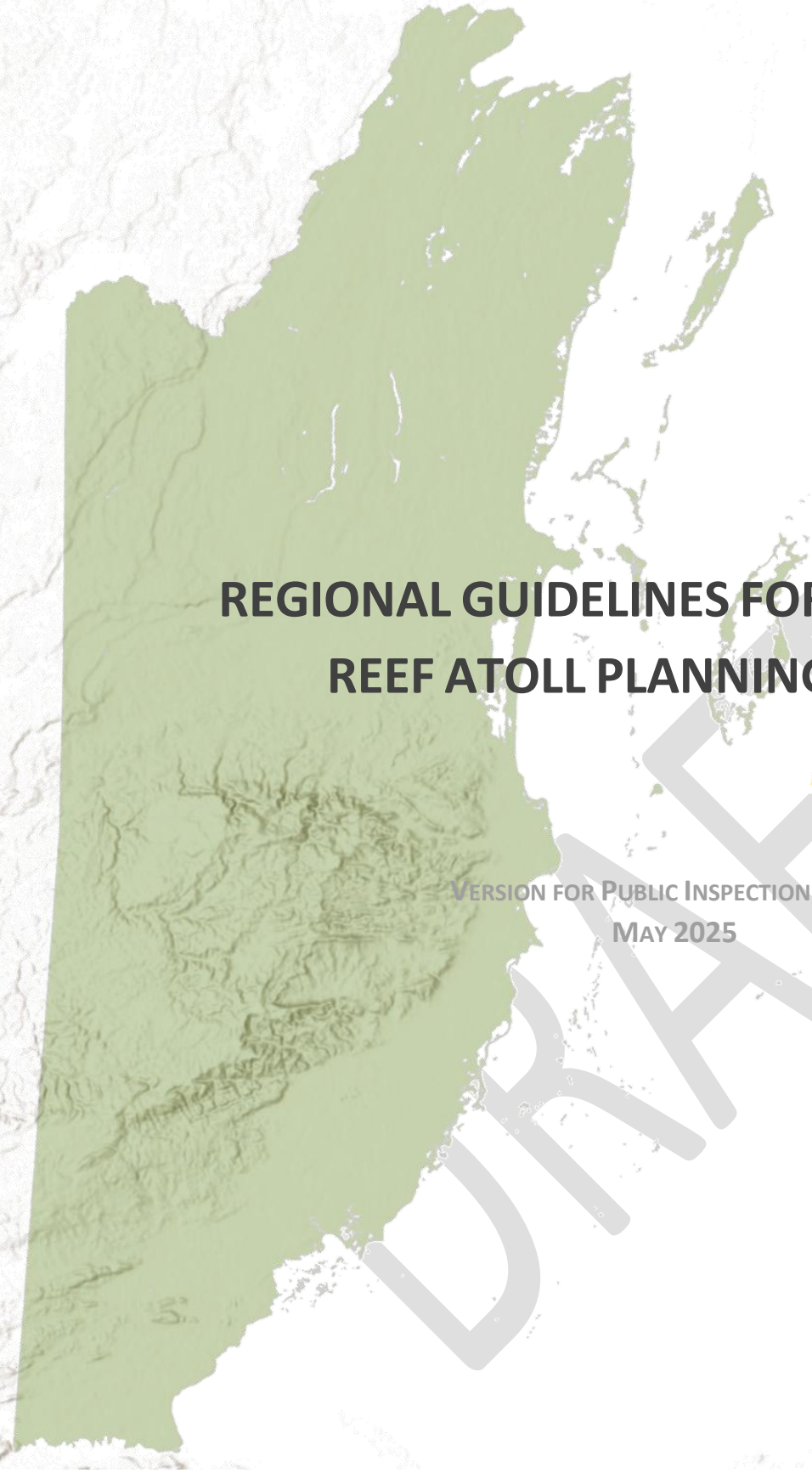

REGIONAL GUIDELINES FOR LIGHTHOUSE REEF ATOLL PLANNING REGION

VERSION FOR PUBLIC INSPECTION PERIOD

MAY 2025

Belize Fund For A Sustainable Future

BLUE BOND and Finance Permanence Unit

IH cantabria
INSTITUTO DE HIDRÁULICA AMBIENTAL
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MAIN CHARACTERISTICS OF THE COASTAL PLANNING REGION

Population: N/A

Cayes: Half Moon Caye, Hat Caye, Long Caye, Northern (2) Caye, Sandbore Caye.

Area Approximately 1600 km^2

Aquatic: 1592 km^2

Cayes: 7,73 km^2

Ecosystems: Seagrass beds, Coral reefs, Mangroves

Major Sources of Income: Tourism and hospitality, Commercial Fishing

Main topics: Tourism, Fishing, Marine Transportation, Land Use and Development, Waste Management and Pollution, Disaster Risk Management.

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1 INTRODUCTION TO THE REGIONAL GUIDELINES

The management of the Lighthouse Reef Atoll Region should follow the recommendations and action lines proposed in the National Integrated Coastal Zone Management (ICZM) Plan and be linked to the goals and aspirations of the community and users. This pristine marine environment is a popular destination for diving and snorkelling, particularly due to the Great Blue Hole, which is a large sinkhole within the reef. The atoll also features several islands and is part of a larger marine reserve.

This Regional Guideline has been developed to:

- Present updated information on Habitat Risk Assessment (HRA), a useful tool for assessing potential impacts and informing environmental conservation decision-making.
- Present updated information on the disaster risk profile to contribute to a more resilient development of the coastal zone.
- Summarize the key issues and challenges of the region, by identifying the strengths, weaknesses, opportunities and threats (SWOT analysis) and collecting feedback from the Coastal Advisory Committee (CAC).
- Formulate a set of recommendations to be developed in the region, in collaboration with local committees and stakeholders.
- Provide information on sectoral recommendations for development standards.

To this end, this document is structured in the following sections:

- Section 1. Lighthouse Reef Atoll Region: presents information on ecosystem services and HRA, disaster risk and SWOT analysis
- Section 2. ICZM recommendations: this section presents the key issues identified combining literature review and stakeholder consultations and informs the formulation of a set of recommendations and actions, supported by a four-year implementation, monitoring, and evaluation plan.
- Appendix: including (i) recommendations for community and caye development, as outlined in the *Interim National Integrated Coastal Zone Management Plan: 2020-2025*, align with the *National Guidelines for the Subdivision and Consolidation of Land* from the Lands Department; and (ii) recommendations from the *National Sustainable Tourism Master Plan*, updated in 2023.

The information presented in this document has been prepared using a combination of technical and participatory approaches. The technical process included the review of existing studies and previous ICZM Plans and the performance of the Habitat Risk Assessment model. The participatory approach was intended to organize two rounds of consultation in the Coastal Planning Region with local stakeholders. In the Lighthouse Reef Atoll Planning Region, a meeting was held on April 2, 2025, at the Belize Audubon Society Conference Room.

Figure 1. First meeting with local stakeholders (Audubon Society Conference Room, April 24, 2025).

2 THE LIGHTHOUSE REEF ATOLL PLANNING REGION

2.1 ECOSYSTEM SERVICES AND HABITAT RISK ASSESSMENT

In the Lighthouse Reef Atoll, coral reefs and seagrass beds follow the same pattern, occupying most of the atoll area at medium risk (Figure 2, Table 1). In these habitats, the difference in the small areas at high risk is due to infrastructure development. Although other stressors in the region are marine transportation and recreation. On the other hand, mangroves have a very limited extent in this region and are mostly at medium risk (82%).

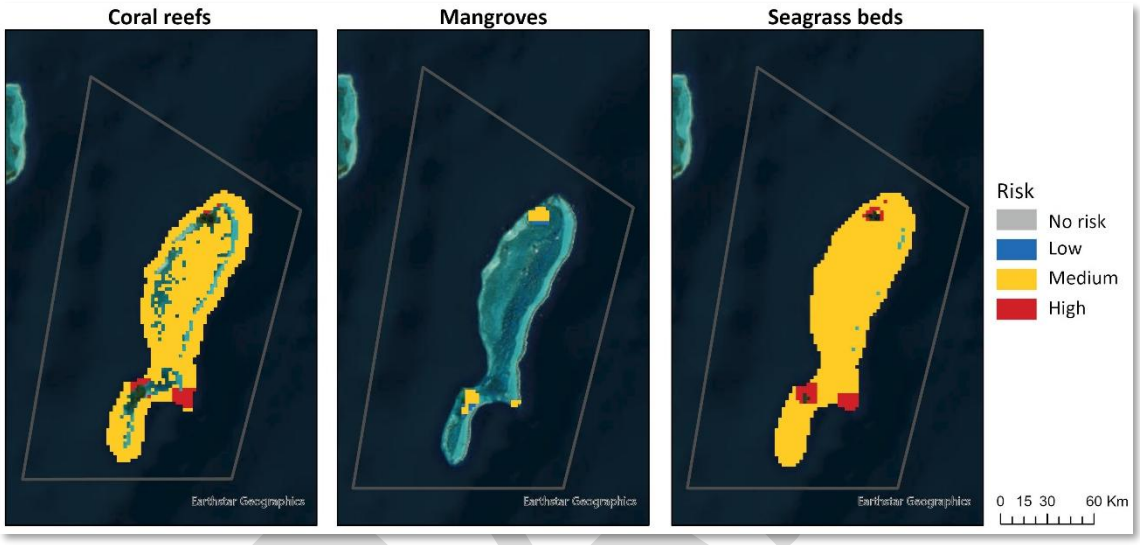

Figure 2. Coral Reef, mangroves and seagrass beds classified as high, medium and low risk for current human activity (2025) in Lighthouse Reef Atoll.

Table 1. Habitat Risk Assessment InVEST model outputs for Lighthouse Reef Atoll.

Habitat	No risk (km^2)	Low Risk (km^2)	Medium Risk (km^2)	High Risk (km^2)
Coral Reefs	0	0	266	12
Mangroves	0	2.5	11.5	0
Seagrass	0	0	290	16.5

2.2 DISASTER RISK AND CLIMATE CHANGE ADAPTATION

Lighthouse Reef Atoll Planning Region faces multiple hazards and risks related to coastal dynamics and climate change. Due to atolls conforming low lying areas, such regions are very highly exposed to tropical cyclone effects and storm surges. Coastal erosion is a critical concern, but mangroves play a key role in mitigating its effects, by providing a natural shield for these areas. According to Martínez et al. (2022), Belize's mangroves significantly reduce erosion caused by tropical cyclones, maintaining shoreline retreat in Long Caye below 0.06 m under both current and more pessimistic climate change scenarios (IPCC AR5 RCP8.5 by 2050, resulting in a sea level rise of 0.275m). However, in sandy coastal areas like Northern Caye, shoreline erosion

(without considering beach resilience, i.e., the ability of a beach to recover naturally from erosion caused by storms or climate change effects) is projected to reach up to around 0.8 and 1.5 m for 50 and 500-year storms respectively under both scenarios.

Despite Lighthouse Reef Atoll's high exposure to tropical cyclone-related hazards, the lack of census and infrastructural data in this region hinders acquisition of reliable vulnerability, coping capacity and resilience parameters to enable a proper risk assessment. Nevertheless, it should be noted that the region is experiencing a rapid increase in demand for tourism development, with several touristic resorts, over-water structures and airfields, which directly suffer from these natural hazards' effects.

2.3 SWOT ANALYSIS

The following section presents a SWOT analysis of the Coastal Planning Regions (CPR) identifying elements or processes that need to be improved or strengthened (Weaknesses), mitigated (Threats), maintained (Strengths), and leveraged (Opportunities), which in turn help define coastal management objectives and recommendations. This analysis results from a careful assessment, including a review of existing studies of the coastal area available and the analysis of previous ICZM Plans, together with the review of sectoral policies and plans, and the comments raised by stakeholders during the consultation meeting held on April 2, 2025.

Strengths:

- Lighthouse Reef Atoll is one of Belize's premier tourism destinations, home to the Great Blue Hole, Half Moon Caye Natural Monument, and other pristine marine environments. These attractions draw international visitors, supporting Belize's economy and reinforcing the country's status as a world-class diving and ecotourism hub.
- The atoll supports coral reefs, mangroves, seagrass beds, and deep waters, providing habitat for lobster, conch, sharks, dolphins, sea turtles, and nesting seabirds like red-footed boobies. It also contains protected and unprotected fish spawning sites, reinforcing its role in fisheries sustainability.
- With most of the CPR designated as a Marine Protected Area (MPA), the region benefits from a strong conservation framework with co-management efforts led by the Belize Audubon Society that safeguards biodiversity. Policies such as the 20/80 (development/conservation) rule for land use of the Lighthouse Reef Conservation Institute, or the target pursued by the Belize Fund for Sustainable Development, which aims to protect 30% of Belize's ocean territory by 2026 limit development while keeping most of the atoll in a natural state.
- Lighthouse Reef Atoll has long supported traditional fishing, with its reefs and deep waters serving as key fishing and breeding grounds. Supplemental livelihoods such as seaweed farming have been proposed to ease pressure on wild stocks.

Weaknesses:

- Rapid tourism expansion and unplanned development are exceeding the region's carrying capacity, leading to the destruction of key habitats, depletion of resources, and disruption of ecosystem services.

- Inconsistent land-use policies among different government agencies. Local land applicants face more challenges at getting application approvals compared to wealthier individuals who receive preferential treatment.
- Expanding piers, overwater structures, and airstrip use threatened marine and coastal ecosystems, while shoreline erosion requires sustainable management solutions.
- Growing tourism reduces access to fishing grounds and camping areas, with privatization of key sites forcing fishermen into informal campsites, increasing management challenges.
- The removal of natural vegetation and development encroaching on fishing zones threaten biodiversity, while unsustainable fishing practices risk long-term fishery productivity and local livelihoods.
- Poorly marked marine routes cause boat groundings, damaging reefs, while large vessels exceed mooring capacities, destroying seagrass beds—calling for improved markers and designated anchorage zones.
- Insufficient regulations in the Marine Reserve and lack of awareness among fishers.
- Companies engaging in destructive activities such as reef dynamiting and mangrove clearing, often with little regulatory oversight.

Opportunities:

- The atoll's natural appeal presents an opportunity to develop low-impact, high-value tourism that prioritizes conservation and limits overdevelopment.
- Strengthening sustainable fishing practices and protecting key habitats can support both biodiversity and the long-term viability of traditional livelihoods.
- Thoughtful planning for erosion control, anchorage areas, and navigational aids can enhance safety while minimizing environmental harm.
- Encouraging soft coastal defences and limiting hard infrastructure can help mitigate erosion and habitat destruction.
- Incentives for sustainable tourism, responsible fishing, and ecosystem service valuation can align economic growth with long-term environmental health.

Threats:

- Rising sea levels, stronger storms, coral bleaching, and habitat destruction threaten the atoll’s ecosystems and long-term resilience.
- Expanding tourism, infrastructure, and overfishing without proper oversight could degrade marine habitats, exceed carrying capacity, and compromise natural resources.
- Inadequate sewage treatment, solid waste disposal, and oil spills from increased tourism and marine traffic pose risks to water quality and biodiversity.
- Privatization, tourism growth, and expanding infrastructure (e.g., piers and overwater structures) may reduce fishing grounds and traditional access, creating socio-economic tensions.
- Future environmental challenges due to new cruise lines, which are expected to bring significant visitor numbers to Lighthouse Reef Atoll.

3 ICZM RECOMMENDATIONS

3.1 KEY ISSUES AND RECOMMENDATIONS

Table 2. Key issues and recommendations. ID refers to the Code of each Recommendation (R). S refers to the scale implementation of each recommendation: National (N), Local (L).

TOPIC	KEY ISSUES	ID	RECOMMENDATIONS	S*
Tourism	Rapid increase in demand for tourism development.	R1	Restrict land use for resort development to existing areas with limited room for expansion, avoiding high-impact tourism and ensuring ecological sustainability.	L
	Loss of traditional tourism livelihoods.	R2	Support ecologically sustainable tourism initiatives that integrate traditional livelihoods and nature-based activities.	L
Fishing	Destruction of critical habitats for fisheries.	R3	Strengthen zoning protections for spawning grounds and traditional fishing areas to maintain biodiversity and fish stocks.	L
	Development infringing upon fishing zones.	R4	Improve regulatory frameworks to ensure development aligns with sustainable fishing practices and does not encroach on key fishing grounds, following DOE's and CZMAI's recommendations and prohibitions.	N
	Loss of fishermen's access to camping grounds.	R5	Secure designated areas for fishermen's campsites and ensure their long-term access to traditional fishing grounds.	L
	Unsustainable use of fisheries resources.	R6	Implement modern, ecosystem-based fisheries management by establishing science-based policies, minimum sizes and maximum catch quotas to ensure long-term economic, social, and ecological sustainability.	N/L
	Lack of navigational aids increasing risks.	R7	Install clear markers for spawning aggregation sites, no-take zones, and traditional fishing grounds to support safe and sustainable fishing practices.	L
	Overexploitation of fisheries resources.	R8	Enforce the management of Fisheries Priority Areas (FPAs) and Aquatic Reserves identified for biodiversity conservation, as defined in the National Fisheries Policy, Strategy and Action Plan.	N/L
Marine Transportation	Increased boat traffic (cruise vessels, cargo ships, water taxi, and leisure vessels) and new cruise lines leading to habitat damage.	R9	Develop and enforce vessel traffic regulations to control high-speed boating, prevent anchor damage, and minimize marine habitat destruction. Follow Marine Spatial Planning policies.	N/L
		R10	Limiting visitor numbers, require local guides, and ensure only Belizean nationals or residents receive tour licenses.	L
	Insufficient mooring buoys and navigation aids.	R11	Implement a National Mooring Buoy Plan in collaboration with relevant agencies to protect sensitive marine habitats.	N

	Frequent vessel groundings due to outdated navigational charts.	R12	Update navigational charts and clearly demarcate safe boating routes to reduce habitat damage.	N/L
Land Use & Development	Increased shoreline erosion due to infrastructure expansion.	R13	Promote the use of soft coastal defence strategies such as mangrove restoration and living shorelines while limiting the use of hard structures.	L
	Exceeding carrying capacity leading to resource depletion.	R14	Integrate human carrying capacity into land-use planning and zoning regulations to prevent overuse of critical habitats.	N
	Deforestation and habitat loss for development.	R15	Support conservation measures such as the Lighthouse Reef Conservation Institute's 20/80 rule, ensuring that 80% of land remains in its natural state.	L
	Unregulated piers (e.g., in Hat Caye) and overwater structure development.	R16	Prohibit closed overwater structures, especially those with bathroom facilities, to prevent water pollution. Enforce stricter regulations on the construction and spacing of piers, with limited number of piers per property.	L
	Uncontrolled coastal development impacting ecosystems.	R17	Enforce stricter permitting processes, requiring detailed EIA and sustainability criteria before approval to ensure ecosystem protection. Establish community reporting mechanisms.	N
Waste Management & Pollution	Oil spills and marine pollution from increased traffic.	R18	Develop and enforce spill prevention measures and emergency response protocols to mitigate environmental damage.	N/L
DRM	Rising sea levels, increased storm intensity, and coral bleaching threatening ecosystem resilience and human lives.	R19	Enhance research initiatives and awareness campaigns led by National Emergency Management Organization (NEMO), regarding adaptation and emergency management, as defined by the National Climate Change Policy, Strategy and Master Plan (NCCPSMP).	N
		R20	Develop and implement climate adaptation strategies, such as nature-based coastal protection, coral reef restoration projects, and managed retreat policies to reduce long-term environmental risks.	N
S: Scale: National (N) and local (L)				

3.2 IMPLEMENTATION, MONITORING AND EVALUATION PLAN

The implementation plan aims to establish priority recommendations to address the key issues of the CPR, as well as to define the actions needed to implement them. To this end, three recommendations have been prioritized, considering their relevance to local stakeholders, their feasibility of implementation during the four years of the ICZM plan, their potential to be applicable to other CPRs and their urgency in terms that have not been addressed during previous ICZM cycles. The selection of recommendations focuses on those at the CPR level, as national recommendations are addressed in the National ICZM Plan.

Following this approach, the prioritized recommendations for this CPR are:

- R3. Strengthen zoning protections for spawning grounds and traditional fishing areas to maintain biodiversity and fish stocks.
- R9. Develop and enforce vessel traffic regulations to control high-speed boating, prevent anchor damage, and minimize marine habitat destruction. Follow Marine Spatial Planning policies.
- R20. Develop and implement climate adaptation strategies, such as nature-based coastal protection, coral reef restoration projects, and managed retreat policies to reduce long-term environmental risks.

The table below outlines the most relevant actions to be carried out for each priority recommendation. This implementation plan covers a four-year implementation period, specifying the stakeholders involved, progress indicators to track each action, and the baseline for comparison. To ensure effective implementation, a biannual report at the CPR level is required.

Table 3. Implementation plan for the prioritized recommendations.

ID	ACTION	STAKEHOLDERS INVOLVED	IMPLEMENTATION PERIOD Y1	Y2	Y3	Y4	PROGRESS INDICATOR
R3: Strengthen zoning protections for spawning grounds and traditional fishing areas to maintain biodiversity and fish stocks.							
3.1	Develop regulations for the Marine Reserve	Fisheries Department, CZMAI, local stakeholders					Regulations are published
3.2	Define and legally establish traditional fishing zones and spawning areas through participatory mapping with local fishers.	Fisheries Department, BAS, local fishers, NGOs					Number of zones legally recognized and mapped
3.3	Disseminate clear information about regulations to fishers and tour operators, including in native languages.	Fisheries Department, BAS, NGOs					Distribution of communication materials and outreach sessions held
3.4	Establish community-based monitoring and reporting mechanisms for illegal fishing.	Fisheries Department, NGOs, local fishers					Number of reports submitted; enforcement actions taken
R9: Develop and enforce vessel traffic regulations to control high-speed boating, prevent anchor damage, and minimize marine habitat destruction.							
9.1	Conduct a vessel impact and traffic assessment, including carrying capacity for different vessel types.	Belize Port Authority, DOE, Fisheries Department, CZMAI					Completion of study and maps
9.2	Establish designated routes and speed zones for leisure, cargo, cruise, and fishing vessels.	Port Authority, Fisheries Department, BTB, Tour Operator Associations, Fishers Associations					Publication of route maps and posted signage
9.3	Enforce regulations on anchoring and speed limits through increased patrols and surveillance.	Port Authority, Fisheries Department					Number of patrols; violation reports
9.4	Establish community-based monitoring and reporting mechanisms.	Port Authority, NGOs, Tour Operator					Number of reports submitted; enforcement actions taken

		Associations, Fishers Associations					
R20: Develop and implement climate adaptation strategies, such as nature-based coastal protection, coral reef restoration projects, and managed retreat policies to reduce long-term environmental risks.							
20.1	Conduct vulnerability assessments for critical habitats (e.g., coral reefs, beaches) and infrastructure.	CZMAI, NEMO, DOE, NGOs, HRI, academic partners (e.g. UB-ERI)					Completion of vulnerability reports
20.2	Implement coral restoration and mangrove replanting in degraded areas.	BAS, NGOs, DOE, HRI					Area (ha) restored
20.3	Integrate climate adaptation into land use planning by identifying high-risk areas (e.g., flood zones, erosion-prone areas) and establishing mandatory no-build and buffer zones, aligned with sea-level rise projections.	NEMO, Lands Department, DOE, CZMAI					Official designation of no-build zones and integration into permitting process
20.4	Develop monitoring systems for reef health and nearshore water quality, including use of the 66 ft buffer.	DOE, BAS, CZMAI, NGOs, HRI					Monitoring reports published; response protocols established

4 APPENDIX

The sectoral recommendations for development standards in terrestrial zones and cayes, as outlined in the *Interim National Integrated Coastal Zone Management Plan: 2020-2025*, align with the *National Guidelines for the Subdivision and Consolidation of Land* from the Lands Department. The following sections present these recommendations in detail.

4.1 RECOMMENDATIONS FOR COMMUNITY AND CAYE DEVELOPMENT

Table 4. Recommended land use for cayes in the Lighthouse Reef Atoll Planning Region

COMMUNITY	RECOMMENDED DEVELOPMENT DENSITY	RECOMMENDED DEVELOPMENT STANDARDS
Northern (2) Caye	Low density development	Residential I, Commercial I, Conservation I
Hat Caye	Least suitable for development	Residential I
Sandbore Caye	Not suitable for further development	Conservation II
Long Caye	Low density development	Residential I, Commercial I, Conservation I&II
Half Moon Caye	Low density development	Residential I, III, Commercial I, II, Conservation II

4.2 NSTMP RECOMMENDATIONS

The *National Sustainable Tourism Master Plan*, updated in 2023, provides an overarching tourism policy and strategic planning instrument. It spans a 20-year period (2010-2030) and highlights 8 contemporary themes regarding tourism. The following themes and actions are established for the Lighthouse Reef Atoll Planning Region:

<u>Urban Settlement & Management</u>

1.7 Ensure the (real and perceived) safety and security of all visitors (at day and night) in tourism towns is prioritised.

<u>Marine, Reef and Caye Condition</u>

3.2 Undertake research and monitoring to better measure the impact of climate and water temperature change of reef systems.

3.3 Policing of illegal fishing and related behaviours that compromise reef & biosphere conditions.

3.4 Acknowledge the critical role of caye and reef management by Non-governmental organization (NGO) and seek a coordinated approach to tourism practices.

3.6 Better management of recreation air & boat traffic in and around the reef and cayes.

3.7 Apply carrying capacity measures to public cayes with the prospect of visitor quotas and seasonal limits.

3.8 Recognise the delicate environmental condition of cayes and establish common development regulations.

National Parks and Protected Areas (Terrestrial Areas)

4.2 Improve visitor access (roads or alternative river, lagoon, or sea craft) to national parks and protected areas for greater convenience.

Tourism Governance Management and Marketing

8.1 Adopt the Spatial Tourism Framework as a national network of hubs, nodes, and corridors to aid decision-making on planning and investment.

8.6 Promote the use of clean energy and sustainable land and management for tourism development and services.

8.14 Restore tourism standards program to benchmark with other regions (i.e. ASEAN) and promote information technologies.

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