean communities, including estuaries, coastal lagoons and beaches.

Belize's estuaries and lagoons, including Placencia Lagoon and Corozal Bay, are transition zones where freshwater and saltwater mix, supporting key species such as tarpon, snook, and manatees, as well as migratory birds. These ecosystems filter sediments and nutrients, improving water quality and preventing hypoxia.

Estuaries support commercial fisheries, aquaculture, and eco-tourism and have an important function in reducing flood risks, filtering pollutants and providing fish nurseries.

Beaches provide essential coastal protection services against coastal hazards, are key for tourism activities and constitute key ecosystem for many species, such as turtles.

However, the information available about these systems is limited, compared with the reef and mangrove ecosystems, are it is recommended to develop specific programs for addressing this gap.

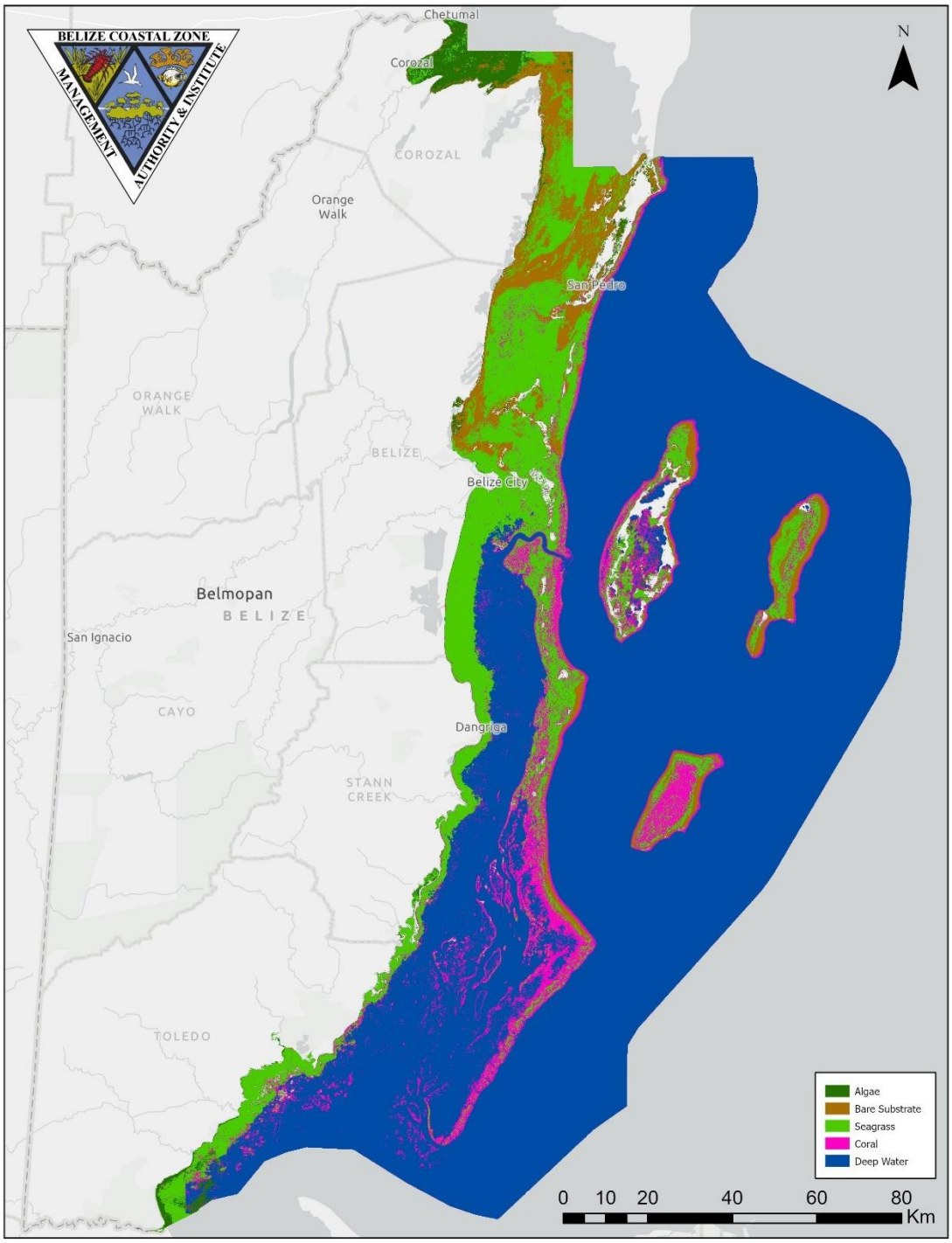


Figure 9. The Belize national marine habitat map 2021 (CZMAI, 2023)

Updated Habitat Risk Assessment

The HRA InVEST tool has been used to evaluate the cumulative risk posed to coastal and marine habitats by anthropogenic stressors. Building upon the ecosystem-based assessment presented in Belize's ICZM 2016 Plan and Interim ICZM Plan 2020-2025, potential threats to coral reef, seagrass, and mangrove ecosystems are analyzed with data updated to 2025 (current scenario).

These ecosystems serve as primary habitats for numerous ecologically and economically important species while also providing a range of benefits to people. The model incorporates nine human activities and environmental stressors that may affect the habitats of interest as outlined below:

- **Agricultural Runoff**: The Agricultural Runoff human activity zone represents the surface runoff from farmland outflows such as crops, orchards, ranch land used for the planting of agricultural crops and the rearing of animals (CZMAI, 2016).
- **Aquaculture**: The Aquaculture human use zone represents the farm ponds used for breeding, rearing and harvesting of shellfish and fish such as shrimp, cobia, tilapia. Marine Protected Areas are excluded.
- **Coastal development** (infrastructure): The Coastal Development human use zone represents the human-induced changes of the landscape such as human settlements, infrastructures and economic activities for purposes such as housing, land clearing, and structures for industry, commerce and community development.
- **Dredging**: The Dredging human activity zone represents areas for the excavation of bottom sediments for the purposes such as maintenance of waterways, ports beach renourishment, and minerals for the construction industry. Marine Protected Areas are excluded.
- **Fishing**: The Fishing human activity zone represents the 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. Marine Protected Areas are excluded.
- **Recreation**: The Marine Recreation human activity zone represents marine areas especially suited to swimming, snorkelling, diving, kayaking and other water sports for the purpose of tourism revenue generation, recreational pursuits, and areas identified for aesthetic beauty.
- **Marine transportation**: The marine transportation activity zone represents marine areas that are delineated for the use of watercraft to transport people, goods and cargo between multiple destinations.
- **Flooding**: The flooded area is obtained from Martínez, J. et al. (2022), considering the current scenario and a return period of 10 years.

Results were classified for each habitat as high, medium, low, and no risk (Figure), according to the categorization scheme of the HRA tool. The first observed result is that most habitats are classified as medium or high risk for the current scenario, although for mangrove habitats there are also significant zones with low risk. Coral reefs showed a medium (52%) and high (48%) risk along the coast, distributed in a different way among the regions. The primary stressors affecting this habitat are marine transportation and recreation, followed by agricultural runoff and fishing. Among regions, the ones with a higher percentage of coral reefs at high risk are Central Region (87%) and Caye Caulker (83%), although in extension the higher areas are found in the Southern Region (308.75 km^2) and South Central Region (307.5 km^2) (Figure).

Regarding mangrove habitats, along the entire coast the majority of the habitat is under medium risk (49%). A very small area (0.7%) is at no risk, primarily in the Southern and Northern Regions. The primary stressors contributing to higher risk levels are marine transportation and

development (infrastructure). There are significant regional differences: in Caye Caulker, 91% of the mangrove habitat is under high risk; however, in Lighthouse Reef Atoll and Turneffe Atoll, none of these habitats face high risk. Additionally, Turneffe Atoll is notable for its high percentage of areas at low risk (72%). The largest expanse of mangroves is found in the Central Region (360.5 km²), where most of the area is classified as medium risk (200.75 km²).

Finally, seagrass beds are predominantly at medium risk (79%), while only 0.006% of the area is at no risk (Southern Region) or low risk (Northern Region). Aquaculture stands out as the stressor with the greatest impact, followed by marine transportation and agricultural runoff, which also have significant effects. Caye Caulker and Ambergris Caye are the regions with the largest proportion of high-risk areas (43% and 30%, respectively). In contrast, Lighthouse Reef Atoll and the Northern Region have most of their area classified as medium risk (95% and 91%, respectively). In terms of spatial extent, Turneffe Atoll has a large area at low risk (140.5 km²), while the Central Region has a significant high-risk area (81 km²).

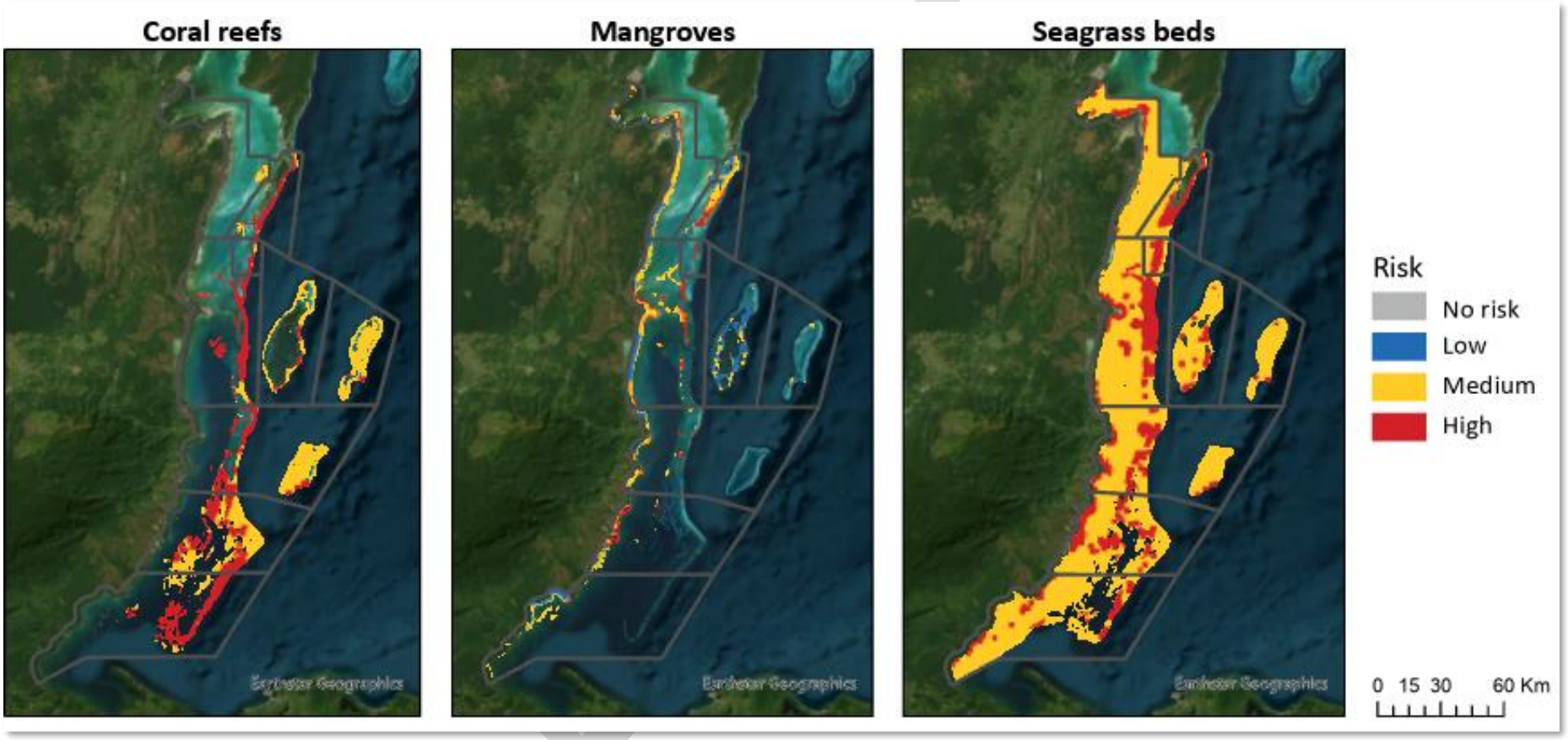


Figure 10. Coral Reef, mangroves and seagrass beds classified as high, medium and low risk for current human activity (2025).

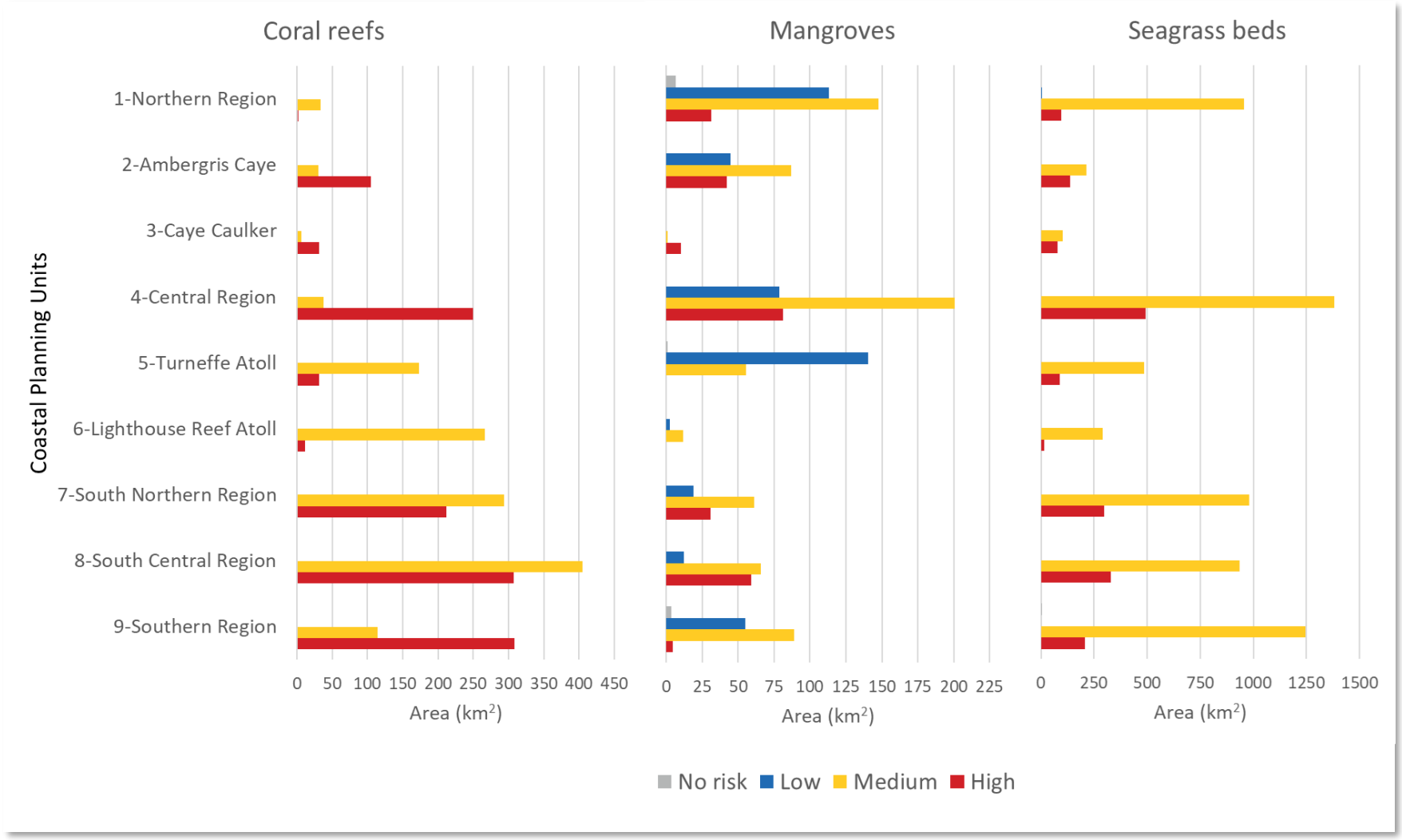


Figure 11. Graph showing coral Reef, mangroves and seagrass beds habitat cover (km2) at high, medium and low risk for current human activity (2025).

These results can be used to identify areas at the highest relative risk of degradation, as well as the primary drivers of risk along the coast of Belize. The model can assist in prioritizing areas for conservation, evaluating management strategies, and informing the design and configuration of spatial plans. The results can be applied in various decision-making contexts, such as:

- Identifying high-risk areas to prioritize management or restoration efforts.
- Using high-risk areas to constrain decision-making when determining the placement of additional uses.
- Utilizing risk plots to gain insight into the most impactful activities and the management strategies that will be most effective.

To support these management decisions, the specific risk posed by each stressor to each habitat is detailed in Annex 1.

In any case, it has to be noticed that the results of the HRA should be interpreted with caution. The classification of habitats into high, medium low or not risk depends extremely on the quality of stressors and habitat distribution information. Additionally, the parameters used as inputs for the model (e.g., risk equation, decay equation, or criteria scores for the effects of each stressor on each habitat) can influence the identified areas at risk. Therefore, while the model outputs provide a valuable tool for coastal management, they should not be assumed to represent a definitive representation of reality.

2.1.2 The socioeconomic context

Belize's people

Belize's population is notably concentrated near the coast, with approximately 45% of its inhabitants living less than 10 kilometers from the low-lying coast-line, according to the 2022 Population and Housing Census by the Statistical Institute of Belize (SIB, 2022) and UNDRR (2021). Belize City alone, the country's largest urban center, houses around 64,000 people—more than 15% of the national population, which totals nearly 400,000 (SIB, 2024a).

In the last decades, the population has mainly increased because the immigration (CZMAI, 2016) although the fertility rate has been decreasing since the last decade (SIB, 2024a). The settlements along the coast have increased, adding more pressure in these areas. This demographic shift underscores the need for strategic national development planning, particularly in rural and coastal areas, to ensure the availability of infrastructure, resources, and essential services.

According to the #PlanBelize Medium Term Development Strategy (2022-2026) (Ministry of Economic Development, 2023), the outstanding socioeconomic challenges faced by the Belizean society have been: corruption and incompetence at a high level, the COVID-19 pandemic, a feeble economy threatens the dollar, more impoverishment and inequality, climate change vulnerabilities and escalating crime and violence and migration.

Belize's economy

Belize's economy relies heavily on tourism. It is focused on ecotourism, adventure and cultural tourism as well as sun, beach and nautical tourism (Ministry of Blue Economy and Aviation,

2022). The latest study done in the contribution of tourism to the GDP, was done in 2019 and it concluded that the direct contribution was about 11.8% and it created 25,000 jobs (SIB, 2024b).

Other key sector for the country's economy is agriculture, contributing about 243 million US$ in 2023, which corresponds to 9.8 % of the total country's GDP (3.005 million US$) (Statistical Institute of Belize, 2023a). This industry is dominated by sugar and banana production that accounts for half the country's exports and is the largest employer in Belize (Ministry of Blue Economy and Aviation, 2022).

Another important economic activity is the import and export of goods. In 2023, a total of 200 million US$ was exported to countries like the United States, United Kingdom and other European countries. Most of these exported goods consist of food and live animals. However, the total of all imported goods in 2023 was valued at 1.313 million US$ mainly from the United States, China and other Central America countries (SIB, 2023b).

Other important sectors are animal production (3.6% of the total GDP in 2023), mining industry (1.3% of the total GDP in 2023) and manufacturing goods like food products and beverages (8% of the total GDP in 2023) (SIB, 2023a).

Coastal areas in Belize are critical for the development of this sectors, especially tourism and transportation. During the last decades rapid growth of the populations and the developments in these areas added extra pressure to coastal and maritime resources. Also, disasters exacerbated by climate change have an important impact on the country's ability to prosper (Ministry of Blue Economy and Aviation, 2022).

Most of all imports and exports are done in the Port of Belize, which is the main seaport of the country. It is also the docking area for all cruise ships. Even though there are no figures to specify its contributions to the nation's economy, it's known that many industries rely on their activity to prosper. Climate change and natural disasters are a threat for port operability (Ministry of Blue Economy and Aviation, 2022).

Fishing is another activity that is common in coastal areas. It employs an approximate range of 2,000 to 3,000 people. It has suffered a big decline in productivity as reflected in the annual variation of its proportion of the total country's GDP (SIB, 2023a). This volatility is attributed to the decline of the shrimp farms production. It is important to note that the data of fisheries production is incomplete and does not include recreative fishing, fish sold directly to consumers, restaurants, etc. It is estimated that total catch could double the actual reports. Fisheries are very dependable on the maritime and coastal ecosystems health, overfishing, climate change and coastal development (Oceana, 2020).

2.1.3 Disaster risk and climate change adaptation

The high population density in coastal areas underscores the urgent need to strengthen the assessment of risks faced by these communities, as their proximity to the coast makes them particularly vulnerable to natural hazards such as hurricanes, storm surges and sea level rise. Understanding these risks is crucial to developing effective strategies to protect lives, infrastructure and livelihoods in these vulnerable regions.

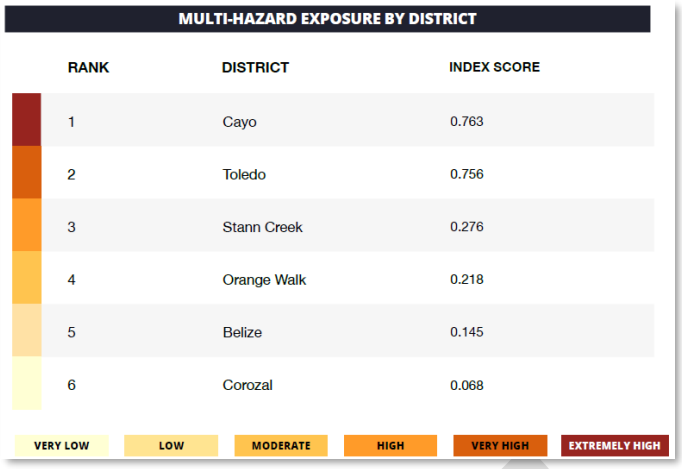
Belize has experienced significant disasters in recent decades, with hurricanes causing extensive damage and long-lasting socioeconomic impacts. According to The World Bank (2018) and CRED (2025), Hurricane Keith in 2000 brought severe flooding, with losses affecting 22% of the country's GDP. In 2016, Hurricane Earl caused widespread destruction, impacting over 10,000 people and resulting in damages equivalent to 11% of GDP. Hurricane Eta in 2020 unleashed heavy rains that affected 60,000 people, while Hurricane Lisa in 2022 made landfall about 10 miles south of Belize City, causing flooding and disrupting the livelihoods of more than 172,000 individuals, as noted in the PDNA Executive Summary (Government of Belize et al., 2023). Between 2000 and 2016, Belize suffered USD 737 million (BZ$ 1,474 million) in direct and indirect losses from natural disasters, averaging USD 46 million (BZ$ 92 million) annually. Nearly half of these losses—USD 319 million (BZ$ 638 million)—stemmed from flooding and storm surges associated with hurricanes and storms of Category 1 or less, underscoring the severe impacts even lower-intensity storms can have (The World Bank, 2018). These events emphasize the country's vulnerability to climate-related hazards and the critical need for effective disaster risk management and financial resilience.

According to several assessments (Pacific Disaster Center, 2021a; Martinez, J. et al., 2022; Government of Belize, 2013), Belize is primarily exposed to seven types of natural hazards: floods, wildfires, earthquakes, landslides, storm surges, extreme heat and tropical cyclones. However, the degree of exposure to each natural hazard varies significantly across districts. The *National Disaster Preparedness Baseline Assessment (NDPBA): Belize District Risk Profiles* evaluates the exposure level to each hazard by considering the population, economic capital and percentage of critical infrastructure exposed.

While the Corozal and Belize Districts experienced no impacts from earthquakes, the Southern districts of Stan Creek and Toledo face significant exposure to seismic threats (41.2% and 100% respectively). Similarly, storm surges pose a substantial threat in Belize and Stan Creek (37.6% and 27.1%), whereas Corozal and Toledo are barely exposed. Extreme heat only affects Toledo in a significant manner (61.7%), and landslides are not a threat in any coastal district.

Flooding is an important hazard across all four coastal districts, with population and capital exposure rates between 14.6% to 32.5%. Wildfires are also relevant in all coastal districts, but mostly in Corozal and Toledo, with exposure levels of 80.5% and 77.1%, respectively. However, the greatest threat to all coastal districts is tropical cyclones, with 100% of the population and infrastructure exposed in every case. These findings underscore the importance of tailored risk management strategies that address the unique vulnerabilities of each district.

A multi-hazard exposure (MHE) assessment (Pacific Disaster Center, 2021a) integrates all threats assigning an index score to each district (see Figure). Toledo is the coastal district with highest exposure levels, whereas Corozal is barely affected. Stann Creek and Belize show intermediate levels of exposure.



MULTI-HAZARD EXPOSURE BY DISTRICT

RANK	DISTRICT	INDEX SCORE
1	Cayo	0.763
2	Toledo	0.756
3	Stann Creek	0.276
4	Orange Walk	0.218
5	Belize	0.145
6	Corozal	0.068

VERY LOW | LOW | MODERATE | HIGH | VERY HIGH | EXTREMELY HIGH

Figure 12. Multi-hazard exposure (MHE) by district. (Source: Pacific Disaster Center, 2021a)

Belize is projected to experience significant climate-related changes, as described by the International Monetary Fund. Western Hemisphere Dept. (2018), including rising temperatures, altered precipitation patterns, sea level rise, and more intense extreme weather events. By the end of the century, temperatures in Belize could increase by up to 4°C, with sea surface temperatures in the Caribbean also rising by 2°C. These changes are likely to intensify tropical cyclone activity and their associated damages, potentially increasing average annual losses in the Caribbean by 22–77% by 2100. Additionally, disruptions to marine ecosystems, including coral bleaching and fish population declines, could severely impact Belize's tourism and fisheries sectors.

According to the International Monetary Fund. The Western Hemisphere Dept. (2018), rainfall is expected to decrease by up to 22% by 2039, increasing the risks of water shortages and drought. Sea level rise is projected to exceed 10 cm by the 2030s, reaching up to 120 cm by the century's end under high-emission scenarios, threatening coastal areas. Extreme weather events are anticipated to become more severe, exacerbating soil erosion, contaminating groundwater, salinizing water sources, and increasing sedimentation in dams and reservoirs, thereby compromising Belize's water resources.

Tropical cyclones (TC) represent the most significant hazard for all coastal regions in Belize, warranting a more detailed examination. These events bring extreme winds, heavy rainfall, waves, and storm surges, which often lead to coastal flooding and erosion, among other impacts. Climate change plays a crucial role in shaping future risks, with key factors to evaluate including rising sea levels and shifts in weather patterns. These changes could potentially result in tropical cyclones becoming more intense, larger, and longer-lasting.

The IPCC 2023 reports with high confidence that the global proportion of major tropical cyclones (Category 3–5) has likely increased over the past four decades. TCs have also been shown to reduce economic growth in the short term. Human-induced climate change is a significant driver, contributing to heavier precipitation during these events. Projections for the near term, particularly at 1.5°C of global warming, suggest an increase in both the intensity and peak wind speeds of tropical cyclones, as well as more frequent and intense extreme rainfall leading to flooding in many regions, including coastal and low-lying areas. These trends highlight the growing threats posed by tropical cyclones under changing climate conditions.

As described by Garner, A. (2023), rapidly intensifying TCs in the North Atlantic have become more frequent and severe due to climate change, with intensification rates increasing by up to 28.7% in the modern era (2001–2020) compared to 1971–1990. Notably, the number of storms strengthening from Category 1 (or weaker) to major hurricanes within 36 hours has more than doubled. However, several studies summarized by Knutson, T. et al. (2020) suggest that the overall number of TCs and hurricanes may decrease by around 25% under a 2º C global warming scenario.

Martínez, J. et al. (2022) analyze the impacts of tropical cyclones (TCs) on flooding and coastal erosion in the Belizean coast, incorporating considerations of climate change. While future TC dynamics were excluded due to ongoing uncertainties, the study accounted for sea-level rise, using a regional projection of 27.5 cm by 2050 based on the RCP8.5 scenario outlined in the IPCC Fifth Assessment Report (AR5) and estimates by Slangen et al. (2014).

In this work, coastal flooding has been simulated and validated using the two-dimensional depth-integrated ADCIRC hydrodynamic model coupled with SWAN. This setup simulates storm surge, wave setup, and overland inundation for both the current scenario and projections for the year 2050 under the RCP8.5 scenario (IPCC AR5, sea-level rise of 27.5 cm). The following maps (Figure and Figure) illustrate the extent and height of flooding relative to the current mean sea level for various return periods.

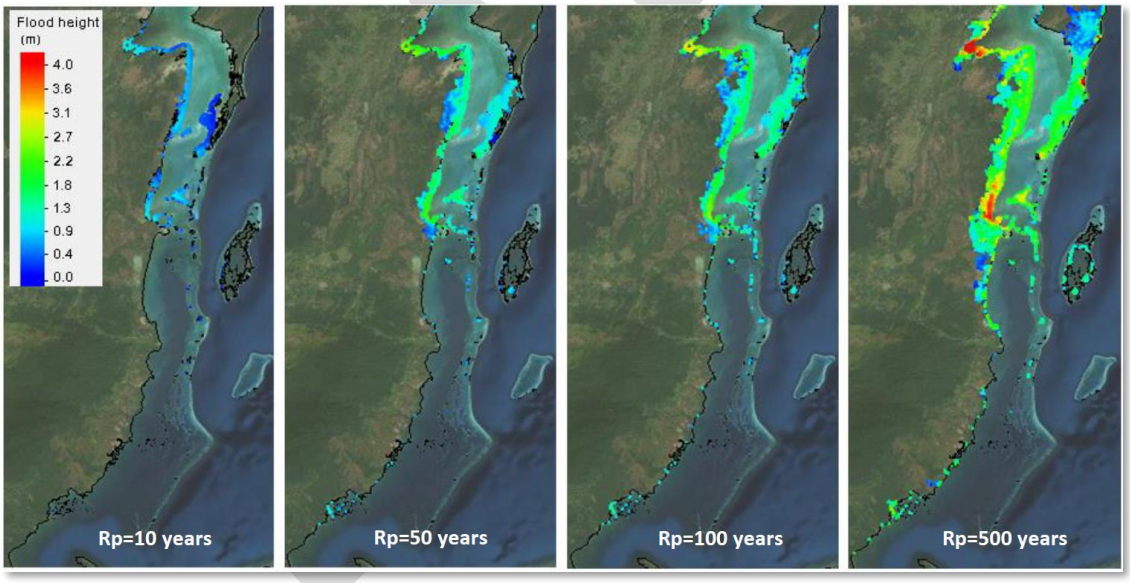


Figure 13. Maps with the 10, 50, 100 and 500 years return periods of extent and flood height (i.e., concerning the current mean sea level) for the present conditions. (Source: Martínez, J. et al., 2022)

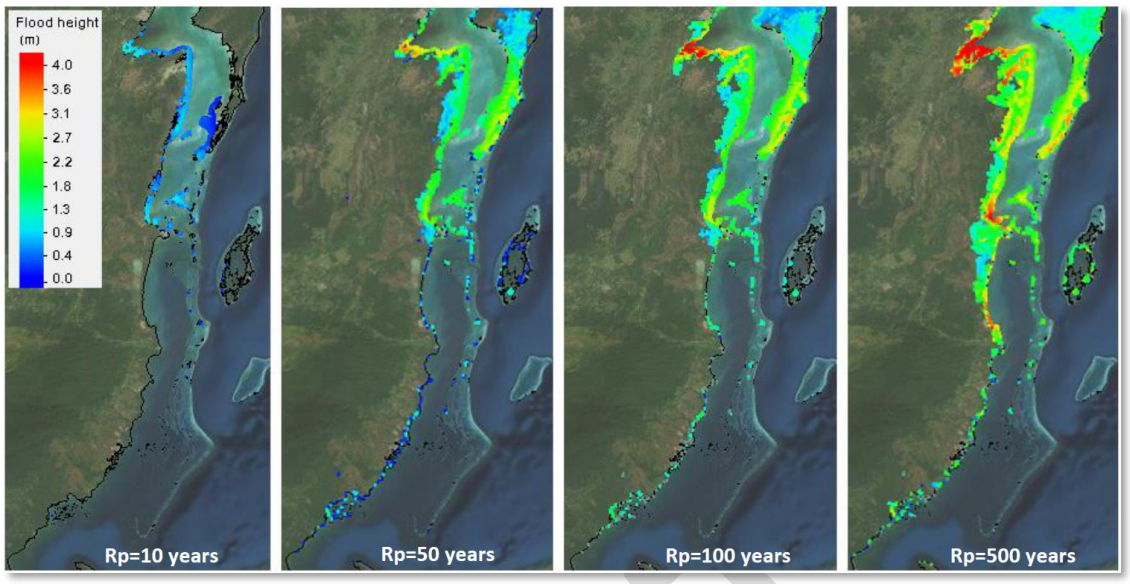


Figure 14. Maps with the 10, 50, 100 and 500 years return periods of extent and depth of flooding for the RCP8.5 climate change scenario by 2050 (SLR= 0.275 m). (Source: Martínez, J. et al., 2022)

These maps reveal that the most affected areas are consistently located in Northern and Central Belize, with significant impacts concentrated in Belize City and Corozal. Under current conditions, flood heights exceeding 3 m may occur in the case of 100-year return period events. However, in the pessimistic scenario, similar flood heights are reached with return periods as short as 50 years.

On the other hand, short-term coastal erosion, considering tropical cyclones, has been simulated using the two-dimensional (cross-shore) model XBEACH, again under the current scenario and the 2050 RCP8.5 projection. To capture the variability of coastal characteristics, in this study the Belizean coastline was divided into 22 Coastal Units (CUs) based on backshore typology. These segments account for different features such as hard structures, sandy beaches backed by vegetation, mangroves, coral reefs, and waterways or wetlands. The following maps (Figures Figure and Figure) show the erosion and scour results for various beach typologies and return periods.

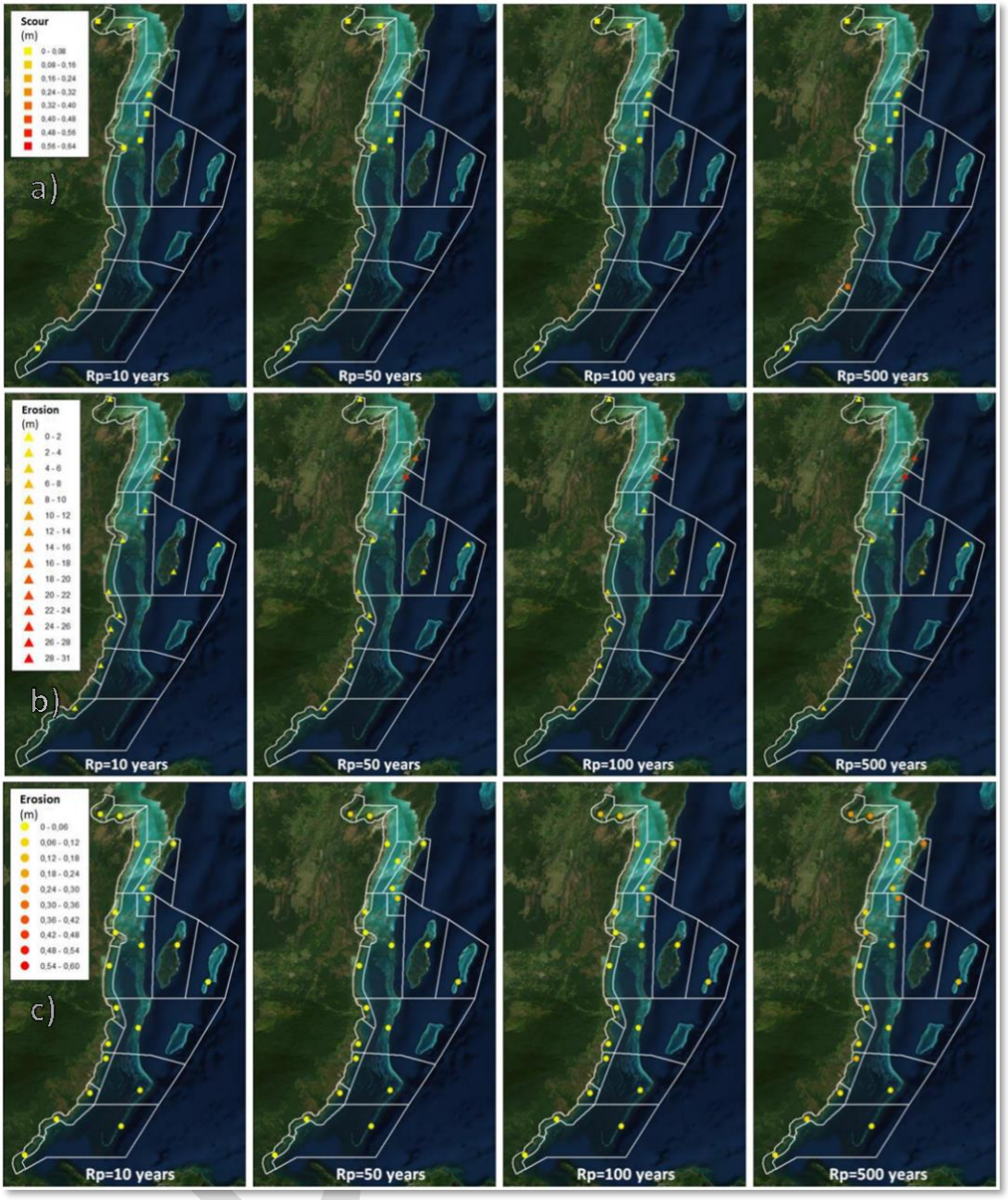


Figure 15. Maps with the 10, 50, 100 and 500 years return periods of a) scour in front of hard structures, b) coastal erosion of a sandy beach backed by vegetation, c) coastal erosion of a coast with mangroves for the present conditions. (Source: Martínez, J. et al., 2022)

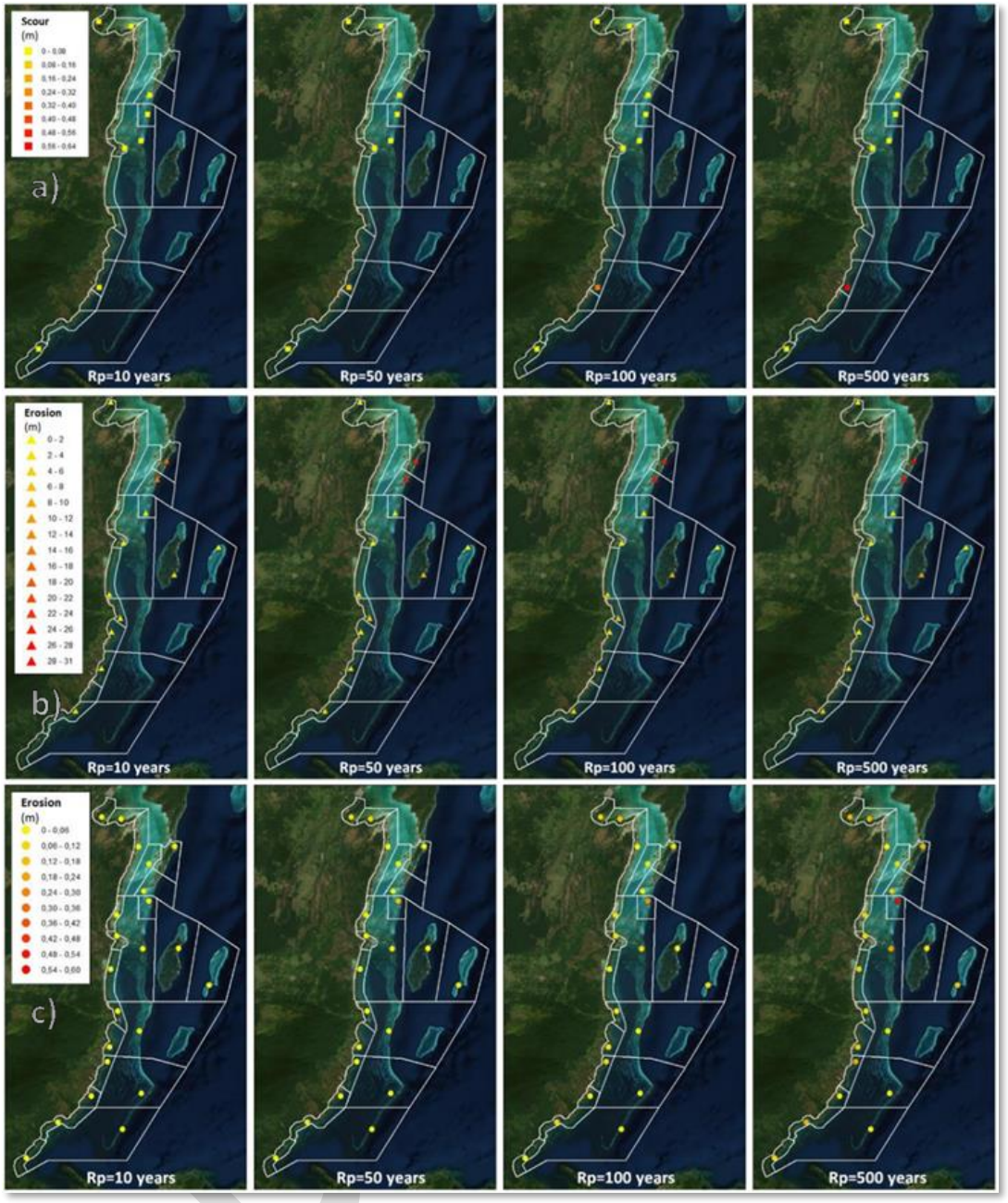


Figure 16. Maps with the 10, 50, 100 and 500 years return periods of a) scour in front of hard structures, b) coastal erosion of a sandy beach backed by vegetation, c) coastal erosion of a coast with mangroves for the RCP8.5 climate change scenario by 2050 (SLR = 0.275 m). (Source: Martínez, J. et al., 2022)

The areas expected to be most impacted by scouring around hard structures are Corozal, Ambergris Caye, Caye Caulker, Belize City, Placencia, and Punta Gorda, with scours typically remaining below 0.08 m. An exception is Placencia, where scour reaches up to 0.56 m under worst-case scenarios with very high return periods. Sandy beaches in Central and Southern Belize generally experience erosion of less than 5 m, while Ambergris Caye is significantly more vulnerable, with erosion reaching up to 30 m in pessimistic projections. Coastal regions with mangroves typically experience erosion of less than 0.12 m, except for Caye Caulker, where erosion can escalate to 0.48 m in the most extreme cases.

Regarding tsunami hazard, according to the Intergovernmental Oceanographic Commission of UNESCO (n.d.), the Caribbean region can expect approximately four destructive tsunamis per century, and while some areas lack historical records of such events, all coastal zones remain at risk, necessitating mitigation and awareness measures. *ThinkHazard!* (https://www.thinkhazard.org, retrieved May 5, 2025), a web platform developed by GFDRR, classifies Belize as a country with low tsunami hazard, indicating more than a 2% chance of a potentially damaging tsunami within the next 50 years, a factor to consider in coastal planning and project design.

While there are no recorded instances of tsunamis reaching the Belizean coast, the country has faced some tsunami warnings due to earthquakes in neighbouring regions. Notable examples include events triggered by earthquakes in Honduras on May 28, 2009, and January 9, 2018, as well as in Jamaica on January 28, 2020, as reported by the National Emergency Management Organization (NEMO).

In terms of risk, the *NDPBA* have averaged hazard, exposure, vulnerability and capacity components to derive an overall resilience score. According, each district's resilience was individually assessed, revealing the following ranking (see Figure). Toledo has the lowest resilience score, while Belize and Stann Creek exhibit the strongest socioeconomic and disaster management capacities. Corozal occupies an intermediate position with a resilience score of 0.466.

RESILIENCE BY DISTRICT

RANK	DISTRICT	INDEX SCORE
1	Belize	0.591
2	Stann Creek	0.528
3	Cayo	0.515
4	Orange Walk	0.500
5	Corozal	0.466
6	Toledo	0.285

VERY LOW | LOW | MODERATE | HIGH | VERY HIGH | EXTRA HIGH

Figure 17. Resilience by district. (Source: Pacific Disaster Center, 2021a)

The Belize District Risk Profiles provide a detailed assessment of resilience and hazard-specific risks across thematic areas (Table 3), highlighting vulnerabilities and guiding resource allocation. Based on the NDPBA composite index methodology (https://www.pdc.org/methodology), the analysis integrates multi-hazard exposure, coping capacity, and vulnerability, using normalized scores to ensure comparability across all components.

Corozal's resilience is hampered by vulnerabilities in environmental stress, clean water access, emergency service capacity, and economic capacity. Its main risks include storm surges, tropical cyclone winds and wildfires, with scores of 0.25, 0.3 and 0.32 each.

Belize District demonstrates the highest management efficiency despite weaknesses in vulnerable health status, environmental stress, transportation capacity, and governance. Key risks are storm surges and tropical cyclone winds, with both scores near 0.33, followed by floods at 0.23.

Stann Creek achieves a relatively high resilience score, though challenges persist in population pressures, economic constraints, governance, and economic capacity. Earthquakes and landslides present the greatest risks (score of 0.31 both), followed by storm surges (0.29), tropical cyclone winds (0.26), floods (0.22), and wildfires, with the lowest risk score at 0.18.

Finally, Toledo has the lowest resilience among all districts, with significant weaknesses in health status, access to information, and communication capacity. Earthquakes are its most severe hazard, with a risk score of 0.72, followed by landslides (0.58), floods (0.57), and extreme heat (0.5). Tropical cyclone winds (0.43) and storm surges (0.24) pose comparatively lower risks.

To sum up these results, a comprehensive multi-hazard risk analysis is elaborated, revealing how each district is impacted by hazards over time (see Table 3). Toledo faces the highest overall risk (0.72), reflecting its low resilience and high exposure to hazards. In contrast, Belize District is the most prepared, with a risk score of 0.35. Cayo and Corozal fall in between, with scores of 0.53 and 0.44, respectively. By analyzing risk profiles, stakeholders can improve operational efficiency and allocate resources more strategically to enhance resilience and disaster preparedness across districts.

	EARTHQUAKE	LANDSLIDE	FLOOD	STORM SURGE	TROPICAL CYCLONE WINDS	WILDFIRE	EXTREME HEAT	MULTI-HAZARD RISK
COROZAL	0	0	0.004	0.249	0.303	0.318	0	0.437
BELIZE	0	0.022	0.230	0.344	0.326	0.002	0.054	0.354
STANN CREEK	0.309	0.309	0.221	0.293	0.265	0.184	0	0.459
TOLEDO	0.715	0.583	0.570	0.242	0.432	0.330	0.503	0.719

Table 3. Hazard-specific and multi-hazard risk score per district. (Source: Pacific Disaster Center, 2021b)

Returning to the assessment of risks specifically associated with tropical cyclone-induced coastal flooding and erosion, the study of Martínez, J. et al. (2022) employed a probabilistic approach to estimate the likelihood of exceeding specific thresholds, such as 50 cm of flooding or 1 m of erosion. The study focused on the potential impacts on coastal communities, considering factors that may increase their vulnerability. These factors were analyzed across three dimensions: human, infrastructure, and environmental.

The findings reveal that northern Belize is more severely impacted by tropical cyclone-induced coastal flooding compared to the southern regions, which are relatively less exposed. Belize City, Ambergris Caye, and Corozal Town are the most vulnerable areas, with higher risks of serious

injuries, loss of life, and significant damage to infrastructure, resulting in substantial replacement costs. Additionally, the northern and central regions' protected ecosystems hold considerable importance, offering not only protection services but also cultural, provisioning, and regulatory benefits essential to the area's environmental and socio-economic resilience.

Mangroves across Belize effectively prevent coastal erosion caused by tropical cyclones, providing a natural shield for these areas. However, significant shoreline retreat is projected in sandy coastal regions, with Ambergris Caye experiencing the most substantial erosion, followed by beaches in Central and Southern Belize. Despite this, sandy beaches demonstrate the potential for natural recovery, though beach resilience was not specifically addressed. The impact of erosion on coastal structures is minimal, with notable effects observed only in Placencia and Ambergris Caye.

2.1.4 The governance for ICZM

The CZMAI is the leading agency responsible for sustainable management of Belize's coastal and marine resources (CZMAI, 2016) and the development and implementation of the ICZM Plan. Other entities also develop their functions and responsibilities on the coast, through the regulation of different uses and activities. It is worth mentioning the following with which CZMAI collaborates regularly:

- The **Department of Environment (DoE)** has the power to make regulations for many different situations including the protection of coastal and marine resources or preserving and protecting the barrier reef and prohibiting the dumping of wastes in the marine environment (DoE, 2020). Also, DoE and CZMAI collaborate during the Environmental Clearance process to guideline undertakings in the coastal area.
- The **Fisheries Department** is responsible for licensing for fishing and aquaculture operations, managing marine protected areas, enforcing fisheries regulations, issuing research permits, and imposing penalties for violations. It plays a key role in sustainable fisheries management by expanding no-take zones, implementing Managed Access Programs to control fishing activities, and strengthening licensing standards and monitoring fishery quotas (CZMAI, 2016). The CZMAI collaborates closely with the Fisheries Department to ensure sustainable fisheries and marine conservation. Their partnership involves collaboration to designate areas for different uses such as fishing, conservation, tourism, and development. They also work together on aquaculture policy and regulation. CZMAI provides essential ecosystem data that supports fisheries assessments. Sport fishing is one of the activities that requires stronger collaboration and partnership between these agencies.
- The **Physical Planning Unit** (PP unit) is under the Lands and Surveys Department, as well as the National Hydrological Service, in charge of integrated water resources management.
- The **Mining Unit** operates under the Ministry of Natural Resources and is responsible for the issuance of quarry permits, mining licenses, prospecting licenses, and reconnaissance licenses. The CZMAI collaborates with the Mining Unit by the provision of data and information to inform decision-making, particularly concerning dredging and mineral extraction, via the permitting process. In this way, CZMAI overviews that

these activities are aligned with ICZM strategies to balance economic activities with environmental sustainability.

- **National Emergency Management Organization (NEMO)**: is Belize's primary authority for disaster preparedness, response, and recovery, established after Hurricane Mitch in 1998. NEMO coordinates efforts across public and private sectors to protect life and property from emergencies and support sustainable development. Other relevant entities for DRM and climate change adaptation are the **National Climate Change Office** (BNCCO), established in 2015 to lead national and international efforts to address climate change by coordinating across sectors, and the **National Meteorological Service** (NMS) that provides comprehensive meteorological and climate-based products and services including specialized forecasts and warnings for severe weather events like hurricanes and floods.

CZMAI participates in multiple committees that engage multiple institutions given the complexity of the coastal management. There are over 60 pieces of legislation that involves most Belizean ministries (CZMAI, 2023). Because of these circumstances, there is the need to create boards of multiple members from various organizations that have, to some extent, common tasks.

One example is the National Environmental Appraisal Committee (NEAC). This committee reviews Environmental Impact Assessments (EIA). It is made up by 16 members, from public, private and academic institutions, including the Lands Department and a coastal expert which comes from the CZMAI. It is not an official member of the committee (pending approval of draft updated EIA Regulations that proposes CZMAI as a member of the NEAC). For the EIAs evaluation, CZMAI reviews coastal zone impacts using ICZM Plan guidelines, regional policies, and studies like the Smart Coast Project. It also assesses effects on sport fishing, community displacement, and provides data and advice to developers and academic institutions, though data classification remains a challenge.

Another committee is the Land Utilization Authority (LUA), which oversees the approval of subdivision applications. If they exceed certain size, an EIA is required. This committee is made up of 7/8 members including NEMO and Public Utility Commission (PUC) but not the CZMAI.

2.2 SWOT ANALYSIS

The previous chapter summarized the baseline conditions during the diagnosis of coast of Belize. It described the characteristics of the main subsystems i.e.: the natural environment, disaster risk and climate change adaptation, the socioeconomic and governance contexts for ICZM. The next step is to structure the major findings in a clear and straightforward manner, facilitating understanding of the coast by coastal managers.

The use of strategic planning tools as the SWOT analysis aims to provide a holistic understanding of Belize´s coastal zone. It facilitates the discernment of the most significant interrelations between subsystems of the coastal area. The SWOT analysis also contributes to the identification specific assets and activities that should be maintained, avoided, promoted or prevented towards a healthier coast and a more sustainable use of national resources.

2.2.1 Strengths

The Natural Environment

- Rich biodiversity, including the Belize Barrier Reef, one of the longest coral reef systems in the world.
- Coastal and marine ecosystems (including the coral reef, mangroves and seagrasses) provide significant ecosystem services and economic resources (e.g., tourism and fisheries). One of the most relevant services is the protection that the reef and mangroves provide against natural hazards.
- Pristine areas and cayes.

Disaster Risk Management

- There is a national disaster management organization (NEMO) that coordinates disaster risk management and emergency response efforts, and there are other institutions contributing to strengthen preparedness and response to climate and non-climate related risks, such as the BNCCO, the NMS, providing comprehensive meteorological, climate-based products.
- The country is involved in regional initiatives and frameworks focused on reducing disaster risk, such as the Caribbean Disaster Emergency Management Agency (CDEMA)
- The coral reef and mangroves provide vital protection against hurricanes, storm surges and erosion, enhancing the region's resilience.

People and Economy

- Country's good reputation as a nature and sustainable destination.
- Belize is a major tourist destination, ranked 40th in the world and 1st in Central America in terms of number of tourists per resident (WorldData, 2021).
- Strong economic contribution from fishing, tourism and other blue economy activities.

Governance

- Long history in ICZM and supporting regulatory and planning instruments.
- Existence of active inter-sectoral governance structures and committees such as NEAC.
- Existence of CACs at local level.
- Existence of active local environmental associations.

2.2.2 Weaknesses

The Natural Environment

- Severe environmental and social impacts due to partial processing of large-scale coastal developments.
- Complex solid and liquid waste management in the cayes.
- Presence of garbage and plastics on the streets.
- Intense pressure on fishing resources and nursery areas.
- Occupancy of the shoreline and the 66 feet reserve.
- Ease in obtaining mangrove clearance permits.
- Lack of available tools to assess cumulative impacts.

- Delimitation of new subdivisions in flooded/water areas.
- Poor attention to beaches, dunes and estuaries as key coastal ecosystems.

Disaster Risk Management

- Exposure to floods, wildfires, earthquakes, landslides, storm surges, extreme heat and tropical cyclones.
- High concentration of the population living less than 10 kilometers from the low-lying coast-line.
- Existing studies are not always used or known by public administrations or the population.
- Limited efforts in prevention and preparedness.

People and Economy

- Displacement of local communities and fishermen in intense tourism areas.
- Economic dependence on natural resources with limited diversification.
- Difficulty or lack of access to the coast or beach in some areas due to private properties.
- Tourism revenues often yield limited benefits for local communities.
- High demand for land due to rapid tourism development.
- Frustration within local communities regarding the effectiveness of public participation.

Governance

- Limited enforcement and patrolling capacity for existing regulations on coastal development and marine resource use.
- Weak attention and study of the coastal physical processes (e.g., sediment transportation, evolution of seabed/bathymetry).
- Insufficient technical and financial capacity in public institutions.
- Weak decision making for coastal management.
- Poor participation of private stakeholders into coastal management and decision-making.
- Gaps in monitoring and evaluation frameworks for assessing policy effectiveness.
- CZMAI´s weak decision-making capacity about developments in the coastal area.
- Lack of awareness among stakeholders of the functions and services provided by public institutions.
- Private sector face challenges to collect necessary data for coastal initiatives.

2.2.3 Opportunities

The Natural Environment

- International collaborations for conservation funding and technical assistance.
- Expansion of MPAs area and biodiversity conservation initiatives.
- Innovative tools and mechanisms for the assessment of cumulative impacts and mitigation hierarchy framework.
- Increased awareness of the benefits of working with nature approach in tourism developments.

Disaster Risk Management

- Collaboration between agencies relates to DRM and coastal management.
- Implementation of climate change adaptation strategies, including nature-based solutions in the Coastal Zone.
- Increased protection of coral reefs and mangroves.

People and Economy

- Increased income for local population related to small-scale and sustainable tourism.
- Involvement of local stakeholders in the regulatory enforcement and reporting processes.
- Increased trust on public agencies.

Governance

- Update main regulatory instruments related to coastal management, environmental conservation and land use planning.
- Accomplishment of environmental commitments of the Blue Bond.
- Integration of advanced technologies for coastal monitoring and data-driven policy-making.
- CZMAI is the leading agency for MSP.

2.2.4 Threats

The Natural Environment

- Severe coral reef degradation leading into irreversible damage.
- Marine pollution from oil exploration and other emerging blue activities.
- Increasing frequency and severity of climate-related hazards (e.g., hurricanes).
- Non-compliance with regulations and permitted uses.
- Loss of natural attractiveness as tourism destination.
- Inadequate use of biodiversity offset mechanisms.

Disaster Risk Management

- Increased exposure of the coastal assets due to the loss of natural coastal barriers such as mangroves and beaches.

People and Economy

- Decline of fisheries.
- Global economic fluctuations affecting tourism.
- Unplanned urban and tourism developments and provision of public services and infrastructure.
- Mass and cruise tourism may displace other types of tourists that generate higher income in the country.

Governance

- Lack of political will to preserve Belizean natural resources.
- Excessive high-level decision-making power, rather than technical levels.

2.3 IDENTIFICATION OF KEY ISSUES

Identification of Key Issues is the cornerstone for achieving the transition from the diagnosis phase to the effective planning stages. Understanding the functioning of the coastal system is crucial for developing a plan which is clearly focused on its objectives and actions, as the Key Issues represents the priorities for management.

First, a preliminary identification of 20 Key Issues has been carried out based on the results obtained in the SWOT analysis. These have been carefully reviewed with emphasis on the relationships between the different aspects addressed. The list of the preliminary Key Issues is presented in Figure .

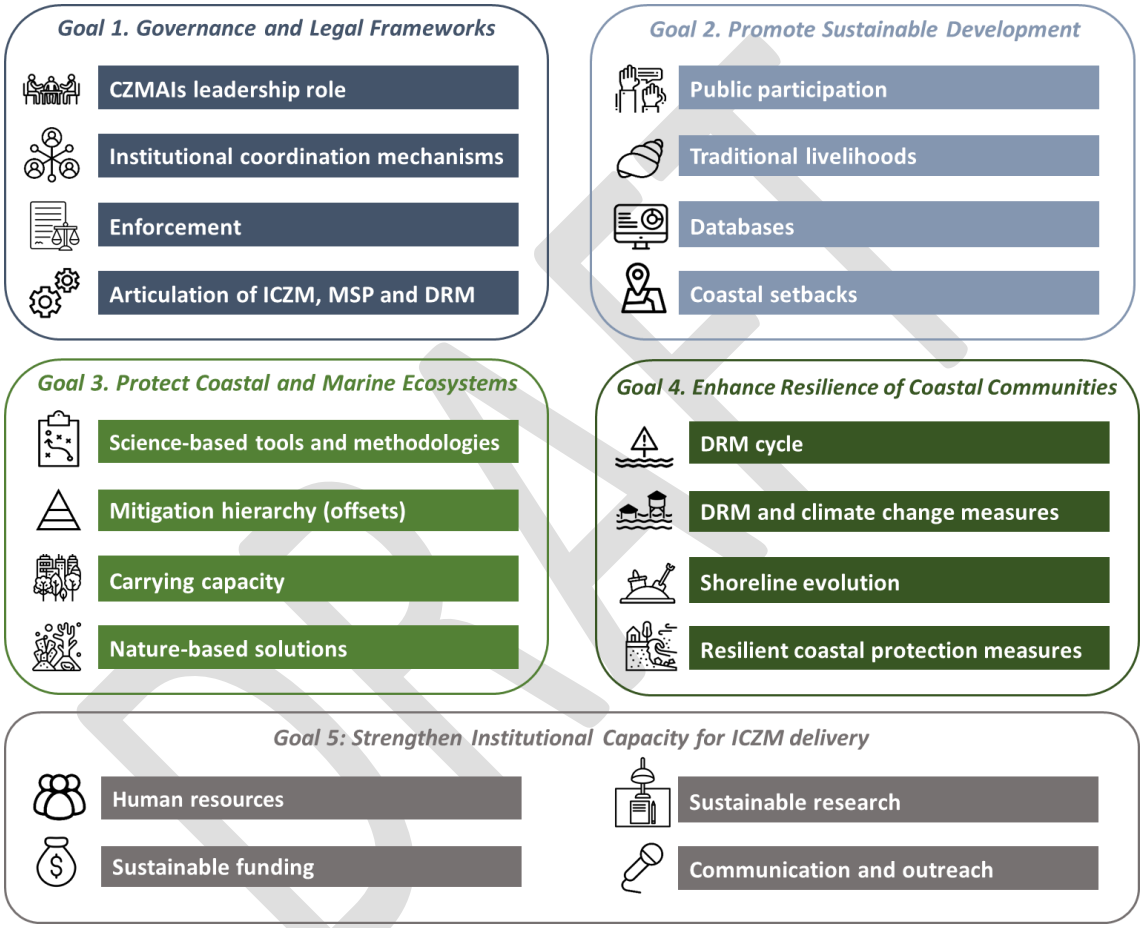


Figure 18. Preliminary list of Key Issues for sustainable and risk-resilient coastal management.

3 NATIONAL ICZM PLAN

This section constitutes the narrative of the National ICZM Plan and contributes to effectively carry out the vision of Belize´s Coastal Zone, in alignment with the Goals and Strategic Objectives outlined in the Draft ICZM Policy.

The National ICZM Plan concentrates on key priorities that will be addressed through the implementation of targeted actions, inspired in the needs identified in the integrated diagnosis, considering the priorities and suggestions of key stakeholders. These key priorities are selected from the Strategic Objectives set in the Draft ICZM Policy, recognizing the available resources and capacities in place to effectively implement the ICZM Plan.

The ICZM planning process entails the following stages: (i) articulation of Draft ICZM Policy Goals, Strategic Objectives and Key Issues identified in the integrated diagnosis, (ii) priorization of Specific Objectives to select management priorities for ICZM Planning and (ii) development of management guidelines and proposal of targeted actions to achieve the priority Specific Objectives.

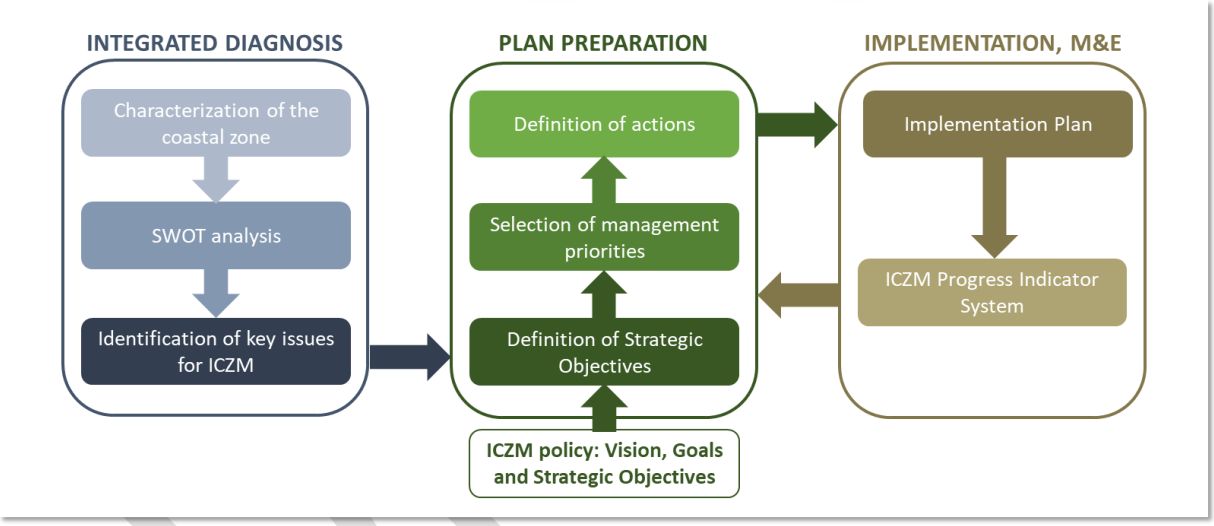


Figure 19. ICZM Planning process. Main components of the National ICZM Plan.

3.2 ICZM POLICY GOALS AND SPECIFIC OBJECTIVES

The Draft ICZM Policy sets five overarching goals and 20 Strategic Objectives for ICZM in Belize. The Specific Objectives were linked to the 20 Key Issues identified in the Integrated Coastal Diagnosis, as shown in Table 4.

GOALS	KEY ISSUES FOR ICZM	STRATEGIC OBJECTIVES
Goal 1: Strengthen Governance and Legal Frameworks	CZMAI´s leadership role	Strengthen CZMAI's, CZMAI AC and BoD leadership role in ICZM and MSP
	Institutional coordination mechanisms	Enhance inter-agency coordination mechanisms to harmonize policies and regulations and strengthen its enforcement
	Enforcement	Develop and implement a national capacity-building program to equip agencies with the technical, human, and financial resources necessary for enforcement of coastal regulations
	Articulation of ICZM, MSP and DRM	Mainstream DRM and MSP into regulatory instruments for coastal management, and update related regulations to align with current climate resilience and marine planning priorities
Goal 2: Promote Sustainable Development	Public participation	Strengthen public participation of local stakeholders and community members
	Traditional livelihoods	Support the diversification of traditional coastal livelihoods (e.g., fishing, farming, tourism) by promoting alternative income-generating activities and addressing land-use conflicts
	Databases	Centralize and provide access to data for ICZM and MSP
	Coastal setbacks	Implement proper building standards and coastal setbacks to improve health, environment and resilience conditions, and strengthen their enforcement through legal measures
Goal 3: Protect Coastal and Marine Ecosystems	Science-based tools and methodologies	Develop capacities and tools to analyze the evolution of coastal processes and ecosystem services
	Mitigation hierarchy	Apply the mitigation hierarchy approach and biodiversity offsets to reduce environmental impact
	Carrying capacity	Mainstream carrying capacity studies into sectoral development policies
	Nature-based solutions	Promote nature-based solutions to enhance resilience of coastal communities and environmental and social co-benefits
Goal 4: Enhance Resilience of Coastal Communities	DRM cycle	Address all phases of DRM cycle in the Coastal Zone through inter-agency collaboration
	DRM and climate change measures	Develop a DRM and climate change adaptation strategy in the Coastal Zone
	Shoreline evolution	Integrate shoreline monitoring, research and planning into the ICZM process, according to CZMAI (2021)
	Resilient coastal protection measures	Integrate DRM and climate change adaptation criteria to develop coastal protection interventions
Goal 5: Strengthen Institutional Capacity for	Human resources	Increase human resources and technical capabilities
	Sustainable funding for ICZM	Develop a sustainable funding mechanism for ICZM
	Sustainable research	Establish a research program to support science-based management

ICZM delivery	Communication and outreach	Improve dissemination, communication and outreach

Table 4. Definition of Strategic objectives

3.3 PRIORITIZATION OF SPECIFIC OBJECTIVES

The available resources within governmental institutions, along with the implementation timeframe for the ICZM Plan, necessitate the selection and identification of key priorities for the upcoming ICZM cycle (2026-2030) to ensure the ICZM Plan's feasibility. To this end, the 20 Strategic Objectives and Key Issues have been evaluated by interpreting their influence on other objectives. Identifying those sensitive Key Issues that can trigger broader changes to the overall system is the final outcome as they will constitute the main management priorities for the ICZM Plan.

The final selection of Key Issues and Specific Objectives was the result of discussions between international and national experts and decision-makers. To this end, meetings with the CZMAI and CZM Advisory Council Subcommittee were held to analyse the following aspects:

- Comments raised during the National Workshop and other consultation activities conducted, including bi-lateral meetings with national agencies and the second round of consultations in Coastal Planning Regions.
- Feasibility of development and implementation considering the available human and financial resources and institutional arrangements.
- Alignment with the priorities of the Blue Bond and Conservation Milestones.

After this process, seven Strategic Objectives were thus prioritized as management objectives (code as PSO "Priority Strategic Objective"):

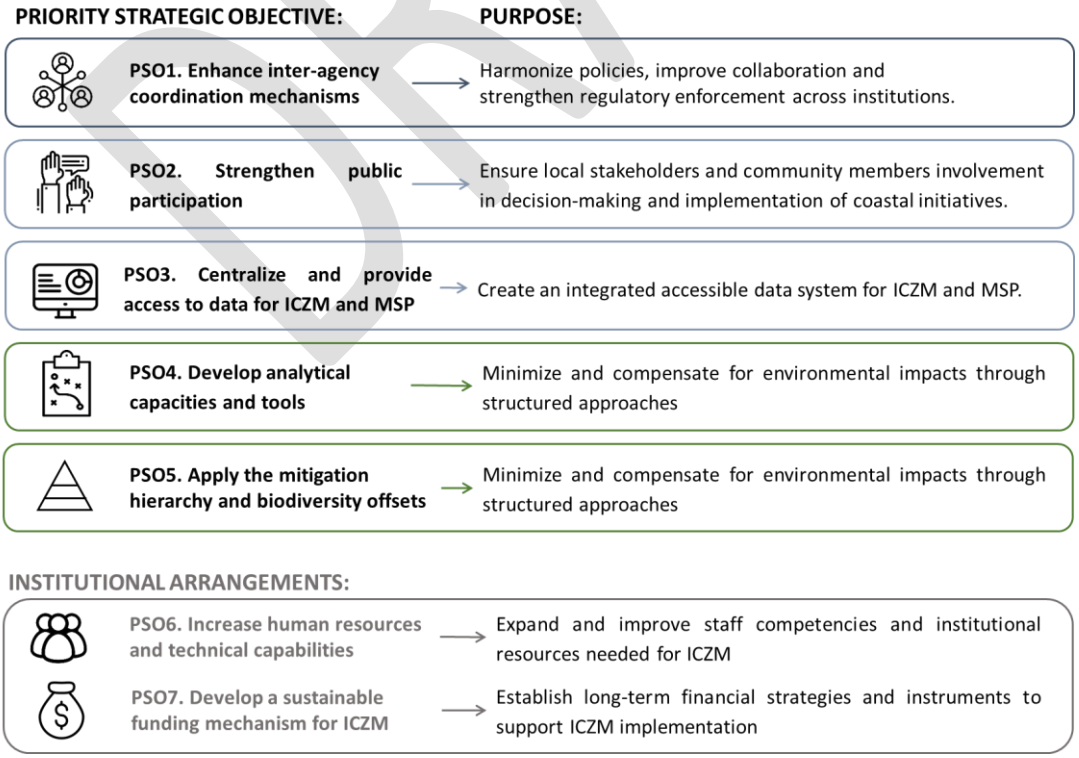


Figure 19. Priority Strategic Objectives.

The following sections describe each PSO: first, a rationale (background and justification) is presented; then, the management guidance advises on how the topic should be applied in a manner that better embraces the principles of ICZM and climate and disaster resilience; finally, actions are listed with recommendations on suitable lead organization to take forward each proposed action and other relevant stakeholders for its implementation, as well as the time scale for implementation. PSO6 and PSO7 are described in Annex 2 as they address the necessary arrangements to enable the development of other PSOs.

3.4 MANAGEMENT PRIORITIES AND ACTION PLAN

3.4.1 PSO1. Enhance inter-agency coordination mechanisms to harmonize policies and regulations and strengthen its enforcement

Rationale

For the management and planning of various aspects of the coast, there are several committees and entities involving public institutions, the private sector, and representatives from associations.

In the case of the CZMAI, both the BoD and the Advisory Council are composed of members from different entities with responsibilities or functions in the coastal zone, as well as the committees, teams and working groups of the BSOP.

On the other hand, the CZMAI participates formally and informally in a number of national committees and initiatives to foster collaboration in coastal management. The most relevant membership is the recent inclusion of CZMAI agency as a member of the NEAC (National Environmental Appraisal Committee), which will be come into effect as soon as the updated EIA Regulations are approved in 2025. Additionally, the CZMAI is member of the Review Panel for mangrove clearance permits and works closely with other inter-agency committees such as the National Climate Change Committee, and with other agencies such as the Fisheries Department, or the Mining Unit, among others.

However, the functioning of some committees face challenges due to limited human resources and there are some areas of work where the CZMAI could strength their participation such as mangrove protection or lands subdivision. Strengthened collaboration mechanisms will improve their efficiency, enhance policy alignment and harmonization, and reinforce enforcement efforts.

Management guidelines

Sustainable and risk-resilient development of the coast requires stronger collaboration and coordination mechanisms and procedures between the CZMAI and the agencies that have competencies and relevant functions in the following topics:

- Mangrove conservation
- Fisheries and sport fishing
- Land use planning
- Disaster Risk Management

- Marine Spatial Planning

Through CZMAI's participation in national committees and initiatives that address these issues, the aim is to strengthen the conservation of coastal ecosystems and promote policy development and decision-making based on scientific and technical information. Additionally, coordination with public agencies is essential for developing joint strategies to enhance enforcement efforts. In this regard, various stakeholders have emphasized the need to reinforce enforcement strategies, including elements such as inter-agency control and monitoring plans, technical and regulatory training of local communities in exchange for incentives, and the replication of the Turneffe Atoll model in other coastal planning regions. These aspects can be raised by CZMAI as part of the ongoing efforts to develop the National Enforcement Strategy.

Action brief

CODE	ACTION	LEAD AGENCY	SUPPORTING AGENCIES	TIMELINE			
				2026	2027	2028	2029
A1	Include CZMAI in committees related to permitting processes	CZMAI	DoE, Forest Department, Lands Department, NEMO, Mining Unit, Fisheries Department, Hydrology Unit, Ministry of Blue Economy and Marine Conservation				
A2	Sign MoU with evaluation and permitting agencies to strengthen coordination among agencies	CZMAI	DoE, Forest Department, Lands Department, NEMO, Mining Unit, Fisheries Department, Hydrology Unit, Ministry of Blue Economy and Marine Conservation				
A3	Continue the dialogues and activities on the ongoing National Enforcement Strategy for the Blue Space to address additional coastal issues and blue economy activities	BBFPU	CZMAI				

Table 5. Action brief – PSO1.

3.4.2 PSO2. Strengthen public participation of local stakeholders and community members

Rationale

Public participation empowers citizens and users of coastal areas to recognize their responsibilities and take action. Active involvement of Belizeans can improve well-being and environmental health. Effective stakeholder engagement is therefore key to the successful implementation of the mandate of the CZMAI and the success of the ICZM Plan.

In this regard, CZMAI has always been committed to consulting with national and local stakeholders and ensuring transparency in the review of regulatory and planning instruments. At national level CZMAI promotes collaboration with non-governmental organizations and other civil society actors and develops programs for raising awareness to wider publics. At local level, the CZMAI has been working with the Coastal Advisory Committees (CACs) and existing boards in coastal planning regions. Recently, the CZMAI drafted Consultation Guidelines to improve the participation process. For the development of the BSOP, the CZMAI has developed participatory tools that provide invaluable spatial data to inform marine planning.

However, there is still a need to strengthen the participation of stakeholders with an emphasis on local entities and representatives, as highlighted during the consultation process for the development of the ICZM Plan. In this regard, it is suggested to increase the presence of CZMAI in the Coastal Planning Regions, facilitate access to information community members and stakeholders, ensure they know about the functions of the agency and increase trust in some communities. Thus, this strategic objective focuses on strengthening, sustaining, and ensuring more comprehensive and effective participatory approaches for ICZM.

Figure 20. Consultation with Ambergris Caye CAC, March 2025.

Management guidelines

To support this, innovative approaches and solid foundations must be established to ensure that effective participatory decision-making accompanies scientific and technical coastal planning. The CZMAI, together with other agencies such as DoE and the Ministry of Blue Economy and Marine Conservation, needs rethinking and reshape the scope and mechanisms of the local

stakeholder's participation, to ensure that their knowledge and concerns are effectively integrated into the coastal management and planning processes. This is essential to address existing frustrations, improve trust and get community support for the implementation of ICZM. New approaches are hereby needed to enhance the role of stakeholders, communities and resource owners (including the private sector) in the development and application of local management arrangements for delivering ICZM.

Coastal literacy, awareness, participation and consultation will help promote understanding and management by all stakeholders, ensuring that decision-makers and social actors are accountable for implementing agreed actions. Local communities will need to be encouraged to collaborate with other partners (public and private) to promote policy implementation. This sharing carries with it the expectation that all actors, especially national public agencies, will fulfill their obligations and responsibilities to the coastal zone. There is a need to promote good governance, which refers to the need for an operational plan that describes this process in detail, including:

- **Updated Consultation Guidelines** that define the scope, methods, and expectations for participation across all ICZM processes.
- **Establishment of Local Coastal Forums** in each planning region, facilitated by trained liaison officers, to ensure two-way communication between communities and CZMAI.
- **Implementation of a Public Awareness and Education Strategy**, including school programs, coastal literacy campaigns, and media outreach.
- **Deployment of a Digital Coastal Engagement Platform**, providing access to planning documents, spatial data, feedback tools, and educational content.
- **Expansion of Citizen Science Programs**, targeting youth, traditional knowledge holders, and tourism operators, to enhance community-based data collection and monitoring.

EFFECTIVE CONSULTATION

Effective consultation will ensure that outcomes are responsive to the knowledge, experience and opinions of stakeholders. Effective consultation will also garner stakeholder support for the proposed amendments to the CZM Act and any supporting regulations. However, consultation will not necessarily lead to consensus. To this end, the consultation processes to be utilized in the coastal zone (by any governmental or non-governmental organization) will need to include the following features:

WHEN TO USE IT	EXPLANATION
Timely	- Consultation should occur early enough in the process to influence decision making. Stakeholders will need to be given a period to properly consider the issues and submit their views.
Accessible and representative	- Involve all relevant stakeholders, including members of the public, interest groups, government agencies, NGOs or any other groups likely to be affected. - Identify key representatives and community champions. - Consider stakeholders with special needs.
Focused	- Objectives of the consultation and the particular amendments on which views are sought will be clearly stated.
Transparent	- Dissemination of information in advance to enable them to understand the objective and contents of the consultations.

	- Make consultation and materials publicly available.
Flexible	- Method will to be chosen on a case-by-case basis (i.e.: in-person interviews, meetings, workshops, discussion panel etc.).
Responsive	- Outcomes need to be communicated to stakeholders within a reasonable period of time. - Inform about how their input was considered and the reasons for any divergence between their input and the outcomes.
Evaluated	- Evaluation of success. - Incorporation of lessons learnt into future consultation strategies.
Aligned with other coastal and marine initiatives	- BSOP and other sectoral initiatives. - Use of same formats and templates to facilitate stakeholder. - Raise awareness on the role of CZMAI.

Table 6. Features for stakeholder participation.

It is understood that the way consultation is undertaken, as well as the frequency, will affect the extent of participation. Examples of types of consultation are indicated below:

TYPE	WHEN TO USE IT	EXPLANATION
Informing	Where a decision has been taken and consultation is not required	Informing stakeholders of the need to develop an initiative
Researching	Where information is needed to help to make a decision	Gathering information on opinions, attitudes and priorities to inform amendments
Consulting	Where views will be taken into consideration when making a decision	Obtaining views on proposed initiatives that will strengthen the roles of both the CZMAI and stakeholders
Involving	Where ideas are being sought and involvement in making a decision is being sought.	Seeking out new ideas and suggestions and encouraging stakeholders to participate in the review process
Partnership	Where we are making a Decision with others	Initiating joint working and decision-making

Table 7. Types of consultation.

Action brief

CODE	ACTION	LEAD AGENCY	SUPPORTING AGENCIES	TIMELINE 2026	2027	2028	2029
A4	Develop a Public Participation Strategy and Operational Plan	CZMAI					
A5	Develop an action plan to strengthen the linkage between CZMAI and CACs	CZMAI	CACs, local councils				
A6	Make publicly available CZMAI´s technical and regulatory documents	CZMAI					

Table 8. Action brief – PSO2.

3.4.3 PSO3. Centralize and provide access to data for ICZM and MSP

Rationale

CZMAI has databases and uses GIS and decision support tools that support its regular activities and allow dissemination of information to other stakeholders on the state of the coast and the potential impacts of planned developments and activities. In this regard, CZMAI manages an extensive geospatial database, along with non-spatial information, which includes relevant data on the distribution of protected areas, ecosystems, coastal and marine activities, water quality, coastal threats, and other related aspects towards a sustainable use of the coastal zone. The database developed under the BSOP is particularly significant, as it integrates scientific data with information acquired through participatory methods.

During the consultation process conducted in 2025, stakeholders from various Belize government agencies acknowledged the role of CZMAI as a central body for coastal zone information. However, it was emphasized that focused efforts are required to strengthen human resources for managing such an initiative, as well as to improve coordination with other existing data management initiatives to avoid duplication and enhance efficiency and collaboration.

Management guidelines

This chapter outlines key steps and principles for collecting and managing both primary and secondary data for ICZM and related coastal studies. The development of these data-related recommendations has taken into account the relevant findings from the diagnosis conducted as part of the ICZM Plan.

- Data collection. It is recommended to follow a set of main principles to collect both primary data (for example, waves, currents, topography, coastal erosion rates, biodiversity assessments, coastal habitat mapping, community feedback, building footprints in the coastal zone, etc.) and secondary data (e.g., analysis of historical satellite images, climate data, research analysis, previous EIAs, etc.):
    - Clearly define the **specific objectives** of the data collection work and identify the **data type required** to meet these objectives. The aim is to ensure that the data collected is relevant and useful for coastal management decision-making. The approach may be sectoral (data for a particular sector, e.g., for a new development) or for a particular component (e.g., mangrove condition data for a particular area).
    - Ensure **representative sampling** by selecting a coastal zone sample that accurately reflects the broader area under analysis, whether it is a sectoral or component-specific approach. Proper sampling techniques (e.g., random, stratified, or systematic sampling) should be used to avoid bias. It is important to ensure both spatial and temporal coverage, especially given that coastal zones are dynamic, and patterns (for instance, of erosion, biodiversity, and human activities) can vary seasonally and across different parts of the coastline.
    - It is recommended to use **consistent and well-defined protocols** for data collection to ensure data consistency, comparability, and reproducibility across different sites and times.

- Ensure **thorough documentation** of collection methods, locations, dates, and conditions to support reproducibility and provide context.
- Georeferenced spatial data must be described using a **standardized metadata schema** (recommended: ISO 19115 International standard for geographic information) and include the Coordinate Reference System (CRS), identified by name and EPSG code (e.g., WGS 84, EPSG:4326), as well as details on the datum, map projection, and spatial extent (min/max latitude and longitude). It should also include access and use constraints, when applicable, by clarifying rights and licensing.
- For **secondary data**, assess the source thoroughly, reviewing the methodology, sample size, and timeliness to ensure relevance, credibility, and reliability. In general terms, the recommended sources should be those that are peer-reviewed, endorsed by credible organizations or widely accepted in the applicable technical or scientific community. Additionally, due to the dynamic nature of coastal zones, it is essential to ensure that the data remains relevant in terms of both temporal and spatial scope.
- During data collection, **ensure data privacy and security** with relevant legal and ethical standards. This includes safeguarding sensitive information and implementing necessary access controls for private, proprietary, or confidential data.

- Data Storage
  - Store data in an **organized system** with appropriate classification and labelling to facilitate easy access and analysis. For coastal zone data, databases (relational or spatial), geographic information systems (GIS) and cloud storage solutions should be considered. It must be ensured that the system can handle large datasets (e.g., satellite imagery) and support complex queries.
  - The establishment of a **Marine Spatial Data Infrastructure (MSDI)** for geospatial features facilitates the efficient management and sharing of spatial data across different sectors and geographic areas. It should include:
    - Standardized formats for easy sharing and long-term preservation (e.g., CSV, NetCDF, GeoTIFF). Note that it is important to regularly update storage formats to adapt them to new standards in data science and GIS.
    - Standardized Data Formats: e.g., ISO 19115 for metadata, Open Geospatial Consortium (OGC) standards like Web Map Service (WMS), Web Feature Service (WFS), and Geography Markup Language (GML) for interoperability. It is crucial to be consistent with the use of coordinate reference systems (CRS) to ensure data from different sources aligns correctly.
    - Providing Application Programming Interfaces (APIs) allows users to interact with the SDI and integrate it with other systems.
  - Automated backup systems should be implemented to safeguard against data loss, including both cloud-based and local backups.
- Data accessibility and sharing

- Promote **open access** to data and implement **standardized APIs, integration** of data from diverse sources, and **interoperability** standards (e.g., OGC) to foster collaboration among stakeholders and ensure seamless data sharing, facilitate analysis, and support informed decision-making.
- Implementing a robust **permissions and access control framework** is essential for regulating data access, modification, and sharing. This ensures the protection of sensitive information while promoting open access to non-sensitive data.

- Data quality and integrity
  - In addition to proper documentation **regularly monitor data integrity** through validation processes, consistency checks, and cleaning (e.g., identifying and correcting errors, removing duplicates, and amending misclassified data). Adherence to metadata standards ensures continued reliability and suitability for analysis and decision-making.
- Data security and privacy
  - Ensure **data privacy** by safeguarding personal information and using anonymization techniques where applicable. **Data security** involves measures such as encryption, access logs, and secure servers to safeguard against unauthorized access or breaches.
- Data updates and maintenance
  - **Continuous monitoring, updating, and long-term preservation** of data are essential for maintaining its relevance and usability. Consider using internationally recognized platforms or repositories for storage, to ensure compliance with best practices in data archiving and long-term access.
- Data visualization and reporting
  - Technical and scientific outputs from CZMAI should be **translated into clear, practical information** to support evidence-based policy and strategic decision-making.
  - **User-friendly portals and APIs** should be developed to enable local communities, government agencies, and other stakeholders to access and explore the data.
  - Information must be presented in accessible formats for non-experts, including regular **summary reports** and real-time dashboards tracking key coastal indicators.

Action brief

CODE	ACTION	LEAD AGENCY	SUPPORTING AGENCIES	TIMELINE			
				2026	2027	2028	2029
A7	Create a National Data Hub for coastal management, monitoring and planning under the CZMAI	CZMAI	SIB, DoE, Forest Department, Lands Department, NEMO, Mining Unit, Fisheries Department, Hydrology Unit, Ministry of Blue Economy and Marine Conservation, IDB				
A8	Develop a user-friendly GeoViewer for the coastal area aligned with BSOP tools	CZMAI	SIB, DoE, Forest Department, Lands Department, NEMO, Mining Unit, Fisheries Department, Hydrology Unit, Ministry of Blue Economy and Marine Conservation, IDB				

Table 9. Action brief – PSO3.

3.4.4 PSO4. Develop capacities and tools to analyze the evolution of coastal processes and ecosystem services

Rationale

In addition to the databases and GIS tools, CZMAI has analytical skills and develops studies to assess the status of the coastal area and its evolution. In terms of studies and tools related to coastal environmental assessment and DRM, the Disaster Risk Profile (Martinez, J. et al., 2022) and the outputs of the InVEST model stand out as key resources.

Although these tools are highly valuable for coastal management, it is necessary to develop additional CZMAI's technical capacities in order strengthen its participation in interagency coordination mechanisms and its advisory function. These increased capacities will enable CZMAI to provide in-time scientific assessment and recommendations to coastal stakeholders, as well as to the committees and boards in which CZMAI will progressively participate officially. Therefore, it is essential to simultaneously develop the necessary tools and train personnel in their use and application. In other words, it is essential to build capacity in two complementary areas: scientific and technical methodologies and tools and staff training—not only for CZMAI personnel but also for other partner organizations involved in coastal assessment.

Management guidelines

The recent inclusion of CZMAI in the NEAC represents a significant opportunity to strengthen its advisory role. To fulfill this role effectively, the agency must have access to agile tools that enable it to deliver timely, science-based technical input in accordance with the timelines established in the ECP. In particular, these tools should support the identification and anticipation of impacts in coastal areas.

One of the main tools for preventing cumulative impacts is Strategic Environmental Assessment (SEA). SEA is a process that integrates environmental considerations into the development of policies, plans, and programs at the earliest stages of decision-making. Its goal is to identify, report, propose mitigation measures, and monitor the environmental effects of strategic

initiatives. SEA goes beyond project-level assessments by addressing cumulative and synergistic impacts, and it often involves stakeholder participation. However, SEA is not currently covered under Belize's EIA Regulations, and its implementation lies beyond CZMAI's direct mandate.

Therefore, CZMAI should develop customized decision-support tools to bridge this gap and provide robust guidance to prevent the degradation of Belize's coastal resources and ecosystem services. Such tools will also be valuable for evaluating the suitability of applications in the coastal zone, subdivision proposals and other initiatives which are currently not assessed based on carrying capacity studies or strategic planning. There are numerous international approaches, methodologies, and tools for assessing impacts that can serve as valuable references in the development of a decision-support system tailored specifically to Belize's context—taking into account available data, local capacities, and regulatory requirements. The following chapters present recommendations for addressing the analysis of cumulative impacts and establishing criteria according to setback schemes.

Methodologies and tools to assess cumulative impacts

Integrated carrying capacity assessment studies are essential tools for sustainable coastal management, particularly in ecologically sensitive regions like Belize. These studies help identify thresholds beyond which human activities—such as tourism, fishing, and coastal development—begin to cause significant and often irreversible environmental degradation. By determining the limits of acceptable use, carrying capacity assessments can prevent or mitigate negative impacts such as water quality deterioration, sediment transport disruption, and habitat fragmentation. The basic notion of carrying capacity establishes that all natural environments have a biophysical limit which, if exceeded, can threaten the integrity of these spaces. In Belize's diverse coastal environment, which includes mangroves, seagrass beds, coral reefs, and estuarine systems, understanding these limits is crucial for preventing cumulative impacts on coastal resources.

This process involves a complex and integrated analysis of ecological, physical, social, economic, legal, and cultural factors, which together provide essential information for managing coastal areas from a systemic perspective, especially in emerging destinations. In this context, it is advisable to develop a methodological framework that is both systemic and integral, addressing potential coastal zone impacts through quantitative and qualitative analysis to support CZMAI and other agencies in their advisory role.

There are many methodologies for the assessment of carrying capacity focused on different aspects or economic activities, such as tourism. Some of the most widely applied methodologies for environmental and tourism carrying capacity from the 80´s are the Limits of Acceptable Change (Stankey et al., 1985), and Miguel Cifuentes (1992), which distinguishes between physical carrying capacity, real carrying capacity, and management carrying capacity. However, it is important to consider not only quantitative data but also qualitative indicators, as human activities in natural spaces vary according to visitor characteristics and the ecosystems themselves. For specific activities such as tourism, there are several approaches, such as the Visitor Impact Management, Visitor Experience and Resource Protection, and the Recreation Opportunity Spectrum— developed by the United States National Park Service.

However, considering the multiple uses and activities of the coastal zone it is essential to develop a tailored methodology and tool that consider the multiple activities and the available

data and resources in place. For its conceptualization and development, it is necessary to review existing methodologies and studies, including sectoral carrying capacity methodologies previously mentioned and the evaluation of cumulative impact methodologies (i.e., Halpern and Fujita, 2013 and Halpern et al, 2008), among others. The tool develop should build upon available information and tools in Belize such as the InVEST model, as it provides a solid foundation to assess ecosystem vulnerability and tradeoffs under different management scenarios.

In summary, carrying capacity studies in Belize's coastal zones should be developed through a systemic, integrated methodological approach that addresses ecological, social, and economic dimensions, using both quantitative and qualitative indicators. By adopting internationally recognized methodologies and incorporating local realities, these studies will support evidence-based decision-making for the sustainable management of Belize's invaluable coastal ecosystems. Stakeholder involvement can also provide valuable insights in these studies, ensuring that the perspectives of local communities and government agencies, and the private sector are considered in setting management objectives and acceptable change.

Establishment and application of setbacks

The primary goal of setbacks is to protect coastal ecosystems and development, thus lessening the likelihood of property damage or irreversible impacts to coastal resources. Following the updated EIA Regulations, the CZMAI will provide advice to the DOE on development applications within the coastal zone to ensure that coastal resources are managed appropriately. To that end, this chapter provides preliminary guidance for the establishment of a setback framework. The approach to establish setback areas takes into account site-specific characteristics, establishing non-fixed distances from the coastline. Accordingly, applications for new developments shall be evaluated considering their specific location, where many setbacks may be applicable. For this it is necessary to establish a reference line of the coastline, which is the HWM, defined after the table. The following table provides preliminary recommendations/starting points for the final definition of a setback framework, considering international experiences.

SETBACK	DISTANCE FROM HWM	OBJECTIVES	RECOMMENDATIONS
Minimum 66 feet Reserve setback	66 feet from HWM	Ensure public access. Ensure the safety of persons and infrastructures. Avoid increasing inundation and coastal erosion risks.	No new developments out of community core areas, where should be minimized. In the case of new developments legally foreseen, it should be ensured that the proposed developments minimize negative impacts on shoreline dynamics, flora, fauna and landscape, permits public access and integrates climate change adaptation measures, with emphasis on NbS.
SLR setback	Variable: 100 m from HWM in areas with medium to high slope (β> 0.5) and 200 m from HWM in areas with low slope (β< 0.50)	Ensure the safety of persons and infrastructures. Adapt to climate change and sea-level rise.	- Minimize developments. - Provide developers with the latest information on sea-level rise and flooding scenarios. - Adapt building codes to sea level rise and flooding scenarios. - Adopt site-specific climate change adaptation measures.

SETBACK	DISTANCE FROM HWM	OBJECTIVES	RECOMMENDATIONS
Inundation setback	Variable: area of storm surge flooding T= 100 years, RCP 8.5	Ensure the safety of persons and infrastructures.	In the case of new developments requiring EIA or LLES, they should present a disaster risk assessment and proposal of risk reduction and climate change measures, with emphasis on NbS.
Landscape setback	Variable: 100 m in rural areas and 200 m in landscape protection areas. This can be redefined according to the distribution of forests and other key elements for landscape conservation	Preserve the landscape as a cultural and economic resource.	- No new developments in potential areas for landscape conservation. - Maximum building height under vegetation height. - All landscaping and buildings should incorporate elements of traditional Belizean architecture. - Must maintain local vegetation and trees. - Must have water permeation of 1 sqm per 100 sqm of paved and built on land. - Must provide sufficient parking for occupants and guests.
Coastal Zone	Rest of Coastal Zone	Preserve and effectively manage coastal resources.	- No developments in protected areas and environmental sensitive zones. - New developments on mangrove areas shall minimize mangrove clearance and integrate mangrove forest as much as possible in gardening design. - No new developments are permitted on beaches and dunes, and turtle nesting sites.

Table 10. Preliminary ideas to define setback distances.

Setback areas are to be defined, delineated and integrated into the GIS systems/platform to facilitate review and processing of applications considering the location of any new development or plan. This allows the periodical update of setbacks based on the last available information on coastal risks and updated mapping of coastal resources.

A crucial aspect of defining the Coastal Zone and the 66 feet Reserve is the determination of the High-Water Mark (HWM). Given the variability of the boundary between land and sea, it is essential to establish a scientifically robust and legally defensible HWM definition. Instead of relying on an instantaneous visual reference, Belize should adopt a statistically derived HWM based on long-term tidal records, sea-level variations, and wave run-up data. This approach ensures a consistent and transparent boundary for ICZM planning and legal enforcement.

The recommended methodology for defining the HWM includes:

- Utilizing a minimum 19-year dataset of tidal records to capture natural variability and shallow-water tidal distortions, following Foreman's (1977) recommendation.
- Calculating the HWM as the statistical average of the high tide plus wave run-up over the mean sea level (MSL) using the formula:

$$HMW = \sum_{i=1}^{i=n} \frac{(MSL + HWL + RU)}{n}$$

Where:

- MSL = Mean Sea Level in Belize
- HWL = High Water Level at high tide
- RU = Wave Run-up at high tide
- n = Number of recorded high tides in the selected period

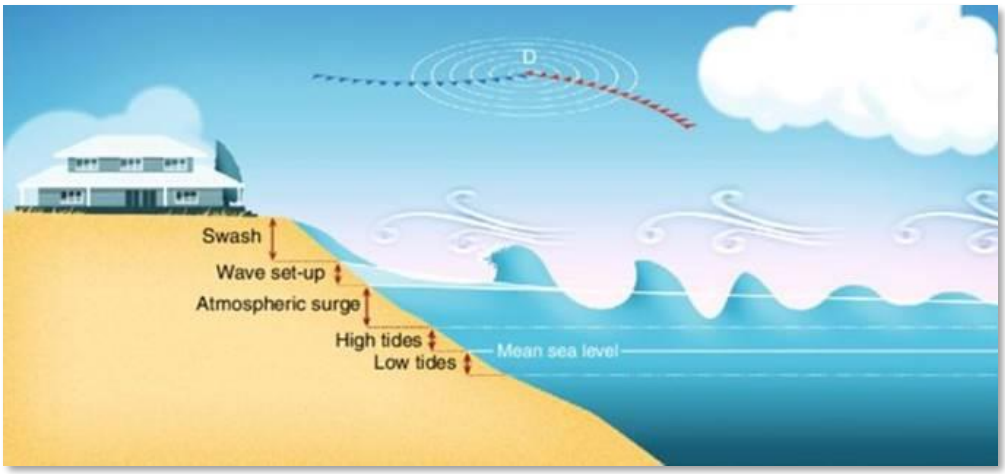


Figure 21. Processes involved in sea-level fluctuation (Source: Melet, 2018)

To ensure the HWM remains relevant under changing conditions, it's essential to include data on extreme events (e.g., storm surges) and projected sea-level rise, such as the IPCC RCP8.5 projection for 2050 (+0.275 m). This allows for better identification of vulnerable areas and supports proactive planning and coastal protection.

The use of satellite imagery, LiDAR, and field surveys helps validate and refine the statistically derived HWM, ensuring spatial consistency across Belize's varied coastal environments. These tools enhance accuracy and support more informed zoning and conservation decisions.

Action brief

CODE	ACTION	LEAD AGENCY	SUPPORTING AGENCIES	TIMELINE			
				2026	2027	2028	2029
A9	Develop a manual for the technical evaluation of undertakings in the Coastal Zone and implement the corresponding tools	CZMAI, DoE					
A10	Develop a phased capacity-building program focused on the assessment of coastal processes and ecosystem services and DRM in the Coastal Zone	CZMAI	DoE, Forest Department, Lands Department, NEMO, Mining				

			Unit, Fisheries Department				
A11	Delineate the HWM based on scientific method and establish a roadmap to address challenges related to the 66 feet Reserve	Lands and Surveys Department and CZMAI	NEMO, DoE, Forest Department				

Table 11. Action brief – PSO4.

3.4.5 PSO5. Apply the mitigation hierarchy approach and coastal and marine biodiversity offsets to reduce environmental impact

Rationale

Biodiversity offsets offer an approach to mitigate biodiversity loss and link biodiversity conservation with development, helping balancing the need for short term economic growth with longer term goals of sustainability. At a global scale, the application of biodiversity offsets to mitigate biodiversity loss in the marine environments is still scarce compared to its application to the terrestrial environment. Biodiversity offsetting policies applicable to marine environments exist in six countries (United States, Canada, Australia, France, Germany, Colombia) and have been actively considered in at least 27 others (Niner H.J., 2017). The mechanisms through which this is being undertaken include their inclusion in established public policy (e.g., Environmental Impact legislation such as in Colombia) or to being driven by various other means outside of public policy frameworks such as voluntary frameworks (e.g., the development of a biodiversity market through local fisheries-based management in Chile (Donlan, 2015).

Belize has been a pioneering country in exploring the application of biodiversity offsets as a tool to foster sustainable development, manage impacts and simultaneously create a framework for financing conservation and management of biodiversity. This effort was led by the Australia-Caribbean Coral Reef Collaboration programme (2012 – 2014) which started to explore the potential of developing a biodiversity offset policy framework in Belize through a participatory process in which representants of the government, NGO and the businesses sector along international experts, the IUCN World Conservation Union and the Business and Biodiversity Offset Program (BBOP), participated in the identification of benefits and challenges in the implementation of global best practices biodiversity offsets to Belize's context (Abdulla, 2013). In this process, biodiversity offsets was identified as an emergent novel approach and an important opportunity to involve the private sector and society in Belize in the conservation and management of biodiversity while engaging in sustainable development. One of the outcomes of this preliminary assessment was the support from different stakeholders' groups for a marine and coastal biodiversity offsetting framework that enhance the collaboration between government and the private sector.

In 2014, the Australia-Caribbean Coral Reef Collaboration programme in partnership with CZMAI developed the Marine and Coastal Biodiversity Offsets Framework for Belize[1] to support the CMZAI and partners in developing pilot offset projects as a key step toward a national Marine and Coastal Zone Biodiversity Offsets Policy.

Management guidelines

Fundamentals and key concepts of the Marine and Coastal Biodiversity Offsets Framework for Belize

The Marine and Coastal Biodiversity Offsets Framework for Belize is based on the biodiversity offsets principles developed by the BBOP[2] and the standards established by the International Finance Corporation (IFC) and Equator Principles Financial Institutions[3].

According to BBOP[4] definition, biodiversity offsets are "*measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse impacts on biodiversity arising from project development after appropriate prevention and mitigation measures have been taken*" and the goal is "*to achieve no net loss and preferably a net gain of biodiversity on the ground with respect to species composition, habitat structure, ecosystem function and people's use and cultural values associated with biodiversity*". Biodiversity offsets definition by BBOP implies the compliance with ten principles, which are very much in agreement with those proposed by other international standards and frameworks on biodiversity offsets (IUCN 2019) [5]:

- **Adherence to the mitigation hierarchy:** The mitigation hierarchy is a framework used to minimize negative impacts on biodiversity from development projects with offsetting being the final step. This ensures that offsets are only considered after all reasonable measures have been taken first to avoid, minimise and rehabilitate/restore the impact of a development project. Specifically, the mitigation hierarchy comprises the following steps:
- Avoidance: measures taken to avoid creating impacts from the outset, such as careful spatial or temporal placement of elements of infrastructure, in order to completely avoid impacts on certain components of biodiversity. This results in a change to a 'business as usual' approach.
- Minimisation: measures taken to reduce the duration, intensity and / or extent of impacts that cannot be completely avoided, as far as is practically feasible.
    - Rehabilitation / restoration: measures taken to rehabilitate degraded ecosystems or restore cleared ecosystems following exposure to impacts that cannot be completely avoided and / or minimised.

[1] Belize Coastal Zone Management Authority & Institute and Australia-Caribbean Coral Reef Collaboration 2014, Marine and coastal biodiversity offsets framework for Belize, GBRMPA, Townsville
[2] Business and Biodiversity Offsets Programme (BBOP). 2009a. Biodiversity Offset Design Handbook, Washington: Forest Trends.
[3] IFC, 2012
[4] Business and Biodiversity Offsets Programme (BBOP). 2009b. Business, Biodiversity Offsets and BBOP: An Overview. BBOP, Washington, D.C.
[5] IUCN Policy on Biodiversity Offsets – January 29, 2016

- Offset: measures taken to compensate for any residual significant, adverse impacts that cannot be avoided, minimised and / or rehabilitated or restored aiming to achieve No Net Loss or a Net Gain of biodiversity for at least as long as the project's impacts. Measures that address residual impacts but are not quantified to achieve No Net Loss or not secured for the long term are compensation, otherwise known as compensatory mitigation.

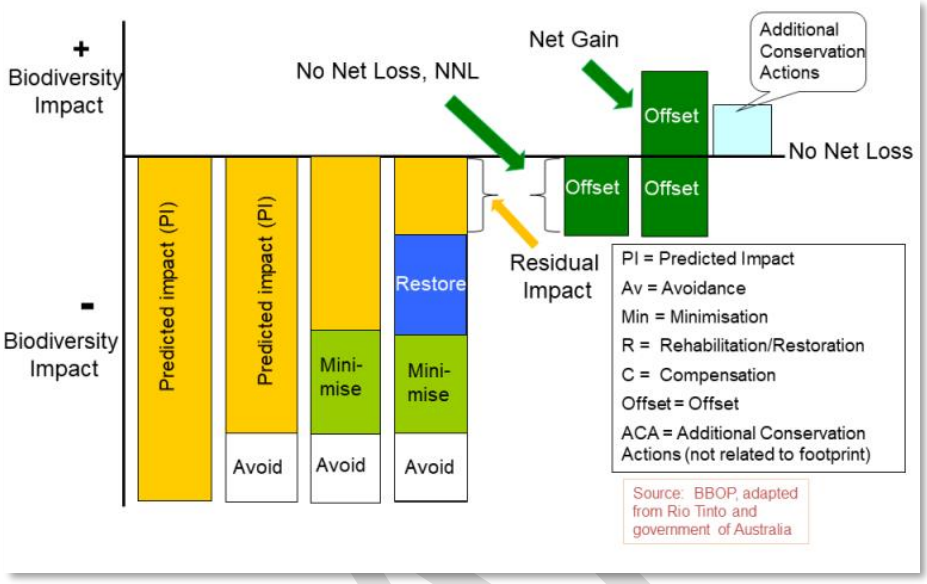


Figure 22. Steps in the mitigation hierarchy to achieve no net loss or a net gain of biodiversity (Source BBOP 2018[6])

- **Limits to what can be offset:** There are situations where residual impacts cannot be fully compensated for by a biodiversity offset because of the irreplaceability or vulnerability of the biodiversity affected.
- **Landscape/seascape context**: A biodiversity offset should be designed and implemented in a landscape/seascape context to achieve the expected measurable conservation outcomes taking into account available information on the full range of biological, social and cultural values of biodiversity and supporting an ecosystem approach.
- **No net loss**: A biodiversity offset should be designed and implemented to achieve *in situ*, measurable conservation outcomes that can reasonably be expected to result in no net loss and preferably a net gain of biodiversity.
- **Additional conservation outcomes**: A biodiversity offset should achieve conservation outcomes above and beyond results that would have occurred if the offset had not taken place. Offset design and implementation should avoid displacing activities harmful to biodiversity to other locations.
- **Stakeholder participation**: In areas affected by the project and by the biodiversity offset, the effective participation of stakeholders should be ensured in decision-making.
- **Equity**: A biodiversity offset should be designed and implemented in an equitable manner, which means the sharing among stakeholders of the rights and responsibilities,

[6] Business and Biodiversity Offsets Programme (BBOP). 2018. Working for Biodiversity Net Gain: An Overview of the Business and Biodiversity Offsets Programme (BBOP) 2004–2018. Washington, D.C.

risks and rewards associated with a project and offset in a fair and balanced way, respecting legal and customary arrangements. Special consideration should be given to respecting both internationally and nationally recognised rights of indigenous peoples and local communities.

- **Long-term outcomes**: The design and implementation of a biodiversity offset should be based on an adaptive management approach, incorporating monitoring and evaluation, with the objective of securing outcomes that last at least as long as the project's impacts and preferably in perpetuity.
- **Transparency**: The design and implementation of a biodiversity offset, and communication of its results to the public, should be undertaken in a transparent and timely manner.
- **Science and traditional knowledge**: The design and implementation of a biodiversity offset process should be informed by sound science, including an appropriate consideration of traditional knowledge.

Benefits to different stakeholders

By applying best practice and global principles, the Marine and Coastal Biodiversity Offsets Framework for Belize would benefit a broad spectrum of stakeholders:

- Benefits to private sector: Biodiversity offsets can enhance a company's license to operate by encouraging regulators to approve new operations and by gaining the support of local communities and non-governmental organizations.
- Benefits to governments: Biodiversity offsets provide regulators with a tool to encourage companies to make meaningful contributions to conservation, often without the need for new legislation and at a lower cost than alternative policies.
- Benefits to conservation groups: Conservation organizations can use biodiversity offsets to secure more and better conservation and obtain additional funding for conservation.
- Benefits to communities: Local communities can use biodiversity offsets to maintain healthy and productive ecosystems during and after development projects, not just through the proper rehabilitation of project sites, but also by achieving additional conservation benefits beyond the project's boundaries, which help support livelihoods and well-being.

Identification and assessment of impacts and risks

Understanding the impact of a development project in biodiversity and ecosystem services is a key step in the design and implementation of biodiversity offsets. Establishing an accurate baseline of biodiversity and ecosystems services that allows to assess what is lost as a result of residual project impacts. For doing so, the use of the most updated and detailed environmental and social data including historical trends in e.g., land and resources exploitation or habitat distribution, is required and the consultation with affected communities and other stakeholders is highly recommended.

The environmental and social impacts need to be assessed at project's area of influence, which within this framework is defined as:

- The spatial extent of biodiversity or ecosystem services likely to be directly impacted by the project's activities and facilities
- The area over which the indirect impacts of the project on biodiversity or on ecosystem services may extend, beyond the site of the project's facilities or site works
- The area affected by cumulative impacts that are the result of the impacts caused by the project interacting incrementally with the impacts from other existing, planned or reasonably foreseeable development
- The area with associated facilities, which are facilities that are not funded as part of the project but that would not have been constructed or expanded if the project did not exist and without which the project would not be viable.
- The identification of impacts and risks should also take into account the priorities established by relevant plans and strategies and Belize's national biodiversity strategies and action plans.

The approach of the IFC, which underpins the Marine and Coastal Biodiversity Offsets Framework for Belize, suggests that the impacts identification process should consider direct and indirect project-related impacts on ecosystem services and identify any significant residual impacts. Priority ecosystem services should be identified and classified in two categories: (i) those services on which project operations are most likely to have an impact and, therefore, which is likely to result in adverse impacts to affected communities; and (ii) those services on which the project is directly dependent for its operations (e.g., water). When affected communities are likely to be impacted, they should participate in the determination of priority ecosystem services.

Mitigation plans

According to one of the key principles of the Marine and Coastal Biodiversity Offsets Framework for Belize, offsetting should be the final step in the mitigation hierarchy. Thus, biodiversity offsets should be included in a Mitigation Plan that clearly outlines the actions to be taken to first avoid impacts; then minimize the duration, intensity, and/or extent of impacts (including direct, indirect, and cumulative impacts); then establish plans to further reduce impacts through the rehabilitation/restoration of affected ecosystems where possible and finally offsetting to compensate residual impacts. The mitigation plan should specify objectives and metrics to assess the project's performance against each stage in the mitigation hierarchy. Regarding the offset step, the mitigation plan should identify specific outcomes and actions to achieve any proposed offsets described in measurable terms (e.g., performance indicators, targets), including a detailed implementation plan. The mitigation plan should also address management requirements to achieve the desired outcomes, including financial resources to ensure that adequate funds are available for offset management for at least as long as the project's impacts last (with a preference for permanent funding) and a clear definition of roles and responsibilities for implementation. The mitigation plan should also include a monitoring and evaluation component that supports an adaptive approach to ensure that the project can deliver offsets despite potential changes in circumstances. The framework recommends that project proponents deliver the required biodiversity offsets before project development to ensure there is no time lag between the loss of biodiversity due to the project and the gain in biodiversity through offsets. If this is not feasible, the offset design should include a multiplier to cover any

lag between biodiversity impacts and the delivery of on-the-ground biodiversity offsets. The framework also recommends that the proponent provide security to ensure that the offset is adequately funded until completion, unless the offset is delivered before the project commences.

Monitoring reporting and review

Effective monitoring of biodiversity offset delivery is crucial for a successful program. The design of biodiversity offsets should include a Monitoring Plan integrated with the development project's long-term monitoring. The monitoring plan must include mechanisms like inspections and audits to ensure compliance and progress. It should define clear metrics, benchmarks, and methods, with reference areas for comparison. Sampling methods should be consistent and reproducible, and it is recommended to involve independent experts. Community representatives should be involved in monitoring, and periodic reports on offset progress should be shared with affected communities, in line with the monitoring schedule.

Legislative and institutional settings

Similar to other countries, in Belize the legislation on EIA is the suitable regulatory framework for applying the mitigation hierarchy, and thus biodiversity offsets. In particular, the Environmental Protection Act Revised Edition 2020, and the Environmental Impact Assessment (EIA) Regulations are key legislative instruments for biodiversity conservation and environmental impact management in Belize.

Under the Environmental Protection Act development projects are subjected to a formal EIA process. The EIA process aims to identify and assess all relevant environmental and social consequences of a project implementation and provides the basis for modifying project designs to avoid and minimise biodiversity impacts. Regulation 19 of the Environmental Impact Assessment Regulations, Revised Edition 2020 requires a project proponent subject to an EIA to submit a "Mitigation Plan." Biodiversity offsets could be included as part of a mitigation hierarchy scheme, in the mitigation plan of the EIA process and considered in Environmental Compliance Plans (ECPs) when projects have received environmental clearance. Following the mitigation hierarchy (and biodiversity offsets) are not currently required by law at its current stage, and future amendments may be needed if offsetting becomes a mandatory requirement under the Environmental Compliance Plan (ECP).

Regulation 19 of the Belize Environmental Impact Assessment Regulations of 1995 and revised version in 2007 also requires a project proponent subject to an EIA to submit a "Monitoring Plan" If biodiversity offsets were implemented as part of the mitigation hierarchy in the mitigation plan, the monitoring plan should outline how offsets will be tracked, measured, and reported. Existent EIA Regulations requires consultation of stakeholder and communities affected by a development project particularly for the risk and impact stage (Sub-regulation 18)[7]. The Marine and Coastal Biodiversity Offsets Framework for Belize highlights the need of engaging with stakeholders throughout the whole process of offset implementation from the

[7] Sub-regulation 18 of the Environmental Impact Assessment Regulations 1995 and revised version of 2003 requires the proponent to establish a Mitigation Plan and a Monitoring Plan.

identification of impacts and potential offsets to offset implementation (see Mitigation plans subsection).

The steps to include this framework within the existent EIA provisions in Belize are shown in Figure .

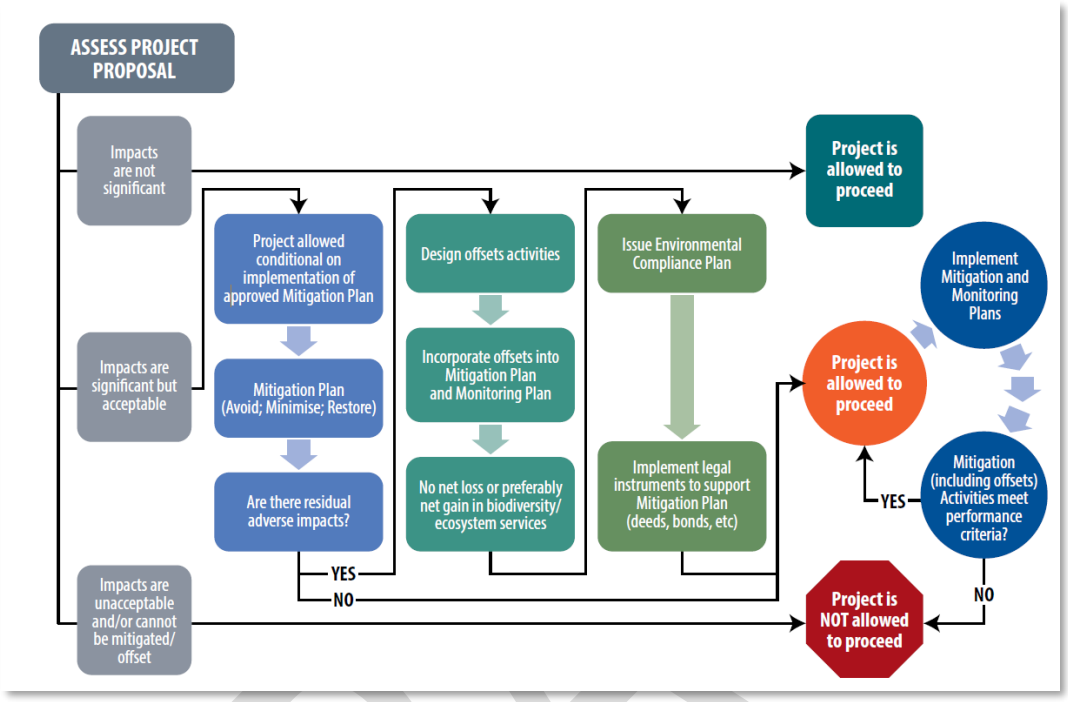


Figure 23. Process diagram proposed in the Marine and Coastal Biodiversity Offsets Framework[8] for Belize for integrating biodiversity offsets into EIA procedures.

In Belize there are several institutions that would play a pivotal role in the implementation of the mitigation hierarchy and biodiversity offsets in the EIA processes. The Department of Environment (DoE), responsible for administering the Environmental Protection Act, is the institution able to incorporate the mitigation hierarchy in the Environmental Compliance Plan. If offsets are introduced as a further component of the EIA process as recommended by this framework, the National Environmental Appraisal Committee (NEAC), formed by representatives of relevant government departments, experts and stakeholders, and responsible of reviewing the EIA reports would be an appropriate body to ensure that biodiversity offsets are considered during project approvals and that offset proposals are scientifically sound. The CZMAI, as a key marine scientific research organisation in Belize, could support the implementation of The Marine and Coastal Biodiversity Offsets Framework by leading scientific studies related to offset development, including on coastal ecosystem health, distribution of key habitats and ecosystem service assessment. The CZMAI should collaborate with the DoE in the integration of this offsets framework into legislation through the

[8] Belize Coastal Zone Management Authority & Institute and Australia-Caribbean Coral Reef Collaboration 2014, Marine and coastal biodiversity offsets framework for Belize, GBRMPA, Townsville

development or amendment of national policy and legislation and in particular with the EIA Unit of the DoE for its implementation.

In addition, there are other public administrations and agencies that could contribute to the implementation of the Coastal and Marine Biodiversity Offsets Framework in Belize. The Belize National Biodiversity Office (NBO) could act as the coordinating body between science, policy and action, support the maintenance and provision of national biodiversity databases, habitat maps, and species inventories that allow the identification of high conservation value areas and critical habitats where offsets should be avoided or targeted for restoration, and develop or support the development of consistent national technical guidelines and standards for offsetting design and monitoring. The Ministry of Blue Economy and Marine Conservation, that can help develop policies that encourage the integration of biodiversity offsets into the blue economy framework through, for instance, the creation of legal incentives or requirements for developers to implement offsets when their activities affect marine ecosystems, such as fisheries, tourism, or port development and could guide the inclusion of offset requirements in policies related to marine spatial planning and sustainable coastal development. The Belize Fisheries Department could contribute by enforcing sustainable fisheries management practices, supporting marine conservation programs, and helping monitor biodiversity within key marine habitats such as coral reefs and mangroves. The Forest Department, in charge of the management of mangrove forests, through supporting habitat restoration projects, and contributing to monitoring activities that track biodiversity changes in these coastal ecosystems.

Finally, conservation funds like the Protected Areas Conservation Trust (PACT) or national NGOs, like the Belize Audubon Society could also contribute to the implementation of the Marine and Coastal Biodiversity Offsets Framework by identifying and establishing offset areas, support the establishment of transparent monitoring systems, support the implementation of local conservation initiatives or assuring that biodiversity offsets contribute to national biodiversity strategies and international goals like (e.g. Aichi Biodiversity Targets).

Engaging affected communities

The Marine and Coastal Biodiversity Offsets Framework for Belize highlights the need of engaging with key stakeholders throughout the whole process of offset implementation from the identification of impacts, the design of potential offsets to offset implementation. Critical elements to successful community engagement for designing and implementing offsets are

- Stakeholder analysis and planning
- Disclosure and dissemination of information
- Consultation and participation
- Grievance mechanism
- Ongoing reporting to affected communities.

Design and evaluation of offsets

The Marine and Coastal Biodiversity Offsets Framework provides initial guidance for designing and evaluating biodiversity offsets that can support implementation of pilot offsetting projects in Belize based on best practice. Yet, the framework highlights the need to review this general

approach to produce a more Belize tailored one. The key elements for the design and evaluation of offsets addressed in the framework are summarized below.

Type of offset measures

The framework considers three types of offset measures.

- Protection of equivalent habitat: Establishing protected and restricted areas with similar coastal habitats and/or purchasing land suitable for restoring comparable degraded habitats. The metric usually applied is hectares. A major challenge is establishing criteria for habitat quality, which is typically handled through assessments by independent experts. This involves benchmarking and defining biodiversity levels in areas that have not been impacted.
- Threat abatement: Addressing key threats to biodiversity and habitats affected by the proposed development (e.g., water quality improvement, restructuring or further regulating). This approach requires a metric that convert habitat impact in threat mitigation (e.g., amount of nutrients removal).
- Surrogate measures: Providing funds to support priority conservation related actions (e.g., to support protected areas management or research projects). This approach requires a metric that convert habitat impact to an offset value in economic terms (e.g., economic value of a hectare of habitat affected). This approach must be carefully applied in order to assure that conservation actions are defined, sufficient to meet offset requirements (e.g., no net biodiversity loss) and that finances are enough to achieve offset goals.

According to the Marine and Coastal Biodiversity Offsets Framework for Belize threat abatement and surrogate measures are the most recommended offset strategies for maximizing conservation benefits in marine and coastal habitats due to the particular environmental processes that govern aquatic systems functions compared to terrestrial systems (e.g., currents, legal aspects). In this type of approaches, a formula or a metric that allows to estimate the threat to be mitigated (for threat abatement actions) or the economic value (for surrogate strategies) to offset the project impact is needed. Deriving a formula for use in regulated offset projects will require further development.

Achieving best conservation outcomes

Achieving no net loss and, if possible, net gains is at the heart of biodiversity offsets. The framework emphasizes the need to consider context specific factors (e.g., local biodiversity, human use and cultural values of biodiversity, background rates of loss) when assessing the environmental impact and identifying equivalent offsets and highlights key factors to be considered in the design of offsets:

- Explicit calculation of loss and gain at impact and offset sites.
- Ensure that gains are additional and can be linked directly to offset activity
- Account for uncertainty and the risk of failure in offset design
- Design offsets to take account of wider landscape context and patterns of biodiversity
- Recognise that there are ecological and scientific limits to what can be offset
- Combine multiple interventions across the full mitigation hierarchy
- Aim to achieve like-for-like biodiversity exchanges in an offset.

Recommendations of establishing an offset scheme

The framework outlines key recommendations for establishing an offset scheme in Belize.

- **Begin with a negotiated approach to offset***:* Initially, offset projects should be voluntary but designed to apply the best available metrics and approaches based on previous international efforts (e.g., habitat hectares, pre-determined monetary value per-hectare of development site). In the future, legislative requirements may be implemented, and metrics will need to be more thoroughly evaluated and defined to ensure that outcomes align more closely with policy objectives and conservation priorities.
- **Offsetting should demonstrate tangible biodiversity outcomes***.* Impacts should be compensated through like-for-like (when possible) or ecological-equivalent actions benefiting the same type of habitat.
- **Trade-ups to be allowed and encouraged***.* Offsets should aim to address biodiversity of greater conservation priority through, for instance, focusing on areas that are of national natural and cultural importance such as the Belize Barrier Reef. Any support for such areas would need to meet additionality criteria.
- **Additionality to be achieved***:* the benefits provided by offsetting should exceed what would have been achieved under normal circumstances.
- **Offsets from several projects may be combined or aggregated***:* Offsets should be managed to maximize the overall net benefit, which may involve strategically combining offsets from various projects if this results in a better cumulative biodiversity outcome.
- **Losses and gains should be measured in the same metric.**
- **Disaggregated metrics are preferred***:* Ideally, the offsetting scheme should develop a set of metrics that capture the values of essential biodiversity components (patterns, processes, and ecosystem services) further than simpler proxy metrics (e.g., hectares) These metrics should be transparent, based on disaggregated, direct, and context-specific measures.
- **A high level of predictive certainty is desirable***:* The intended conservation outcomes should be predictable and clearly defined with a reasonable level of certainty. The use of InVEST software already applied in the development of the Belize ICZM Plan, is recommended for offset evaluation. In particular, it could be applied to estimate the potential benefits in terms of habitat extension and ecosystem services derived from restoration or conservation measures. This information is key to identify habitat conservation or restoration actions that could compensate any residual impact derived from project development.
- **Multiplier should be considered***:* The multiplier refers to the size of the area that must be treated by the offset action for one standardized unit of loss to be compensated at the level of no net loss. Although initially these multipliers can be based on general guidelines adapted from relevant international examples, a more refined approach to multipliers should be developed, to transparently and credibly reflect the levels of uncertainty in the offset design and implementation, while accounting for variations in habitat quality.

Habitat classification and equivalence

The concept of habitat is used as a way to characterize biodiversity that can be spatially defined for practical purposes. Habitat equivalency, in its simplest form, involves classifying habitat types (e.g., coral reefs, seagrass meadows, mangroves). The Marine and coastal biodiversity offsets framework for Belize recommends classifying the habitats following the IFC habitat classification system, which goes beyond the types and considers their quality and vulnerability. According to this system, habitats can be classified as:

- **Modified Habitat**: areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition. Modified habitats may include areas managed for agriculture, forest plantations, reclaimed coastal zones and reclaimed wetlands.
- **Natural Habitat**: areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition.
- **Critical Habitat**: areas with high biodiversity value, including (i) habitat of significant importance to Critically Endangered and/or Endangered species; (ii) habitat of significant importance to endemic and/or species with a restricted range of distribution; (iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes.

Habitat types are integrated in The Marine and Coastal Biodiversity Offsets Framework for Belize through five principles:

- The Framework applies to those areas of modified habitat that include significant biodiversity value, as determined by the risks and impacts identification process. The development project should be designed to minimise impacts on such biodiversity and implement mitigation measures as appropriate.
- The development project should not significantly convert or degrade natural habitats, unless all of the following are demonstrated:
- no other viable alternatives within the region exist for development of the project on modified habitat
- consultation has established the views of stakeholders, including affected communities, with respect to the extent of conversion and degradation
    - any conversion or degradation is mitigated according to the mitigation hierarchy.

1. In areas of natural habitat, mitigation measures should be designed to achieve no net loss of biodiversity. Appropriate actions include:
    - avoiding impacts on biodiversity through the identification and protection of comparable areas in terms of biodiversity and ecological functions
    - implementing measures to minimise habitat fragmentation, such as biological corridors
    - restoring habitats during operations and/or after operations
    - implementing biodiversity offsets.

- In areas of critical habitat, project activities should not be approved unless the following are demonstrated:
  - the project will demonstrably have long-term benefits to the national interests of Belize
- no other viable alternatives within the region exist for development of the project on modified or natural habitats that are not critical
  - the project does not lead to measurable adverse impacts on those biodiversity values for which the habitat is critical, and on the ecological processes supporting those biodiversity values
  - the project does not lead to a net reduction in the national population of any Critically Endangered or Endangered species assessed over a reasonable period of time (several generations).

2. In such cases where a project meets the requirements defined in point 4:

- the project's Mitigation Plan should describe how the project will be designed to achieve net gains of those biodiversity values for which the critical habitat was designated
- where biodiversity offsets are proposed as part of the mitigation strategy, the proponent should be required to demonstrate through an assessment that the project's significant residual impacts on biodiversity will be adequately mitigated to meet the requirements of the previous point
- a robust, appropriately designed and long-term biodiversity monitoring and evaluation program should be developed.

Action brief

The CZMAI and the Australia-Caribbean Coral Reef Collaboration identified several key steps and pillars of activity needed to facilitate the implementation of the biodiversity offsets framework in Belize, including launching pilot biodiversity offsets projects, investing in capacity within the public and private sectors, identifying priority conservation areas, and creating the required policy, legislative, and administrative frameworks. These, together with the proposals of stakeholders during the consultation process for the development of the ICZM Plan, have been considered for the proposal of actions.

CODE	ACTION	LEAD AGENCY	SUPPORTING AGENCIES	TIMELINE			
				2026	2027	2028	2029
A12	Conduct sensitization and socialization workshop and preliminary training activities	CZMAI	Ministry of Blue Economy and Marine Conservation, DoE, Forest Department, National Biodiversity Office, Fisheries Department, PACT				
A13	Determine and create the most suitable institutional mechanisms for managing biodiversity offsets	DoE, Ministry of Blue Economy and	CZMAI, Forest Department, National Biodiversity				

		Marine Conservation	Office, EAI Unit of the DoE				
A14	Develop a comprehensive Coastal and Marine Biodiversity Assessment Framework	DoE, Ministry of Blue Economy and Marine Conservation	CZMAI, Forest Department, Fisheries Department, National Biodiversity Office, PACT				
A15	Develop a plan for implementing and piloting biodiversity offsets in Belize	DoE, Ministry of Blue Economy and Marine Conservation	CZMAI, Forest Department, National Biodiversity Office, PACT				

Table 12. Action brief – PSO5.

4 IMPLEMENTATION PLAN

The implementation process of the ICZM plan entails 15 actions to be carried out in the next four years (2026 – 2029). CZMAI is the agency in charge of the overall implementation of the ICZM Plan but other agencies will be actively involved and lead some actions. To ensure a fluent and smooth launch of the implementation phase, it is recommended that, once the ICZM Plan is approved, the CZMAI organizes a round of meetings with partners to review their roles and activities for implementing the ICZM Plan, as well as reporting methods.

This section proposes a roadmap to guide the implementation process and guarantee its temporal coherence and overall consistency, and includes and estimation of the implementation costs of the National ICZM Plan.

Finally, each action is fully described in an individual factsheet (to be developed once Actions are approved after Pubic Inspection Period), compiled in Annex 3. These Action Factsheets include a brief description, expected outcomes, timeline of application and related actions, stakeholders involved, budget and progress indicators (see template in Figure).

Ax. Title of the action	
Description	*Detailed description of the action.*
Outcomes	*Expected outcomes*
Related actions	*Listed of actions that are related (in timing or in scope).*
Key stakeholders	*Agency responsible for implementation and other stakeholders involved in its implementation.*
Estimated duration	*x months*
Budget	*xxxxxxx USD*
Action indicators	*Progress indicators*

Figure 24. Template of action factsheets.

The Implementation Plan consists therefore of the roadmap, budget and action factsheets, which combined are to provide a useful assistance to CZMAI and partners throughout the implementation process.

4.1 LOGICAL FRAMEWORK

To be completed once PSO and Actions are validated; following this template:

	PROJECT SUMMARY	INDICATORS	BASELINE	OBJECTIVE	MEAN OF VERIFICATION	RISKS AND ASSUMPTIONS
GOAL						
STRATEGIC OBJECTIVE						
OUTCOME						
OUTPUT						
ACTIVITIES						

4.2 ROADMAP

The detailed calendar and implementation roadmap will be included in Annex 3 after the Public Inspection Period, once the Actions are validated.

4.3 BUDGET

The budget for the implementation of the ICZM Plan has been estimated based on the Action costs. For each action, staff costs, facilities and consultancy works were considered and their rate distribute during the action implementation according to its roadmap.

The estimated budget considers the installations and operational costs of each action. This cost breakdown enables a more precise follow-up of the planned investments. The detailed breakdown will be included in Annex 3.

The total budget is to be estimated after the Public Inspection Period, once the Actions are validated.

5 MONITORING AND EVALUATION STRATEGY

5.1 THE ICZM PROGRESS INDICATOR SYSTEM

The ICZM Plan requires a monitoring system to regularly evaluate the implementation progress. The final aim is to detect deficiencies and bottlenecks to guide the adaptive management process. This system is to be used by managers to improve their own performance (adaptive management) and their reporting mechanism (accountability).

The ICZM Progress Indicator System is based on international guidelines and experiences. It is composed of a set of 15 indicators that informs on the implementation progress by evaluating the achievement of each Action (Action Progress Indicators). These indicators are defined according to one variable which are measured and normalized. Then, these indicators are aggregated into PSO progress indices that provide an estimation of the success in achieving PSO.

ACTION PROGRESS INDICATOR	PSO PROGRESS INDEX
I.1	P1- PSO1
I.2	
I.3	
I.4	P2- PSO2
I.5	
I.6	

Table 13. Relation between Action and PSO progress indicators and indices.

Following the example in the table, the calculation of P1-PSO1 and P2-PSO2 is as follows:

P1- PSO1=∑(Action progress indicators (I.1 to I.3) scores × Weight)

P2- PSO2=∑(Action progress indicators (I.4 to I.6) scores × Weight)

Being: Weight= 1/number of Action Progress indicators per PSO.

The full description of this progress Indicator System will be presented in Annex 4.

This approach links the evaluation of the Action implementation with the PSO achievements so that any constraint occurred during the application of the ICZM Plan could be easily detected. Action Progress Indicators can be represented to understand the progress in each PSO, and these can be represented to overall progress of the ICZM Plan and to identify those PSO facing difficulties for implementation.

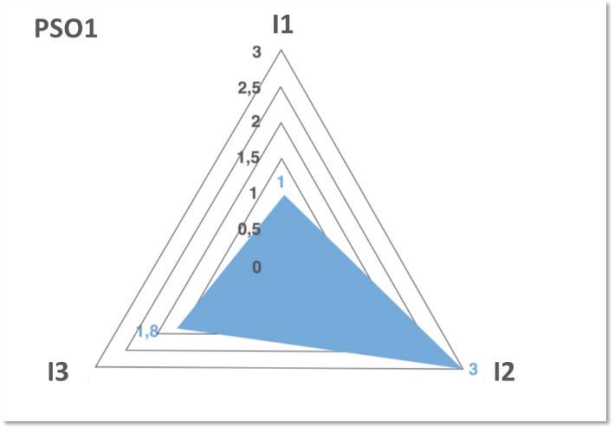


Figure 25. Example of representation of progress of Actions of PSO1.

5.2 STATE OF THE COAST

Monitoring the coast of Belize is essential for developing and implementing an effective ICZM Plan. Belize's coastal and marine ecosystems—including mangroves, seagrass beds, coral reefs, and coastal wetlands—are critical to national development, livelihoods, and climate resilience. However, these areas are under increasing pressure from tourism, coastal development, pollution, and climate change. Regular monitoring and reporting provide the scientific foundation necessary to understand changes in coastal conditions, assess ecosystem health, and evaluate the impact of human activities. This enables evidence-based decision-making, ensuring that development aligns with conservation goals and long-term sustainability.

Two main tools are proposed to institutionalize this process: (i) elaboration of "State of the Coast" reports, and (ii) implement a coastal and marine indicator-based dashboard. These are described in the following sections

5.2.1 State of the Coast reports

It is proposed that **biennial "State of the Coast" reports** be produced. These reports would serve as key tools for policy evaluation, public awareness, and adaptive management. Their effectiveness and efficiency would be significantly enhanced by leveraging the **Data Hub** being developed under CZMAI. This Data Hub will centralize, organize, and process spatial and non-spatial data related to coastal ecosystems, land use, climate variables, and socio-economic indicators. By automating data flows and analysis through the Hub, the State of the Coast reports could be generated with minimal need for additional data collection, significantly reducing the time and cost involved. This systematized approach will ensure that decision-makers have timely, accurate, and accessible information to guide sustainable coastal development in Belize.

The general objectives of these reports are:

- To Identify pressures that may be affecting the coastal zone currently or which may affect the coastal zone in the future.

- To provide an update on the management activities being carried out in Belize's coastal zone including all significant research and monitoring programs as well as the effectiveness of these State of the Belize Coastal Zone Reports.
- To present a qualitative and quantitative assessment of the state of the coastal zone and the effectiveness of ICZM.

The structure of the "State of the Coast" reports shall be defined in alignment with the design of the Data Hub, and may consider the outline of previous reports, such as the 2014-2018 State of the Coast Report (CZMAI, 2020), and the Key Issues for coastal management identified in the integrated diagnosis. As preliminary proposal, at least the following sections may be developed under the Status of the Coast reports:

- Status of the coastal zone:
    - Coastal habitats and protected areas: including distribution of habitats, status of conservation, evolution over the time, impacts.
    - Blue economy activities and coastal development: including demographic and economic evolution, land use and coastal development footprints, human stressors, key pressures.
    - Disaster risk management and climate change adaptation: evolution of shoreline, disaster risk assessment, measures for disaster risk reduction and climate change adaptation, implementation of nature-based solutions.
    - Governance for ICZM, including improved coordination mechanisms, data collection and management and public participation processes.
- Implementation of ICZM Plan:
    - Effectiveness of ICZM.
    - Summary of the ICZM Progress Indicator System.

The production of a series of "Coastal Status Report Cards" that help to capture the health and resilience of coastal zone is recommended that represent annexes to the "State of the Coast" reports. They should be produced and designed to enable a reader (via print or online media) to quickly understand the status of a coastal resource, and to understand important species that may be found there plus the climate or man-induced pressures that are being upon them.

5.2.2 Dashboard

In addition to biannual reporting, CZMAI may consider to implement an even more dynamic information gathering and analysis system, to fulfill the growing demands on the organization. The **availability of accurate and timely information will support its participation in interagency committees such as NEAC and the provision of data to any interested parties**. To this end, it is proposed to develop a **dashboard** displaying information from the Data Hub in real time.

This dashboard may be adjusted to the different units and programs of the CZMAI and shall be designed in alignment with the Data Hub, the contents of the Status of the Coast reports, and other dashboards developed in Belize, such the one proposed under The Natural Capital Project. Following this approach, each manager of the CZMAI will be able to monitor the performance of each indicator for which they have responsibility and to take any corrective actions necessary in a timely and targeted manner. An alert system shall be developed for each indicator which

would inform the manager responsible, of any indicator which is performing at a level outside of the agreed parameters (either positive or negative) so that the manager may take appropriate action.

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