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Component of a 10-year Management Plan

North-East Tobago
Man and the Biosphere Area

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Man and the Biosphere Programme

FOCUS: ALIEN INVASIVE SPECIES

AUGUST 2022

Component of a 10-year Management Plan

FOCUS: ALIEN INVASIVE SPECIES

for the

North-East Tobago Man and the Biosphere Area

Draft

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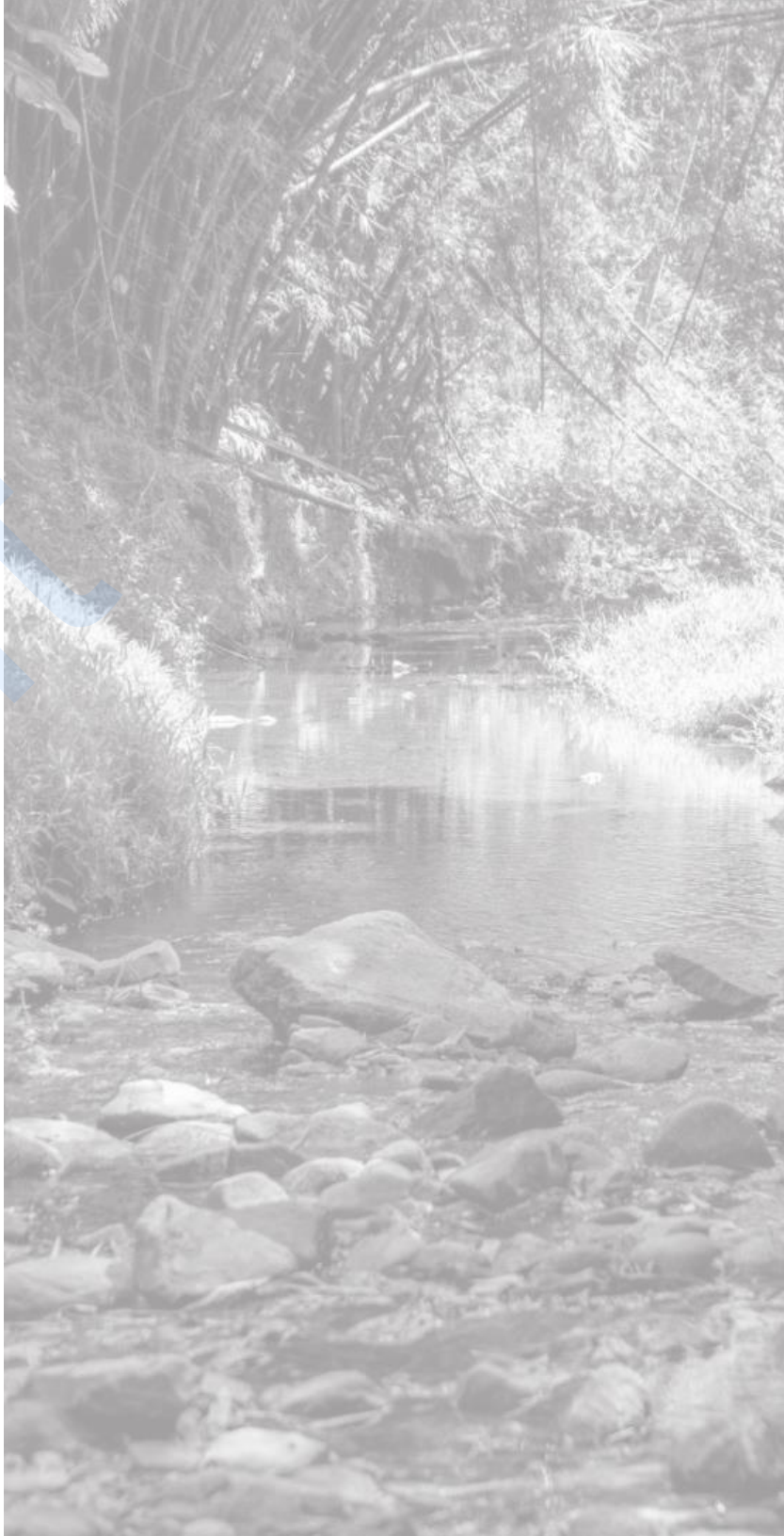


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1 EXECUTIVE SUMMARY

This document was developed as part of a project titled: *"Caribbean Small Island Developing States Trinidad Sub-Project Rehabilitation of Quarries*" (IWEco TT) with funding from the Global Environmental Facility, under approval of the United Nations Development Programme and via a contract with the Environmental Management Authority of Trinidad and Tobago. It is meant to be a guideline for the future management authority and staff of the North-East Tobago UNESCO Man and the Biosphere Reserve (NETMABR). While it will be open to all stakeholders, it is not meant to be an instrument for outreach activities; an outreach-friendly, intelligible version of the management plan will be developed in late-2022. The document represents the second component of the overall 10-year Management Plan for the NETMABR. The first, complementary component was finalised in December 2021 and a third and final one will be finalised under other interventions and consolidated in November 2022.

This draft plan was developed via review and analysis of primary and secondary literature as well as formal and informal stakeholder consultations between 2018 and 2022; major limitations were based on COVID-19 restrictions and significant primary data deficiencies. The draft plan at hand will be discussed with stakeholders between June and November 2022, revised and finalised accordingly.

This, second component of the Plan includes:

- Revision of previous Stakeholder and Communication Plans,
- Participatory Development of Vision, Mission, Objectives and Principles,
- Site Description,
- SWOT and PESTLE,
- Alignment with existing Legal and Regulatory Framework, Policies and International Conventions.

Furthermore, it includes situational analyses, high level goals, priorities, strategies and proposed actions for three management topics / components:

- Conservation Strategies, Programmes and Priority Projects
- Climate Change Resilience Strategies, Programmes and Proposed Actions
- Community-based, Green, Blue, Purple Economic Strategies, Programmes and Proposed Actions

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Next steps and two key recommendations are provided in the chapter below.

The ERIC team would like to thank the EMA Office, Trinidad and Tobago, specifically Alicia Aquing, GEF IWEco National Project Coordinator, and Mr Linford Beckles, Director, Department of the Environment, Tobago House of Assembly for facilitating this intervention and put trust in our technical capabilities.

North-East Tobago Man and the Biosphere Reserve Management Plan Components

SLM

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6. Alien Invasive Species
7. Sustainable Agriculture and Sustainable Land Management Practises
8. Sustainable Tourism
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2 THE WAY FORWARD

The ERIC has successfully applied to the UNDP Small Grants Programme, Trinidad and Tobago, to fund the final components of the Management Plan and create a knowledge sharing platform for the Plan via a project titled: "*Drafting the Final Components of the Management Plan for the North-East Tobago UNESCO Man and the Biosphere Reserve and Intelligible Knowledge Management*". The proposal was endorsed by the Department of the Environment, Tobago House of Assembly, which is the Focal Point for the UNESCO MAB Programme in Trinidad and Tobago and by Division of Ecological and Earth Sciences, UNESCO, Paris, France. This final component was approved in May 2022.

This timing aligns perfectly with a contract between the Inter-American Development Bank and Syntegra Change Architects Limited (Trinidad) with the following key objectives:

1. to structure the corporate governance framework of the NETPAMPT under a research-driven and participatory approach;
2. to structure the institutional framework of the NETPAMT, using components of an environmental and social management systems and including the foundations for a fund-raising strategy; and
3. to provide training and dissemination of i) the corporate governance framework; and ii) E&S institutional framework to key stakeholders.

Having started in February 2022, this intervention, of which the NETPAMT, and by extension the Tobago House of Assembly, is the direct beneficiary, will allow the NETPAMT, as future management organisation of the UNESCO Man and the Biosphere Reserve in North-East Tobago, to revise, refine, and apply the finalised management plan.

Based on these interventions, **the key recommendations** for advancing the sustainable development goals under the UNRESCO MAB Programme for NE Tobago are to:

1. **engage the Government of Trinidad and Tobago and the Tobago House of Assembly to provide the necessary budget allocations (2022-2024) for the operations of the NETPAMT until initial Green Fund funding and subsequent, self-financing is secured, and**
2. **facilitate stakeholder awareness and tangible benefits for communities in the NETMABR.**

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3 INTRODUCTORY REMARKS

This document was developed as part of a project titled: *"Caribbean Small Island Developing States Trinidad Sub-Project Rehabilitation of Quarries*" (IWEco TT) with funding from the Global Environmental Facility. It is meant to be a guideline for the future management authority and staff of the North-East Tobago UNESCO Man and the Biosphere Reserve (NETMABR).
The document represents a component of the overall 10-year Management Plan for the NETMABR. The additional, complementary components will be finalised under another intervention, and both consolidated in June 2022.
Amongst other guidelines, the Technical Guidelines for Biosphere Reserves (TGBR, UNESCO 2021) were taken into consideration for preparing this document.

The TGBR provides an indicative list of several main items a UNESCO Biosphere Reserve Management Plan should contain:

a. a recommendation for an organisational/governance structure responsible for implementation of the plan,
b. a situational analysis,
c. a vision,
d. medium-term goals,
e. management priorities,
f. proposed priority projects, and
g. monitoring indicators,

The document at hand covers, for the components under the contract with the EMA, items **b, c, d, e, and f**. Item **a** was covered under a previous assignment, item **g** will be covered under the above-mentioned complementary SGP project.
The components (topics) of the NETMABR Management Plan covered under this assignment included:

- Revision of previous Stakeholder and Communication Plans
- Participatory Development of Vision, Mission, Objectives and Principles
- Site Description, SWAT and PESTLE
- Alignment with existing Legal and Regulatory Framework, Policies and International Conventions
- Conservation Strategies, Programmes and Priority Projects
- Climate Change Resilience Strategies, Programmes and Proposed Actions

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- Community-based, Green, Blue, Purple Economic Strategies, Programmes and Proposed Actions
- Stakeholder Consultations, Local Capacity Building and Media Outreach

As discussed with the funding agency, stakeholder consultations were quite limited due to time- and COVID-19 restrictions. Furthermore, stakeholder consultations will be most efficient and effective when the full draft of the Management Plan will be available in 2022 and a more concise and intelligible version can be produced to meaningfully engage at all stakeholder levels. Once all documents will have been consolidated, the final layout will be polished using an advanced desktop publishing and page layout designing software application. Once funding permits, an intelligible and interactive website will be created to facilitate ease of access to and navigation through the Management Plan.



Figure 1. Fishermen in Castara Bay

4 METHODS

This draft document was developed via review and analysis of primary and secondary literature (see Annex 1) as well as formal and informal stakeholder consultations between 2018 and 2022. These consultations were conducted in relation to the drafting of the UNESCO Man and the Biosphere Nomination Form for NE Tobago, the drafting of the Dossiers for the Designation of NE Tobago's Main Ridge Forest Reserve, Islets and Reefs as Natural National Heritage Sites of Trinidad and Tobago and the drafting of a proposal to the Inter-American Development Bank titled: "Organisational Governance and Operational Strengthening of the North East Tobago Protected Area Management Trust (NETPAMT)".

It should be noted that this document applies the common writing style of UNESCO MAB Reserve Management Plans and, as such, does not claim to be or follow the writing style of a scientific research paper.

5 LIMITATIONS

The bulk of the document was prepared between November 2021 and June 2022 when restrictions regarding the COVID-19 pandemic prohibited workshops, group consultations and broader community involvement. Additionally, the extremely tight timeline for delivery of the draft and final document did not allow for the desired stakeholder participation. However, these limitations can be addressed in mid-2022, when the complementary components of the management plan will be finalised and a more intelligible version of the management plan can be developed, which will be more directed towards stakeholder engagement than programme management guidance (as it is the case for this document).

An additional, major limitation is the ubiquitous data deficiency for NE Tobago regarding all components of the management plan. Therefore, many statements in the situational analyses are based on recent, oral stakeholder reports and personal observations of the resident expert team. Hence the reason that baseline surveys, monitoring and evaluation interventions are essential to inform the future implementation organisation.

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6 VISION

MAB Vision: A world where people are conscious of their common future and their interactions with the planet, and act collectively and responsibly to build thriving societies in harmony within the biosphere.
To be based on stakeholder consultations.

7 MISSION

The MAB Mission 2015–2025 is to

- develop and strengthen models of sustainable development through the WNBR;
- communicate experiences and lessons learned, and facilitate the global diffusion and application of these models;
- support evaluation and high-quality management of biosphere reserves, strategies and policies for sustainable development and planning, and accountable and resilient institutions;
- help Member States and stakeholders to achieve the Sustainable Development Goals by sharing experiences and lessons learned related to exploring and testing policies, technologies, and innovations for the sustainable management of biodiversity and natural resources and mitigation and adaptation to climate change.

To be adapted on stakeholder consultations.

Figure 2. Children planting trees in Parlatuvier Bay (Janina Ewals)



8 KEY OBJECTIVES

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In order to address NE Tobago conservation and sustainable development challenges through strengthening the functions of a BR, the technical team proposes the following **Main Objective** for the management of the NETMABR:

To successfully consolidate and co-manage interventions related to sustainable and regenerative development, research, capacity building, education and networking on landscape, human- and eco-system levels for the benefit of NE Tobago's cultural and natural heritage, communities, and people.

Note: To be adapted based on stakeholder consultations

This key objective is designed to address the 12 key barriers that were identified by previous management plans for NE Tobago and IFPAM documents further as follows:

1. outdated legal and regulatory framework for establishing and managing natural and cultural resources,
2. unclear, fragmented roles responsibilities of stakeholders, especially managing authorities,
3. disempowered and under-resourced management authorities,
4. inadequate funding,
5. willingness to participate if interventions seem to be too restrictive,
6. stakeholder conflicts,
7. lack of broad, bipartisan political will,
8. lack of technical capacity to identify and address issues,
9. minimal capacity on the ground with respect to practical approaches to effective natural and cultural heritage management,
10. inadequate law enforcement,
11. minimal experience with income-generating opportunities, and last but by no means least,
12. a lack of transparency, accountability and compliance with regulation and legislation by the Tobago House of Assembly.

While IFPAM and other programmes and projects were able to partially address these barriers, and while it can be stated that conservation status and efforts in NE Tobago have never been better, it remains a fact that all of the above barriers are still valid and need attention.

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The Management Plan at hand is based on the methodical approach that most of the above-mentioned barriers can be addressed by implementing strategies aligned with the three MAB functions.

These, below-described key strategies, are mainly based on the results of the recent Improved Forest and Protected Area Management Project (IFPAM, 2015-2020) which applied a participatory approach in identifying objectives and potential solutions to overcome conservation barriers; additionally, the ongoing interaction between the technical team and key stakeholders was used to refine recommendations included into the Management Plan.
These strategies are reoccurring and supported by proposed activities in the various components of the Management Plan at hand.
It should be noted that, while IFPAM continuously considered socio-cultural aspects of NE Tobago as essential to successful management of natural resources, there was, unfortunately, not a matching project to similarly address the management of NE Tobago's cultural heritage.

Figure 3. Iguana Bay (Janina Ewals)



9 WHAT IS THE UNESCO MAB PROGRAMME?

In 1971, United Nations Educational, Scientific and Cultural Organisation (UNESCO) launched the intergovernmental Man and the Biosphere programme (MAB) that aims to establish a basis for the improvement of relationships between people and their environments. It predicts the consequences of today's actions on tomorrow's world and thereby increases people's ability to efficiently manage natural resources for the well-being of both human populations and the environment (30).

The working unit of MAB is the Biosphere Reserve (BR), an international description of recognition from UNESCO for an area in the world, which is deemed to demonstrate a "balanced relationship between humans and the biosphere".

Biosphere Reserves are internationally recognised areas comprising terrestrial, marine and coastal ecosystems. Each reserve promotes solutions reconciling the conservation of biodiversity with its sustainable use by local communities. BRs are nominated by national governments and remain under the sovereign jurisdiction of the states where they are located.

BRs are intended to be model regions for demonstrating successful approaches to protection and sustainable development at a regional level. MAB sites are established with the goal to:

- harmonise conservation of biological and cultural diversity with economic and social development, and
- make a tangible contribution to the transition to green societies and support national governments' efforts to attain the Sustainable Development Goals (SDGs).

Biosphere Reserves have **three inter–connected functions**:

- **Conservation**: protecting cultural diversity and biodiversity, including genetic variation, species, ecosystems, landscapes, and securing services provided by such diversity.
- **Development**: fostering economic and human development that is environmentally and socially sustainable and culturally appropriate; and
- **Logistic Support**: facilitating demonstration projects, environmental education and sustainable development education and training, research and monitoring.

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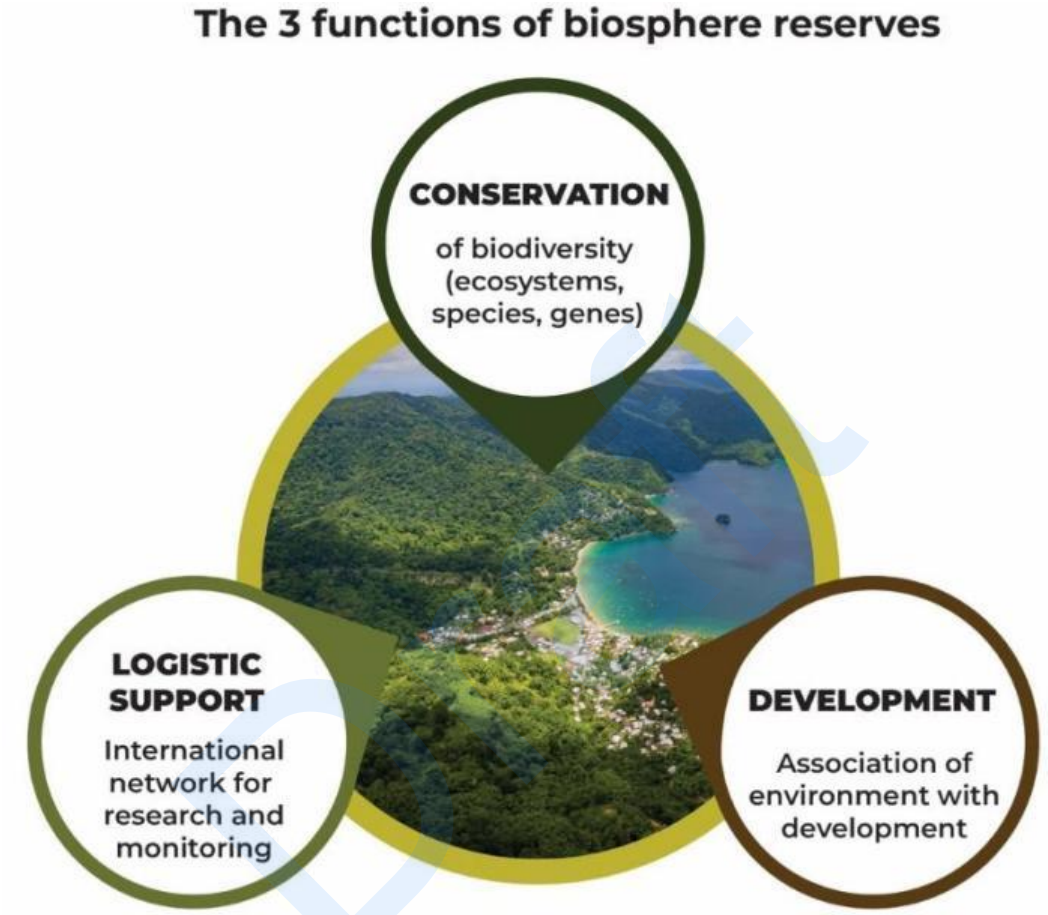


Figure 4. Schematic overview of 3 functions of biosphere reserves.

A BR consists of **three areas or zones – The core, buffer, and transition zones**.

The core zone is usually a legally protected area in which human activity is strictly limited and where monitoring of conservation priorities take place.

The buffer zone allows for appropriate activities such as research and scientific study, ecotourism, education and training.

The transition zone contains human settlements, agricultural and other commercial activities synonymous with human settlement.

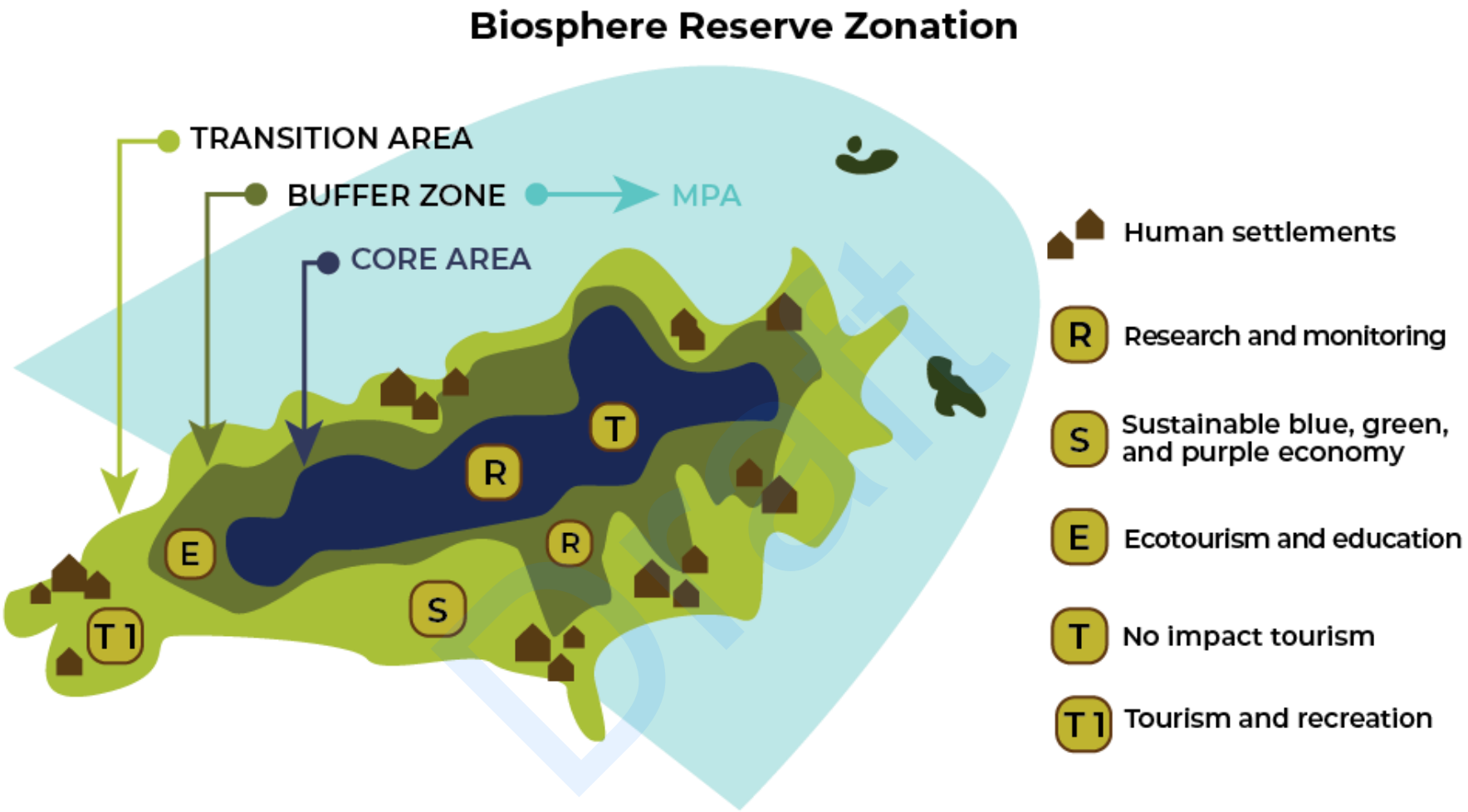


Figure 5. Schematic overview of NE Tobago Biosphere Reserve zonation (ERIC 2021).

The MAB Programme has a significant World Network of Biosphere Reserves (WNBR) which serves as a management tool for various municipal regions to improve strategies for sustainable development. As the pressures upon ecosystems increase with growing populations and climate change, the need for upgraded relationships between people and their natural surroundings only increases.

The **MAB Programme Mission** for the period 2015-2025 (31) is to:

- develop and strengthen models for sustainable development in the WNBR;
- communicate the experiences and lessons learned, facilitating the global diffusion and application of these models;
- support evaluation and high-quality management, strategies and policies for sustainable development and planning, as well as accountable and resilient institutions; and
- help member states and stakeholders to urgently meet the Sustainable Development Goals through experiences from the WNBR, particularly through exploring and testing policies, technologies and innovations for the sustainable management of biodiversity and natural resources and mitigation and adaptation to climate change. (MAB Strategy 2015-2025 & Lima Action Plan)

9.1 Administration

The international MAB Programme

The MAB programme is organised under an international agreement through UNESCO; state parties undertake actions within the MAB programme voluntarily and sites remain under national jurisdiction. At the global level, the MAB Programme is governed by its International Coordinating Council (ICC), under the overall authority of the UNESCO General Conference and its Executive Board.

The next level of governance is represented by regional and thematic networks. Governance at the national level is ideally through MAB National Committees.

The MAB institutional structure is outlined in Figure 6.

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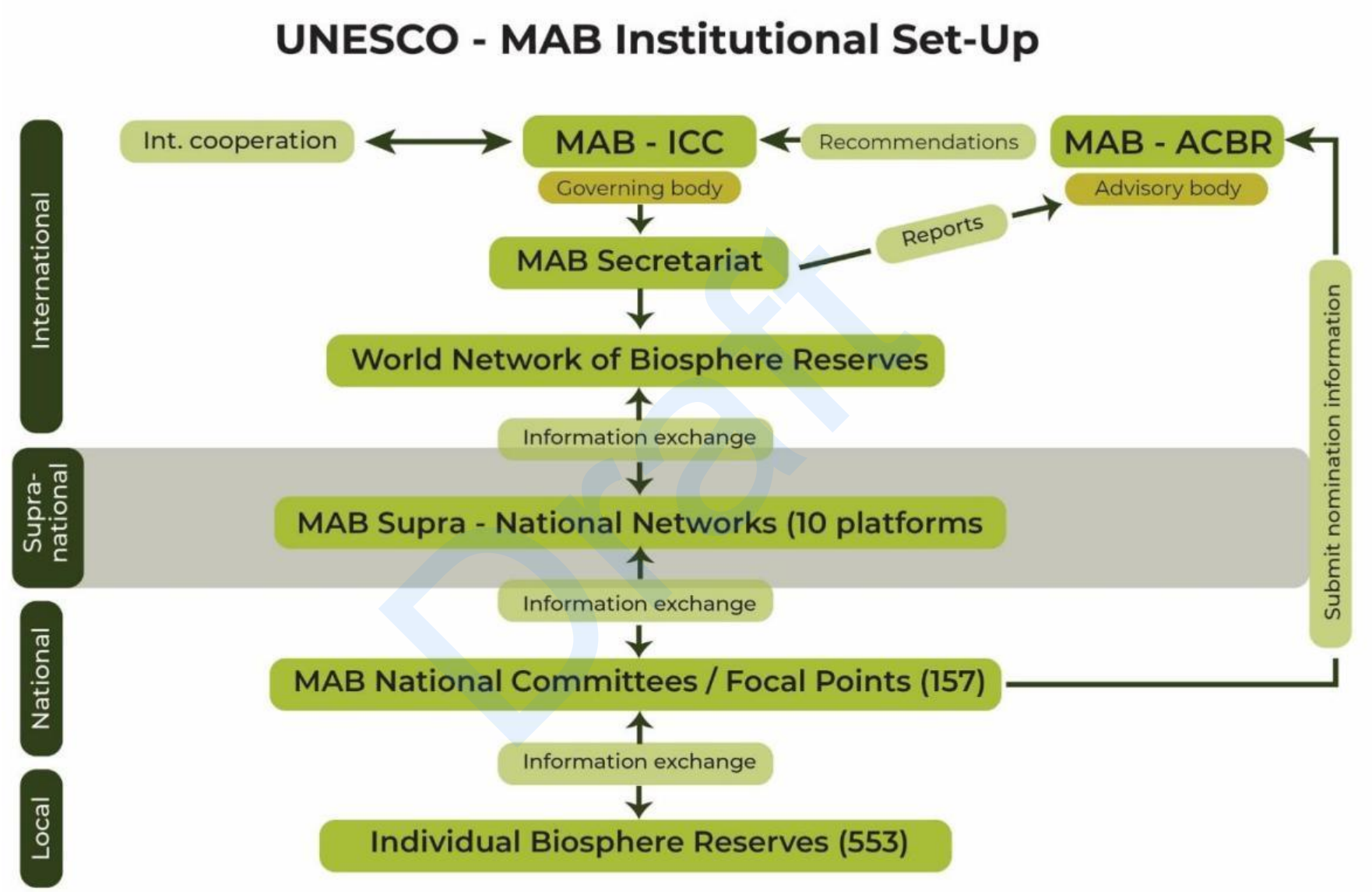


Figure 6. Diagram of the MAB institutional structure adapted from Schliep (24).

The MAB International Coordinating Council (ICC) is the governing body that meets biannually and consists of 34 Member States elected by UNESCO's General Conference. The ICC elects a chair and five vice-chairpersons from each of UNESCO's geopolitical regions that constitute the MAB Bureau which undertakes the responsibilities of the ICC between its biannual meetings. The MAB International Advisory Committee for Biosphere Reserves is the primary scientific and technical Committee body advising the ICC. The MAB Secretariat is the administrative centre for MAB based at UNESCO's Division of Ecological and Earth Sciences in Paris, the Secretariat work closely with the different field offices and Supranational Networks (e.g., IberoMAB – Iberian Peninsula and Latin America/ Caribbean region) around the world to coordinate the work of the MAB programme at the regional, national and individual Biosphere Reserve levels.

MAB is funded through the regular budget of UNESCO and mobilises funds-in-trust granted by Member States, bilateral and multilateral sources and extra-budgetary funds provided by countries, the private sector and private institutions.

UNESCO's intergovernmental structure provides MAB with a framework to help national governments support the planning and implementation of research and training programmes with technical assistance and scientific advice.

MAB-related activities are nationally financed however the programme can grant seed funding to assist countries in developing projects and/or to secure appropriate partnership contributions.

MAB offers fellowship opportunities co-sponsored by a number member states to assist the technical development of individuals seeking to build a profession within the field of the UNESCO programme priorities. These opportunities would be available to local staff to apply for.

Importantly, designation as a MAB Reserve does not necessarily require the formation of new laws.

9.2 Designation of NE Tobago

In September 2019, the Government of Trinidad and Tobago successfully submitted a Nomination Form to UNESCO with the request to consider NE Tobago as a Man and the Biosphere Reserve.

The eligibility criteria taken from the Biosphere Reserve Nomination Form are shown in Table 1.

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Table 1. The eligibility criteria taken from the Biosphere Reserve Nomination Form (2018).

	MAB Eligibility Criteria	NE Tobago
1	**Encompass a mosaic of ecological systems representative of major biogeographic region(s), including a gradation of human interventions**	✓
2	**Be of significance for biological diversity conservation**	✓
3	**Provide an opportunity to explore and demonstrate approaches to sustainable development on a regional scale**	✓
4	**Have an appropriate size to serve the three functions of biosphere reserves**	✓
5	**A legally constituted core area/s devoted to long term protection of sufficient size to meet long term conservation objectives**.	✓
6	**Buffer zone/s clearly identified & surrounding or contiguous to the core area/s, where only activities compatible with the conservation objectives can take place**".	✓
7	**Outer transition area where sustainable resource management practices are promoted and developed**	✓
8	**Organisational arrangements should be provided for the involvement and participation of a suitable range of inter alia public authorities, local communities and private interests in the design and the carrying out of the functions of a biosphere reserve**".	Ongoing
9	**Able to describe arrangements in place or foreseen**	✓
10	**Mechanisms to manage human use and activities in the buffer zone or zones**	✓
11	**Management policy or plan for the area as a biosphere reserve**	Currently developed
12	**Designated authority or mechanism to implement this policy or plan**	Department of the Environment, NETMAPT
13	**Programmes for research, monitoring, education and training**	✓

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In the Nomination Form, NE Tobago' values were described as follows:

"Covering over 835km^2, the proposed area encompasses three protected areas, one of which is the oldest protected tropical forest reserve in the world, a large planned Marine Protected Area (MPA) and 15 communities which are home to approximately 10,000 residents with a rich historical and cultural heritage. The area's rare and largely intact Caribbean Island Ridge-to-Ocean eco- and human-systems are well equipped to fulfil the three functions of a UNESCO Biosphere Reserve (BR): its biodiversity, range of ecosystems, and special-interest species are important on a regional and global scale (Conservation); the cultural heritage is a living example for the region's deeply rooted, historical, socio-economic and spiritual relationship between communities and natural resources (Development); and decades of regionally outstanding educational, research and networking activities (Logistic Support).

The close linkage between ecosystem services and natural resource use, active community groups, successful sustainable development projects, governmental initiatives and its closeness to Trinidad's resources provide the area with the prerequisites to successfully implement a BR and share lessons learnt with its Caribbean neighbours while serving as a regional role model. Being a hotspot for conservation related research for decades and having a track record of environmental education, capacity building and monitoring are well established cornerstones for providing and further increasing logistical support.

The legal, policy and institutional framework to manage a MAB area exist; current projects and programmes as well as those in the national and local development pipeline, and improved collaboration between government, civil society and private sector are demonstrably supportive of this BR nomination initiative. On varying levels, NE Tobago is already close to meeting the key conservation objectives of a successful BR as mentioned in the Seville MAB Strategy.

Coordinating future sustainable development efforts under a MAB umbrella and the inclusion of all relevant sectors of the society will significantly improve conservation and livelihoods through responsible use of our natural and cultural heritage which is the central goal of Tobago's guideline policy document, the Comprehensive Economic Development Plan."

On 28 October 2020, NE Tobago was officially declared a UNESCO MAB Reserve.

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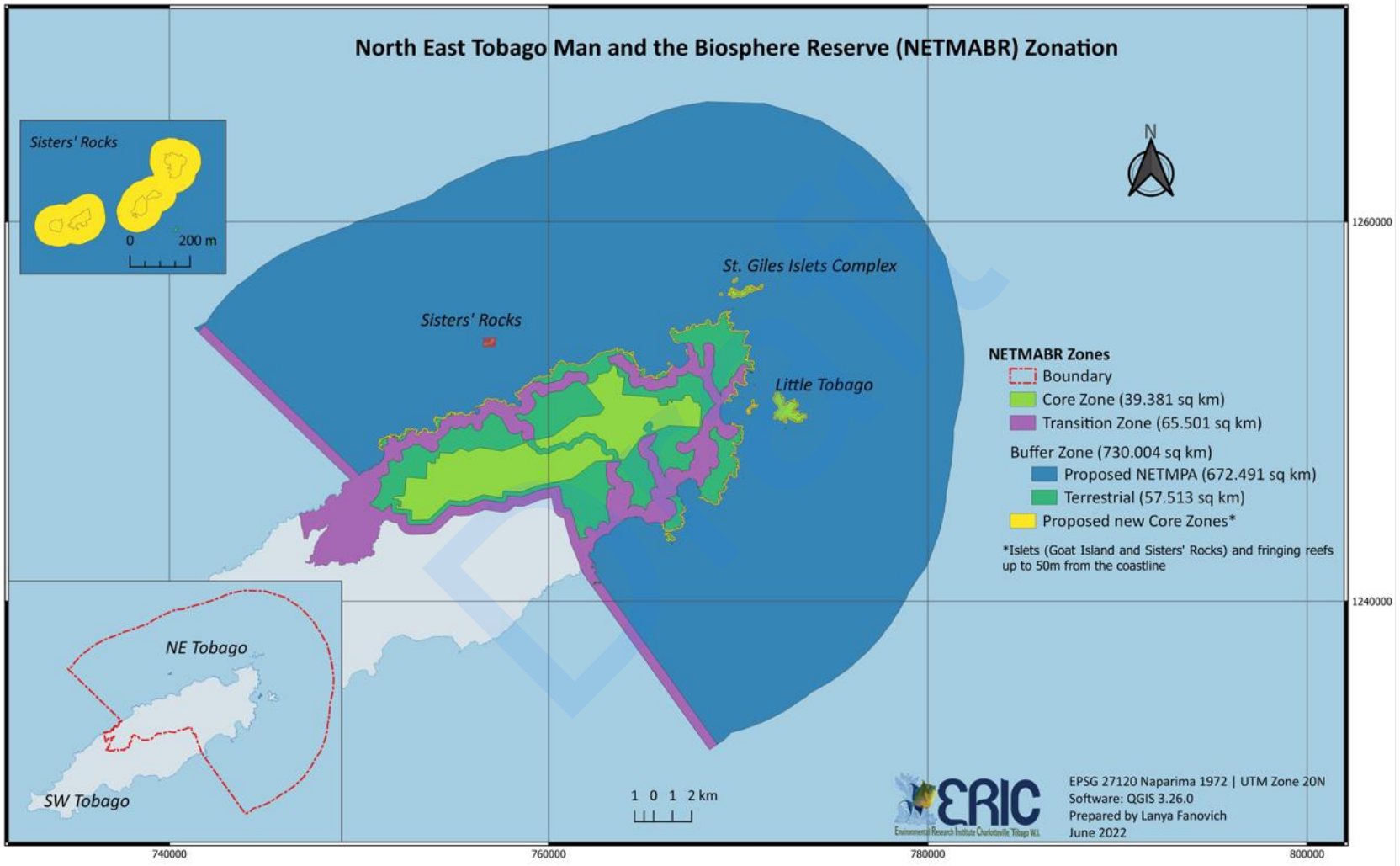


Figure 7. Zonation of the NE Tobago MAB Reserve (ERIC 2022)

The **Core Zone** of the NETMABR consists of three legally protected areas: the MRFR, Little Tobago and the St Giles Islet Complex, all of which are terrestrial.

It should be noted that, at the moment, the Core Zone does not include any marine areas, due to lack of protective legislation and regulations; however, work has started to designate high conservation value, coastal fringe reefs as Natural National Heritage Sites (which is the fastest way of to achieve legal protection) in 2021, and the National Protected Area Systems Plan was approved by Cabinet, which hopefully will result in the designation of the overall NE Tobago Marine Protected Area with some special, IUCN 1a category areas. Once these marine areas receive legal protection, they can, later on, switch from Buffer to Core Zone status within the BR.

The **Buffer Zone** for NETMABR was defined as:

- all lands between the Transition Zone and the MRFR Core Zone,
- a 125m belt on both sides of roads within the Core Zone (combining to a width of 250m)
- a 250m belt along the boundary between the Core Zone and the south-western area outside of the NETMABR,
- coastal areas between the boundaries of the NETMPA and the Transition Zone, and
- the entire marine realm of the proposed NETMPA.

As mentioned in the section above, some marine Buffer Zones might change to Core Zone as soon as legal protection can be provided. Therefore, the terrestrial, coastal Buffer Zones are crucial to protect sensitive marine ecosystems.

The **Transition Zone** was defined as all lands that are located within a 250m belt on both sides of all roads within the overall boundaries of the NETMABR; this includes all communities, and economic activities in the NETMABR (except for some micro-scale subsistence farming and hunting in the Buffer Zone). The result of this definition is a Transition Zone band, sandwiched between the terrestrial and marine Buffer Zones on which it has significant influence.

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10 MANAGEMENT PLAN COMPONENTS

The following chapters are subdivided into situational analysis, goals, strategies, and proposed activities. It is important to understand that the chapters are at different results framework levels therefore the subheadings are not necessarily on similar logic levels as well. This is the result of the High-Level Goal of each Component starting on a different logic level.

Table 2. Management plan component levels

Component level	Definition
Summary Situational Analysis	The current state of the BR respectively to the chapter subject, descriptively identifying strengths, weaknesses, opportunities and threats
High-Level Goal	The desired status achieved by the management plan
Priorities	Interventions that either significantly contribute to achieving the goal, or significantly reduce existing threats to the goal
Strategies	Long-term plans of action designed to achieve the goal
Proposed Activities	Programmes, projects, and other interventions that are aligned to the strategies and should be revised once the situational analysis significantly changes.

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10.1 Addressing Barriers to Sustainable Management

The NETMABR is subject to a series of interconnected, indirect threats to successful implementation of the MAB programme. Local residents and stakeholders are not commonly inspired to undertake conservation-relevant practices. This is partly because intelligible, adequate and continuous environmental education still requires improvement. While knowledge often exists, it is not successfully translated into a positive attitude and actual practise. This in turn is partially due to perceived and actual lack of ownership and empowerment on the part of residents in NE Tobago. On the other hand, and in certain cases, the sense of ownership is very well developed and strongly articulated; however, ownership rarely translates into stewardship.

Similarly, residents facing environmental challenges are often not informed enough to take appropriate actions against those perpetrating the violations (e.g., seek assistance from the Environmental Police and/or the Environmental Commission of Trinidad and Tobago).

Additionally, the lack of coherent and consistent conservation co-management and co-operation often undermines good efforts in some areas by neglect in others. For example, efforts of CSOs to protect nesting sea turtles are undermined by a lack of law-enforcement regarding the use of turtle nets and turtle meat consumption.

The principal barrier to addressing direct threats to the ecosystems of NE Tobago is fragmented management and use. The National Protected Areas Policy, the National Protected Area Systems Plan (7), the IFPAM Project (6) and ERIC's stakeholder assessments have all identified and prioritised this barrier for NE Tobago. Regulations and roles are unclear and consequently there is limited "enforcement / implementation of regulations concerning natural resource use" as stated in the NE Tobago Management Plan (2003). Fragmented, formal and informal, public and private, land management and use create an environment where it is nearly impossible for a single stakeholder to meaningfully influence the direct threats that are degrading NE Tobago's ecosystems.

This barrier has two components.

Government Sector

The ***government component*** involves the formal management of public lands and waters. This barrier includes outdated legislation and policy, a labyrinthine institutional structure and limited government capacity and resources. Repeated government initiatives since the 1970's have failed to address this issue; a case in point is the National Protected Areas Policy (2011) that called for a wide range of actions to be undertaken by 2016. These include the "*revision, development and declaration of supporting legal instruments [to] enact an enabling legislative framework*", the establishment of a centralised authority "*to administer the coordination and*

implementation of the National Protected Areas Policy for Trinidad and Tobago", and the establishment of protected areas under the new policy. Unfortunately, all efforts to declare the North East Tobago Marine Protected Area have failed since over half a decade.

Non-Government Sector

Fragmented management and use of land and waters also occurs in ***non-government sectors***. The absence of a national land use planning framework combined with outdated regulations and limited enforcement means that private land management and use is largely unrestricted. There is a concomitant lack of mechanisms and incentives for private land owners to engage in or benefit from conservation. The current, forested state of most private land in NE Tobago is therefore not a result of public policies or priorities, but an artefact of the priorities and preferences of individual owners. Although this speaks to the conservation commitment of some land owners, it is a highly vulnerable state for long-term conservation. Land owners may choose to develop their land with infrastructure or unsustainable agriculture that compromises the NETMABR.

Informal management and use of the land- and sea-scape, including public and private areas, is likewise unrestricted. As explained in the THA Comprehensive Economic Development Plan 2.0 (20), Tobago hosts "*longstanding insecure land tenure arrangements with as much as 83 percent of the lands of Tobago allegedly in informal tenure (the majority being family lands)*". Informal but long-standing family lands, squatting, small agricultural plots, unregulated dumping, hunting, harvesting of timber and other forest products, and harvesting of fish from the marine environment all represent often legitimate uses of public and private lands that can none the less contribute to fragmentation and degradation of ecosystems.

The implementation of the UNESCO MAB programme, including the operationalisation of the NE Tobago Protected Area Management Trust, offers a significant opportunity to de-fragment and consolidate the management of natural and cultural resources under one, overarching programme.

Although fragmented management is the principal barrier to conservation in NE Tobago, another critical barrier is a lack of monitoring and communication. This issue captures two hindrances to biodiversity conservation regionally as identified by the Caribbean Islands Biodiversity Hotspot assessment: limited technical and scientific knowledge and poor availability of information needed for effective decision-making, and lack of awareness of importance of biodiversity and ecosystem services. This similarly applies to the socio-cultural and economic development aspects of the NETMABR. Limited information and communication mean that it is difficult to:

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quantify threats, foster informed discussions, prioritise management actions, measure the success of interventions, and inspire stakeholders to take action. This barrier will be specifically targeted by strengthening the logistic function of the NETMABR.

In order to address the described challenges through strengthening the functions of a BR, the technical team proposes the following **Main Objective** for the management of the NETMABR:

To successfully consolidate and co-manage interventions related to sustainable and regenerative development, research, capacity building, education and networking on landscape, human- and eco-system levels for the benefit of NE Tobago's cultural and natural heritage and people.

In order to go into more depth, previous management plans for NE Tobago and IFPAM documents further detailed 12 key barriers to successful natural resource management in NE Tobago as follows:

1. outdated legal and regulatory framework for establishing and managing natural and cultural resources,
2. unclear, fragmented roles responsibilities of stakeholders, especially managing authorities,
3. disempowered and under-resourced management authorities,
4. inadequate funding,
5. willingness to participate if interventions seem to be too restrictive,
6. stakeholder conflicts,
7. lack of broad, bipartisan political will,
8. lack of technical capacity to identify and address issues,
9. minimal capacity on the ground with respect to practical approaches to effective natural and cultural heritage management,
10. inadequate law enforcement,
11. minimal experience with income-generating opportunities, and last but by no means least,
12. a lack of transparency, accountability and compliance with regulation and legislation by the Tobago House of Assembly.

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While IFPAM and other programmes and projects were able to partially address these barriers, and while it can be stated that conservation status and efforts in NE Tobago have never been better, it remains a fact that all of the above barriers are still valid and need attention.
The Management Plan at hand is based on the methodical approach that most of those barriers can be addressed by implementing strategies aligned with the three MAB functions.

These, below-described key strategies, are mainly based on the results of the recent Improved Forest and Protected Area Management Project (IFPAM, 2015-2020) which applied a participatory approach in identifying objectives and potential solutions to overcome conservation barriers; additionally, the ongoing interaction between the technical team and key stakeholders was used to refine recommendations included into the Management Plan.
These strategies are reoccurring and supported by proposed activities in the various components of the Management Plan at hand.

It should be noted that, while IFPAM continuously considered socio-cultural aspects of NE Tobago as essential to successful management of natural resources, there was, unfortunately, not a matching project to similarly address the management of NE Tobago's cultural heritage.

Figure 8. View from Speyside onto Little Tobago and Goat Island (Janina Ewals)



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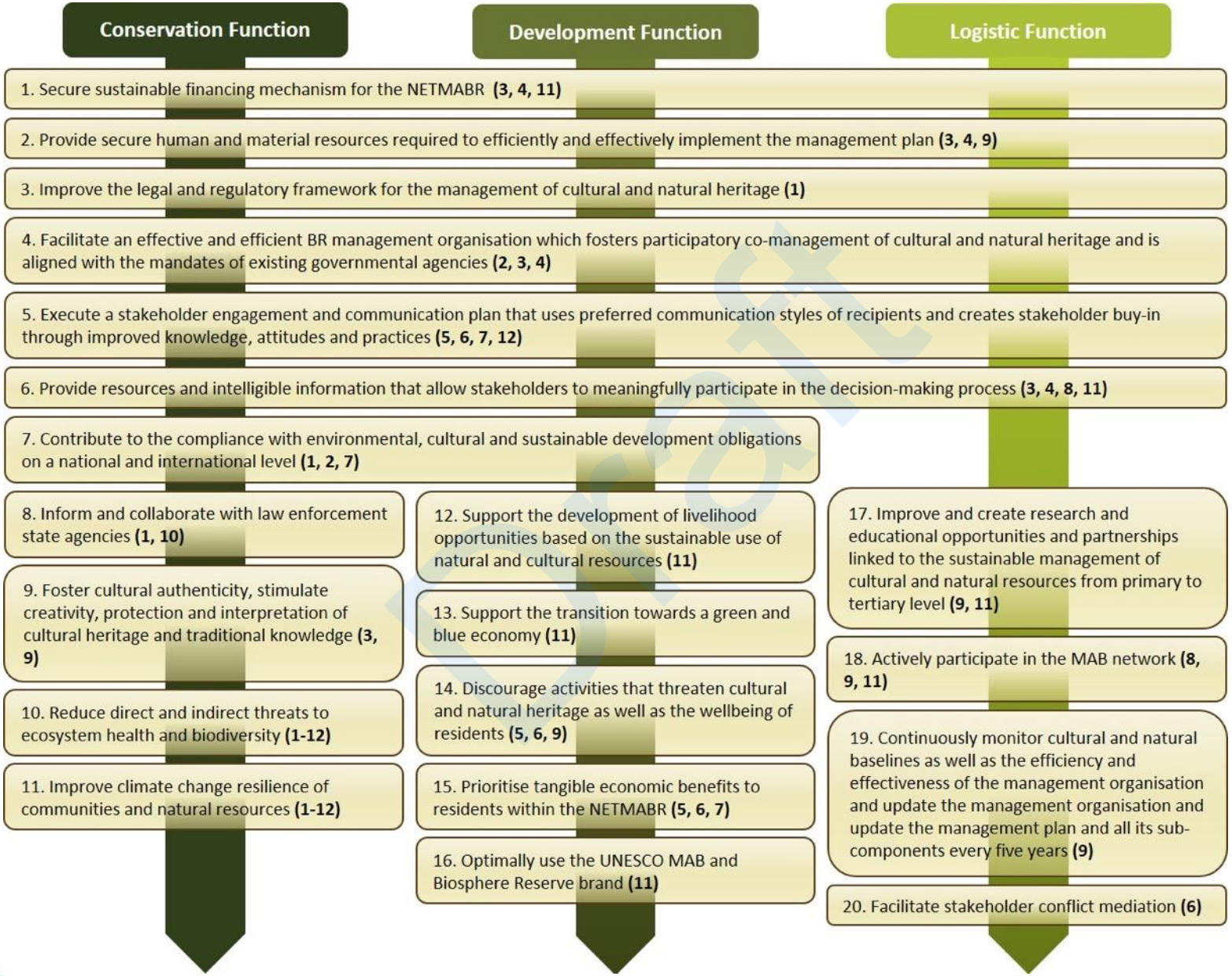


Figure 9. Proposed Main Strategies for the BR Management Plan, Addressed Key-Barriers in (brackets)

11 ALIEN INVASIVE SPECIES

SUMMARY SITUATIONAL ANALYSIS

Alien invasive species (AIS, also referred to as invasive alien species or IAS), are those plants, animals, fungi and microorganisms whose spread and establishment outside of their native distribution, have either caused or the potential to cause harm to indigenous biodiversity and ecosystems. Their introductions are typically human-vectored and are either intentional or non-intentional.

Not all introduced species are invasive. AIS typically display a combination of life-history traits which allow them to survive in their new environment, outcompete native species and disrupt the local ecological balance. Socially, AIS may dramatically impact local livelihoods, economies, and public health.

While the NE Tobago UNESCO Man and the Biosphere Reserve (NETMABR), has been identified as an iconic land and seascape in Trinidad and Tobago, where much of its ecosystems are relatively intact, there are several pathways for the introduction of AIS. Areas of the biosphere reserve (BR) where communities, certain land uses and infrastructure interface with the natural environment, create potential sites for the introduction of AIS. Cruise ships, yachts, and transboundary fishing vessels, especially in the port or Charlotteville, are critical introductory pathways in the marine environment as they inadvertently transport “stowaways”.

Tackling the issue of AIS has been identified as one of the Aichi Target priorities in the National Biodiversity Strategy and Action Plan for Trinidad and Tobago (2017-2022). It identified that strategies for identifying, prioritising, and managing pathways, and controlling or eradicating priority species at priority sites, will be implemented by 2020.

A draft National Invasive Alien Species Strategy for Trinidad and Tobago was developed in 2011 for the UNEP-GEF Project “Mitigating the Threat of Invasive Alien Species in the Insular Caribbean”. It outlines strategies and an action plan under which the future Tobago AIS management plan should be modelled after, to ensure that its actions are streamlined with national policy. This plan is yet to be updated to consider new and emerging AIS.

Additionally, there are at least four databases listing AIS species for Trinidad and Tobago including:

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1. Trinidad and Tobago's Biodiversity Clearing House Mechanism (TTBCHM),
2. Centre for Agriculture and Biosciences International (CABI) Invasive Species Compendium (ISC),
3. Invasive Species Specialist Group (ISSG) Global Invasive Species Database (GISD) and
4. Global Register of Introduced and Invasive Species – Trinidad and Tobago (GRIIS-TT).

Just three of these databases pre-date the arrival of the red lionfish (*Pterois volitans*) whose presence in Tobago was first documented in 2012.

There is a dire need to revise these lists to:

- include new AIS since last update;
- identify AIS present on each island;
- distinguish AIS from introduced and/ or unestablished species; and
- update the "unknown" invasiveness status of introduced species.

The Management Plans for the Main Ridge Forest Reserve National Park and the NE Tobago Marine Protected Area, prepared by the Food and Agriculture Organisation, both identified AIS as issues of concern and in need of management. For the MRFR, flora such as the tropical kudzu (*Pueraria phaseoloides*), common bamboo (*Bambusa vulgaris*) and pitch apple (locally: parrot apple) (*Clusia rosea*) were identified, while for the proposed MPA, the lionfish (*Pterois volitans*) is the primary species of concern.

Tropical kudzu is an aggressive, fast-growing weed capable of overgrowing vegetation, introduced as protein-rich forage for livestock. While its spread has been confined to the roadsides flanking the MRFR, grazing cows are potentially one of the pathway vectors for its proliferation into small forest gaps near the roads. The common bamboo has become naturalised in NE Tobago's forests, typically colonise riverbanks in monospecific stands. Apart from outcompeting native riparian vegetation, biodiversity within these stands is significantly reduced as there is very limited habitat for other native species. The bamboo is dispersed downstream when its culms fall into the water due to land clearing for agriculture, harvesting for construction or disturbance from inclement weather events. Fortunately, its spread into the MRFR is limited. The Department of Natural Resources and Forestry (DNRF) is the primary agency responsible for overseeing terrestrial alien invasive species in Tobago. Presently, there is no ongoing control of these two species, nor

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is there a response plan in place for control of any other terrestrial invasive species. A major barrier to the implementation of any developed response plan is the lack of sufficient resources (staff and equipment) and training in its control. At best, the DNRF can only monitor species spread and its potential damage.

Figure 10. Invasive bamboo (*Bambusa vulgaris*) in the MRFR (Janina Ewals)



The red lionfish is a voracious and venomous coral reef fish, whose presence in Tobago's reefs was first documented in 2012. Since then, it has been reported at every dive site on the island with higher densities in the northeast. The lionfish are generalist feeders, preying on any fish and crustaceans within its feeding territory. Its proliferation within Tobago's reefs may be a result of the dispersal of eggs and larvae by currents and ship ballast water. The awareness of the lionfish's spread and impact in the wider Caribbean and its early detection played a role in the relative success of its management in Tobago. The Institute of Marine Affairs through its Green Fund project "Control and Management of the Invasive Lionfish in Trinidad and Tobago", implemented various strategies such as culling derbies, lionfish trapping and handling workshops, encouraging a market for lionfish consumption and awareness campaigns. These initiatives along with voluntary culling by the recreational diving industry have assisted with maintaining relatively low numbers compared to reports from the wider Caribbean. Despite this, there are anecdotal accounts from various dive tour operators of noticeable negative impacts to small coral reef fish populations and diversity at various popular dive sites. However, the effectiveness



Figure 11. The Lionfish (Pterois volitans)

and efficiency of much of the implemented actions, especially culling, are questionable and there is a need for long-term sustainable management strategies.

A cross-reference of the lists provided by the four AIS databases against the Global Biodiversity Information Facility (GBIF) database, identified 19 potentially invasive species in Tobago, of which 14 were documented in the NETMABR (**Error! Reference source not found.**). Of these 14, four are plants, five are invertebrates and four are vertebrates. It is also clear that terrestrial species are better documented for the island than aquatic species (3 freshwater, 1 marine). A caveat to this list is that the listed species are dependent on documented reports entered into the GBIF database, making this checklist incomplete. Also, the origins and/ or the status of a number of species recorded for Tobago (not listed below) are unknown.

Table 3. Alien Invasive Species checklist for Tobago and the NETMABR

Taxon	*Scientific Name*	Common Name	Habitat	Tobago	NETMABR	Referenced Databases*
Invertebrate - Insect	***Aedes aegypti***	**Yellow Fever Mosquito**	**Terrestrial**	**Y**	**Y**	**CABIISC, GBIF, GRIIS-TT, ISSGGISD, TTBCHM**
Invertebrate - Insect	*Pheidole megacephala*	African Big-headed Ant	Terrestrial	Y	Y	CABIISC, GBIF, GRIIS-TT
Invertebrate - Insect	*Solenopsis geminata*	Tropical Fire Ant	Terrestrial	Y	Y	CABIISC, GBIF, GRIIS-TT, ISSGGISD, TTBCHM
Invertebrate - Insect	*Tapinoma melanocephalum*	Ghost Ant, Black-headed Ant	Terrestrial	Y	Y	CABIISC, GBIF, GRIIS-TT, ISSGGISD, TTBCHM
Invertebrate - Mollusc	***Tarebia granifera***	**Quilted Melania**	**Freshwater**	**Y**	**Y**	**GBIF, GRIIS-TT, TTBCHM**
Plant - Grass	***Bambusa vulgaris***	**Common Bamboo**	**Terrestrial**	**Y**	**Y**	**CABIISC, GBIF, GRIIS-TT, TTBCHM**
Plant - Grass	*Paspalum conjugatum*	Buffalo Grass	Terrestrial	Y	N	CABIISC, GBIF, GRIIS-TT
Plant - Tree	*Terminalia catappa*	Tropical Almond Tree, West Indian Almond	Terrestrial	Y	Y	CABIISC, GBIF, TTBCHM
Plant - Tree	*Manilkara zapota*	Sapodilla	Terrestrial	Y	N	CABIISC, GBIF, GRIIS-TT, TTBCHM
Plant - Tree	*Leucaena leucocephala*	Lead Tree	Terrestrial	Y	N	CABIISC, GBIF, GRIIS-TT, ISSGGISD
Plant - Tree	*Hibiscus elatus*	Blue Mahoe	Terrestrial	Y	Y	CABIISC, GBIF, GRIIS-TT, TTBCHM

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Taxon	*Scientific Name*	Common Name	Habitat	Tobago	NETMABR	Referenced Databases*
Plant - Weed	*Asclepias curassavica*	Blood Flower, Red Top	Terrestrial	Y	Y	CABIISC, GBIF, GRIIS-TT, TTBCHM
Vertebrate - Amphibian	*Eleutherodactylus johnstonei*	Johnstone's Robber Frog, Whistling Frog	Freshwater	Y	N	GRIIS-TT, TTBCHM
Vertebrate - Fish	***Pterois volitans***	**Lionfish**	**Marine**	**Y**	**Y**	**CABIISC, GBIF**
Vertebrate - Fish	***Oreochromis mossambicus***	**Mozambique Tilapia**	**Freshwater**	**Y**	**N**	**CABIISC, GBIF, GRIIS-TT, TTBCHM**
Vertebrate - Mammal	***Mus musculus***	**House Mouse**	**Terrestrial**	**Y**	**N**	**CABIISC, GBIF, GRIIS-TT, TTBCHM**
Vertebrate - Reptile	*Anolis wattsi*	Watt's Anole	Terrestrial	Y	Y	CABIISC, GBIF, GRIIS-TT, ISSGGISD, TTBCHM
Vertebrate - Reptile	*Anolis richardii*	Grenada Tree Anole	Terrestrial	Y	Y	CABIISC, GBIF, GRIIS-TT, ISSGGISD
Vertebrate - Reptile	*Anolis aeneus*	Bronze Anole	Terrestrial	Y	Y	CABIISC, GBIF, GRIIS-TT, ISSGGISD, TTBCHM

Database abbreviations as provided for listed databases.* **Species with high negative impact level for the NETMABR in bold. Please note that Kudzu and Parrot Apple are invasives but not listed in the databases.

Management of AIS in the NETMABR requires effective Tobago-wide control and management, due to the potential dispersal mechanisms and mobility of these species, once present and established on the island. While emphasis is often placed on introductions from another country, there should also be special consideration for local species whose geographical range is typically confined to either Trinidad or South West Tobago. Their introduction into the NETMABR may potentially exhibit similar invasive traits as AIS.

To successfully implement AIS management activities, a multi-sectoral approach is important. Multiple stakeholder groups should be involved at various stages, including the Department of the Environment, the Department of Natural Resources and Forestry, the Department of Marine Resources and Fisheries, Department of Agriculture, Customs and Excise Division, the Institute of Marine Affairs, the Environmental Management Agency, farmers (agriculture, horticulture, livestock, fish), fishers (spear and artisanal), forest tour guides, ENGOs, dive tour operators, ornamentals and pet traders, natural and social scientists, economists and GIS experts.

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HIGH LEVEL GOAL

Alien invasive species do not significantly impact ecosystem health and services in the NETMABR.

PRIORITIES

- Improve the legal and regulatory framework for the management of AIS (see main strategy 3).
- Reduce direct and indirect threats of AIS to ecosystem health biodiversity and livelihoods (see main strategy 10).

STRATEGIES

- Adaptation and implementation of the National Invasive Alien Species Strategy for Trinidad and Tobago.
- Creation and maintenance of an open-access AIS database, linked to the Trinidad and Tobago Biodiversity Information System (TTBIS).
- Development of an AIS watchlist based on documented global, regional and local (Trinidad and South West Tobago) incursions
- Implementation of species-specific biosecurity and control measures for priority species and habitats.
- Implementation of local monitoring programmes to assess the spread of AIS and the effectiveness of biosecurity and control measures.
- Execute a stakeholder engagement and communication plan that uses preferred communication style of recipients and to raise stakeholders' awareness and capacity to participate in control and monitoring of AIS (see main strategy 4).

PROPOSED ACTIVITIES

Facilitate:

- the appointment of an AIS Advisory Committee chaired by the Director of the Department of Natural Resources and Forestry and comprised of representatives from the Department of Environment, the Department of Marine Resources and Fisheries, Department of Natural Resources and Forestry, the Institute of Marine Affairs, the Environmental Management Authority, Customs and Excise Division, The University of the West Indies, the University of Trinidad and Tobago and ENGOs. The committee members should advise on:
  - the adaptation and implementation of the National Invasive Alien Species Strategy for Trinidad and Tobago to contribute to the compliance with obligations on a national and international level (see main strategy 7);

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- improvement of the legal and regulatory framework for management of AIS;
- biosecurity, control and restoration measures to be implemented by the AIS Unit and stakeholders;
- research and educational opportunities (see main strategy 17);
- external funding mechanisms to continue implementation of research, monitoring and biosecurity and control measures;
- effective and relevant communication with various target audiences; and
- networking with regional and international experts on AIS issues.

- development of a Tobago AIS Management Policy and Action Plan, in alignment with existing legal and institutional frameworks;
- establishment of an AIS Unit within the Department of Natural Resources and Forestry and provide secure human and material resources to efficiently and effectively implement the management plan (see main strategy 2);
- lobbying for the integration of AIS-potential issues into future or revised Tobago sectoral and divisional plans and strategies such as those related to food production, fisheries, water management, climate change, wildlife management, forestry, town and country planning, tourism, economic development, etc.
- design and implementation of baseline ecological assessments to document native and invasive species, habitats, susceptibility (exposure) and sensitivity (impact) of sites and habitats, pathways, and vectors;
- design and implementation of rapid socio-economic assessments to identify sensitive and vulnerable stakeholders, livelihoods, and sectors in Tobago;
- design and implementation of risk assessment method and system to identify and prioritise species, pathways, sites and actions for control and eradication, using the data collected from baseline ecological and socio-economic assessment.
- enlistment of experts to develop a user-friendly AIS database and predictive monitoring tools linked to the TTBIS and other regional and international databases (e.g., GBIF) and to build the capacity of the AIS Unit in its use and maintenance.
- development of a tiered-AIS watchlist, listing species of high, medium, and low concern, including species not yet present but with the potential to enter the island and the NETMABR, based on its regional or global invasive history.

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Figure 12. Preserved potentially invasive *Ophiothela mirabilis* on section of host gorgonian



- adoption of biosecurity measures to prevent the entry of potential invasive species and to rapidly detect incursions at ports of entry.
- adoption of easily implementable and effective measures to either contain, control or eradicate priority AIS species in priority habitats by different stakeholder groups.
- design and implementation of restoration programmes to replace invasive large trees with native species to prevent habitat fragmentation.
- improve and create research and educational opportunities and partnerships among AIS experts/ researchers, AIS Unit and community stakeholders, through comprehensive surveys, community-based science, sighting reports and primary to tertiary level activities (see main strategy 19).
- Continuous monitoring of baselines as well as the efficiency and effectiveness of management strategies, to be updated every five years (see main strategy 19)
- execution of a stakeholder engagement and communication plant that uses preferred communication styles of recipients and creates stakeholder buy-in through knowledge, attitudes and practices (see main strategy 5).
- secure sustainable financing mechanisms for the management of AIS (see main strategy 1)

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