USAID
FROM THE AMERICAN PEOPLE

MARINE MARKET SYSTEMS

MOZAMBIQUE MARINE AND COASTAL RESOURCES MARKET ASSESSMENT:

A REFERENCE GUIDE

April 2021


Mozambique
Marine Protected Areas (MPAs)
North
0 50 100 150 200 250km
Mozambique Protected Areas
Buffer Zones
Hunting Concessions (Coutadas)
Forest Reserves
Community Conservation Areas
Coral Coast
Swamp Coast
Parabolic Dune Coast
TANZANIA
ZAMBIA
MALAWI
ZIMBABWE
ESWATINI
SOUTH AFRICA
Rovuma
Messalo
Niassa Special Reserve
Niassa Lake Marine Protection Area
CABO DELGADO
NIASSA
TETE
ZAMBEZIA
MANICA
SOFALA
INHAMBANE
GAZA
MAPUTO
NAMPULA
Lichinga
Montepuez
Pemba
Lurio
Memba
Nacala
Ilha de Moçambique
Cuamba
Nampula
Gurúè
Mágoè National Park
Tete
Zambezi
Angoche
Mocuba
Pebane
Quelimane
Indian Ocean
Gorongosa National Park
Marromeu National Reserve
Chimoio
Dondo
Beira
Chimanimani National Park
Save Delta
Save
Bartolomeu Dias
Potential Protected Area
Inhassoro
Vilankulos
Zinave National Park
Banhine National Park
Limpopo National Park
Changane
Maxixe
Inhambane
Chokwe
Zavora
Xai-Xai
Ressano Garcia
Matola
Maputo
Boane
Catembe
Bela Vista
Maputo Special Reserve
Inhaca Marine Reserve
Ponta do Ouro Partial Marine Reserve
Quirimbas Potential Protected Area
Quirimbas National Park
Lurio - Memba Potential Protected Area
Nacala - Ilha de Moçambique Potential Protected Area
Gilé National Park
Primeiras e Segundas Islands Environmental Protection Area
Zambezi & Cheringona Coast Potential Protection Area
Zambezi Delta
Beira Potential Marine Protection Area
Pomene National Reserve
Inhambane Bay & Tofu Potential Protected Area
Bilene Potential Protected Area
Cabo São Sebastião Total Protection Area
Bazaruto Archipelago National Park
Protected Areas
1 Quirimbas National Park
2 Primeiras e Segundas Islands Environmental Protection Area
3 Marromeu National Reserve
4 Bazaruto Archipelago National Park
5 Cabo São Sebastião Total Protection Area
6 Pomene National Reserve
7 Maputo Special Reserve
7a Inhaca Marine Reserve
7b Ponta do Ouro Marine Reserve
Potential Protected Areas
A Quirimbas Potential Protected Area
B Lurio - Memba Potential Protected Area
C Nacala Potential Protected Area
D Zambezi & Cheringona Coast Potential Protection Area
E Beira Potential Marine Protection Area
F Inhambane Bay & Tofu Potential Protected Area
G Bilene Potential Protected Area
Barra Beach
Tofu Beach
Homoine
Panda
Jangamo
Inharrime
Zavora Beach
Non-formal Protected Area
1. Mahijo Mbate
2. Nha Ozi Seafori
3. Mandzenida
4. Marvambone
5. Guidzivane
5. Guilalene
7. Inhambane
8. Ponte Cais
9. Marragane
10. Guindzive
0 50km


1
Palma
Rovuma
Tecomaji
Rongui
Quiwia
Vamizi
Vumba
Metundo
Quiligue
Tambola
Quifugue
Mocimboa
Baixo Nameguo
Baixo Varuni
Baixo Vadiazi
Mueda
Medjumbi
Macaloé
Messalo
Macomia
Matemo
Tho
Quirimbo
Sangar
Quilalea
Mefund
Quisiva
1 Quirimbas National Park
Non-formal Protected Area
A Quirimbas Potential Protected Area
Pemba
0
100km


2
Cape of Columulomo
Fernao Veloso
Ometola Bay
Nacala
C Nacala - Ilha de Moçambique Potential Protected Area
Itocula
Jamali
Monapo
Mossuril
Injaca
Lumbo
Ilha de Moçambique
Goa
Sena
0
50km


3
Angoche
Mafede
Buga Puga
Baixo Miguel
Nejavo
Caldeira
Gilé National Reserve
Regone
Moma
Moma
2 Primeiras e Segundas Islands Environmental Protection Area
Epidendron
Casuarina
Pebane
Baixo Tanibi
Silva
Fogo
Coroa
0
50km


4
Gorongosa National Park
3 Marromeu National Reserve
Inchope
Vila Machado
Dondo
Beira
E Beira Marine Protection Area
0
100km


5
Inhassoro
Bazaruto
4 Bazaruto Archipelago National Park
Benguera
Santa Isabel
Vilankulos
5 Cabo São Sebastião Total Protection Area
0
50km

Authors: Ashok Menon, Luca Crudeli, Kevin Carlucci, Nathan Sage, Afonso Madope and Vera Julien

This publication was produced by the SPEED+ Project under Contract No. AID-656-TO-16-00005 at the request of the United States Agency for International Development. This document is made possible by the support of the American people through the United States Agency for International Development. Its contents are the sole responsibility of the author or authors and do not necessarily reflect the views of USAID or the U.S. Government.

MARINE MARKET
SYSTEMS

Acknowledgements

While the majority of the research for this report was carried out through a desk study, the authors did rely on the input of numerous partners and contributors with expertise in marine and coastal conservation in completing the report. A bulk of the time and cost of undertaking the report was provided by Marine Market Systems (MMS) on a pro bono basis, who worked hand-in-hand with the USAID SPEED+ project to complete the report. Ashok Menon was the lead author of the report and led the report team of Luca Crudeli, Kevin Carlucci, Nathan Sage, Afonso Madope and Vera Julien, to produce the final report.

The authors are specifically grateful to the Government of Mozambique for the information and support provided in finalizing the report. Special thanks is provided to the Minister Augusta de Fátima Charifo Maita, from the Ministry of the Seas, Inland Waters and Fisheries (MIMAIP), who encouraged and supported the study, along with Dr. Miguel Langa of ProAzul, who provided equal support and information that helped with the completion of the report. We are encouraged at their dedication to advancing sustainable and coordinated marine and coastal economy activities throughout Mozambique.

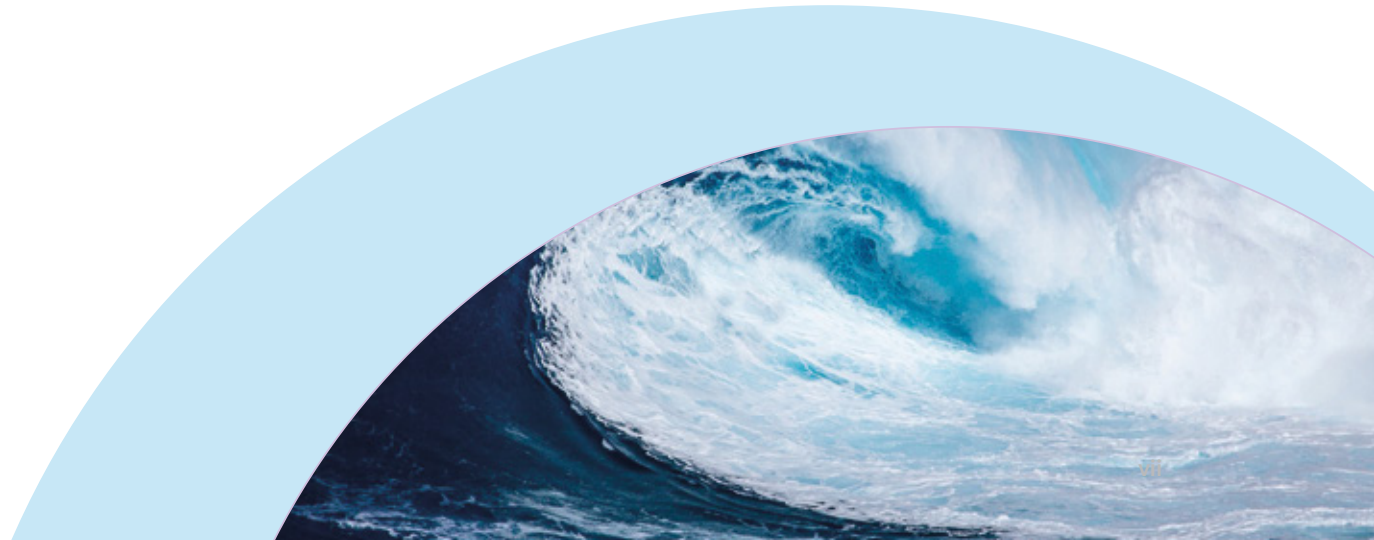
The authors are also grateful to Minister Ivete Maibase of the Ministry of Land and Environment (MTA), and her team, including Manuel Mutimucuio, as well as Mateus Muthemba, the Director of Mozambique's National Administration for Conservation Areas (ANAC), for their support and input during the production of the report. We are extremely encouraged at their passion and dedication to marine conservation throughout Mozambique and believe that their advocacy efforts will ensure Mozambique marine and coastal assets are protected for generations to come. Specifically Dr. Mohamad Harun as well as Dr. Armindo Araman provided key details that were essential to the completion of a comprehensive report.

The authors are highly indebted to Heidi Schuttenberg at USAID/Washington, who spent considerable time in editing and finalizing the report, and whose guidance and recommendations helped to improve the report, as well as Isabella Genta, also at USAID/Washington, who assisted in finalizing the report. Joao Moura Estevao Marques and his team at the World Bank provided valuable contacts, information and comments on the report. Hugo Costa and his team at Wildlife Conservation Society (WCS) worked hand-in-hand with USAID to provide key details for the maps produced in the report, on the key biodiversity areas (KBAs) for marine landscapes, on their marine conservation efforts in Mozambique and on reviewing and commenting on the report. Biofund, specifically Luis Bernardo Honwana, Alexandra Jorge, Sean Nazareli and Denise Nicolau were also key partners in providing critical information and reports related to the marine conservation efforts throughout Mozambique, as well as in advocating for greater awareness and sustainable use of Mozambique's marine resources. Rodrigo Fernandez and Dalila Sequeira at the World Wildlife Fund (WWF) provided important information on their marine-related work in the Quirimbas and in Primeiras and Segundas. Peter Bechtel and Tim Born provided a critical review of the report. Jorge Ferrao from University

Pedagogica also helped source key background reports. Mike Donald at Kwala Lodge in Nacala also provided diving services and information for this report, for which we are grateful. We also like to warmly thank Jenny Stomvol and Cornelius Rupert from Back to Basics, Andrea Marshall and Janneman Conradie from Marine Megafauna Foundation (MMF) and, Ian Cook at Pomene Beach Camp, for all their input into the report and support while diving and photographing underwater. Yara Tibirica and Nakia Cullain provided key information and reports about Inhambane and Zavora which we appreciated, as did Tibea Hammann from Nuarro. Mike Donald from Kwalala Lodge in Nacala also provided key details for the report and facilitated our dives in and around Nacala, including to the A huge thanks goes to Jan Van Deventer from Fire Island Conservation and his team for bringing us to dive, photograph and see first hand the conservation efforts around Fire Island. Marcos Perreira from Centro Terra Viva (CTA) also provided key unpublished forthcoming and other reports that were critical in completing this study.

The underwater photographs in the report were all shot throughout Mozambique by Luca Crudeli, Ashok Menon and Pedro Ferreira, who we thank for the photographs he provided to the report. Additional photos from various seascapes in Mozambique can be found at www.ferreirasphotography.com, www.instagram.com/crudeli_uwp, and www.instagram.com/am_underwater.

As we hope you find when reading the report, Mozambique is an incredible country for its marine and coastal diversity and beauty. The authors have travelled, dived and taken underwater photographs throughout the world, and put Mozambique squarely in the top 3 destinations in the world for marine and coastal assets and the sheer beauty of its underwater world. We were consistently awestruck at each of the destinations we visited. Given Mozambique's current level of development, we believe a market systems approach can be used to harness the private sector to finance conservation outcomes - free conservation of sorts. For that to happen, government, donors, civil society need to be aware and motivated to work together for sustainable use and conservation of Mozambique's marine and coastal assets. We hope this report serves as an initial foundation to understanding the state of play of the marine and coastal economy and a useful resource for policy makers, donors, civil society and the private sector to design responsible and sustainable marine and coastal actions that will ensure those resources can be enjoyed for generations to come.



Contents

Introduction

Marine and coastal resources have sustained the lives and livelihoods of Mozambicans for millennia, and with two-thirds of the country's population living in the coastal region, this relationship continues into the 21st century. Mozambique's economy is intertwined with the marine sector, playing an important role in food security, job creation, and economic growth. According to the World Bank, the 'blue economy' contributes up to 10% of the country's GDP.

Mozambique is home to one of the world's most diverse hotspots of marine life with 900 species of reef-associated fishes, 400 species of mollusks, 70 species of hard and soft corals, 122 species of sharks and rays, 5 of the 7 species of turtles that exist worldwide, the last viable population of dugongs in the Western Indian Ocean, 740 species of sea and coastal birds, and 2,910 km² of mangroves. Nurturing these assets are large intact ecosystems, such as the Zambezi River delta, which contains the second largest contiguous mangrove habitat in Africa that provides a nursery for juvenile fish and key marine species the Zambezi mangrove stand has in fact increased in size by around 10% over the past two decades to 37,034 hectares.[1] Truly,

[1] The Mangroves of the Zambezi Delta: Increase in Extent Observed via Satellite from 1994 to 2013. Found here: https://www.srs.fs.usda.gov/pubs/ja/2015/ja_2015_trettin_004.pdf

Mozambique's marine assets are mesmerizing; the authors of this report recently assembled a photo exhibition of diverse species from years of diving in the country to continue crowdsourcing information on the country's underwater biodiversity.

Mozambique's marine and coastal resources are woven into the national economy. Along its 2,770 km coastline (33% longer than the west coast of the United States), artisanal fisherfolk and commercial fishing vessels are out at sea daily, while world class beaches attract tourists and active ports operate as economic hubs for the goods produced in Malawi, Zambia, Zimbabwe, South Africa, and domestically in Mozambique. While these actors all contribute to the blue economy and share these marine and coastal resources, little sustained effort has been invested in ensuring they are all pulling in the same direction.

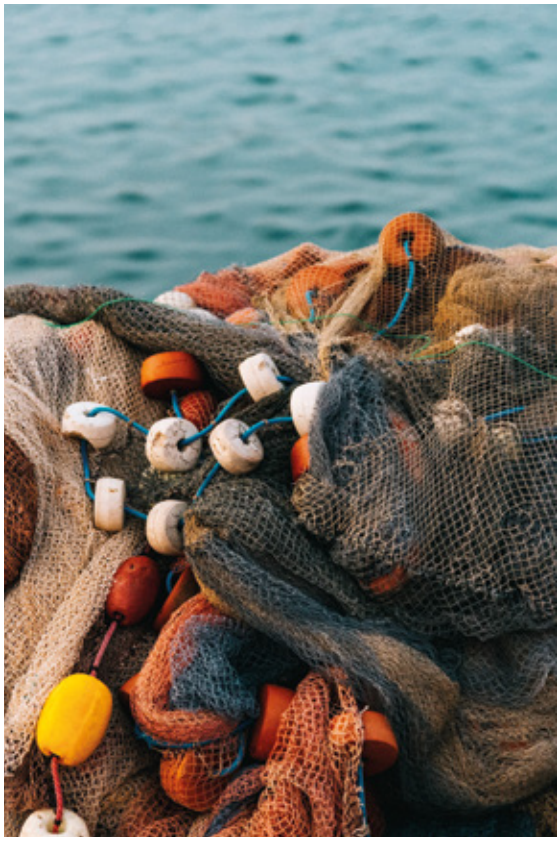
The blue economy in Mozambique is not governed as a unified sector, but rather as a complex intersection of sectors connected by a shared natural resource. Presently, 10 ministries and 40 agencies/offices have a role in marine and coastal resources management, spanning from tourism to transportation and scientific research to fisheries. Governing the sustainable use of the country's marine and coastal assets is highly complex, requiring information sharing and coordination on a scale seen in few other areas of the national economy.

Recent actions by the GoM show its commitment to aligning the universe of actors in the blue economy behind the Ministry of Sea, Inland Waters and Fisheries (MIMAIP). As the newly appointed center of gravity for all aspects of the blue economy, the ministry is tasked with fulfilling the GoM's stated goal of increasing the area of its Marine Protected Areas (MPAs) by five-fold, from 2% to 10% of its territorial waters by 2024, with a further expansion to 30% by 2030. In November 2019 the GRM established the Fund for the Development of the Blue Economy, or *ProAzul,* which has the mandate to coordinate activities and increase financing for sectors that make up the blue economy. *ProAzul* arose out of the large Growing Blue Conference hosted in Maputo during May 2019, and the nascent entity plans to host a subsequent international conference in 2021/2022.

The purpose of this report is to present a reference guide on Mozambique's marine and coastal resources to a diverse audience of investors, government officials, tourism operators, donors, NGOs, and anyone who has interest in improving management of these beautiful resources alongside the committed staff at MIMAIP. The fact is, data and information on Mozambique's marine sector is in very short supply, often hidden in isolated reports with a narrow audience, such as a reef survey, an illegal fishing assessment, or a tourism brochure. With the help of key informants, from fishermen to scuba diving guides, this document is an attempt to aggregate the existing information, knowledge base, and networks into one useful resource a cross-sectoral reference guide.

To make the encyclopedia-like content of this document most approachable, the presentation style used is like a tour guide seeking to appeal to a broad audience by limiting the use of overly technical sectoral jargon and allowing readers to create their own journey with the information presented. Thus, this reference guide intentionally does not present recommendations, with the hopes that the information itself can serve as a launching pad for future investment in sector-specific actions in the key geographies. The marine seascapes illustrated in Section 1, for example, present maps, photos, and profiles to familiarize the reader with the local context these geographical snapshots are documented in a holistic fashion and are meant to serve as foundational knowledge for further studies and interventions.

This reference guide also aims to present the benefits of using an integrated systems approach across the blue economy to achieve positive social, economic, and environmental outcomes. From a programmatic perspective, linkages among these systems are often acknowledged for example, reports often cite the understanding that fish and fish products account for about 40% of animal protein intake in Mozambique however, nutrition and food security funding from donors seldom find their way into coastal fisheries programs.[2] The authors hope the presentation style inspires collaboration across sectors and marine market systems, which mirrors the challenging task at hand for MIMAIP.



The below reference guide is presented in three sections. Section 1 offers a profile of the country's marine and coastal assets: what is here. Section 2 describes the characteristics of the country's blue economy: how are the assets being used. Section 3 provides a description of the political economy and governance structure from the national to local levels: who is in charge.

[2] FAO Fisheries and Aquaculture Department, Summary tables of Fishery Statistics: Food Balance Sheets 2011.

This report is laid out as follows:

SECTION 1: MARINE AND COASTAL ASSETS IN MOZAMBIQUE

1.1 Key Attributes of Mozambique's Marine & Coastal Assets

1.2 Seascape Profiles: Mozambique's Marine Protected Areas (MPAs)

1.3 Seascape Profiles: Seven High Potential Geographies for New MPAs

SECTION 2: ECONOMIC USE OF MOZAMBIQUE'S MARINE & COASTAL ASSETS

2.1 Overview of Mozambique's Ocean-Based Economy

2.2 The Blue Economy Productive Sectors

2.3 Threats to Mozambique's Marine Ecosystems & Species

SECTION 3: GOVERNANCE OF MOZAMBIQUE'S MARINE & COASTAL ASSETS

3.1 Governance Structure: Outside of MPAs

3.2 Governance Structure: Inside the Country's MPAs

3.3 Community-Based Coastal Resource Management

3.4 Other Key Ministries & Institutions

3.5 Local Governments

3.6 Donors & NGOs

3.7 Financing Marine Conservation

The blue economy itself is vast, a coastal and seascape-based organizing framework that involves resources we know little about; a lack of understanding often leads to undervaluing marine assets in the national economy. The authors of this reference guide see a future where Mozambique's ecosystems and economic systems are studied with equal fervor, and their co-dependence understood as essential to the wellbeing of its people. We hope this document is stepping stone on this journey.

1. MARINE AND COASTAL ASSETS IN MOZAMBIQUE

Mozambique's blue economy is based on the country's rich marine and coastal assets. This section reviews:

Note that section 1.1 provides a higher level view of the country's marine and coastal assets, while sections 1.2 and 1.3 offer a deep-dive holistic seascape profile of 14 marine seascapes.

1.1 Key Attributes of Mozambique's Marine & Coastal Assets

Mozambique has 1,721 miles (2,770 km) of coastline, which is 33% longer than the west coast of the United States.[3] Mozambique exclusive economic zone (EEZ), which extends from the coast to 200 nautical miles (370 kilometers) off the coast is large: 220,850 mi2/572,000 km2. Currently, 2% of Mozambique's EEZ, or roughly 7,456 sq miles (12,000 sq kms) are under marine protected status.

Mozambique's coast offers a wide diversity of habitats that shape its blue economy industries, such as fishing, tourism, shipping, and gas exploration and production. These ecosystems include coral reefs (730 miles2/1,890 km2), mangroves (1725 miles2/4,467 km2), seagrass beds (170 miles2/439 km2), coastal dunes, and sandy beaches.[4] These habitats are home to extremely rich marine biodiversity, which includes protected species such as turtles, dugongs, sea horses, dolphins, sharks, giant mantas and whales as well as key marine habitats such as mangrove forests, sandy beaches and vast coral reefs.[5] They also include other critical, but less studied, marine life that are essential parts of healthy marine ecosystems—from various types of coral, shrimp, crab, frog fish, octopus, reef fishes and nudibranchs—that help sustain the fish stocks Mozambique's economy relies on (fisheries helped Mozambique earn roughly $70 million in revenue in 2019, roughly 0.47% of GDP). For this report, we will refer to these assets as Mozambique's "other" marine biota, since we have not found much information on identification, monitoring or conservation of many of these species.[6]

The variety of species that can be found in Mozambican waters is mesmerizing and through the years, key informants, from fishermen to scuba centers and researchers, have noted a decline in populations, typically from overfishing. Mantas, which have a market value of $30,000, have been in steady decline over the years. The last viable population of dugongs in the Western Indian Ocean resides in the waters of Bazaruto. Seahorses are caught and sold to Chinese traders, as are sea cucumbers, once plentiful in the Quirimbas, which are seldom found today. Shark fishing is steadily growing, especially in the north, and has recently seen an uptick throughout the country as economic decline from the COVID-19 pandemic forces the population to turn to fishing for food and protein. Turtles continue to be poached. Lobster populations are declining. The authors encountered stories like these time and time again.

---

3 The west coast of the United States (Washington, Oregon and California) is 1,293 miles or 2,081 kms.

4 Marzoli, A. Inventário florestal nacional. DNTF, Maputo, Moçambique, 2007.

5 Pereira, M. A. M., C. Litulo, R. Santos, M. Leal, R. S. Fernandes, Y. Tibirica, J. Williams, B. Atanassov, F. Carreira, A. Massingue & I. Marques da Silva. Mozambique marine ecosystems review. Final report submitted to Fondation Ensemble. 139 pp. Maputo, Biodinamica/CTV. 2014. The report provides an in-depth overview of the marine ecosystems of Mozambique and highlighted its biodiversity: almost 900 species of reef-associated fishes have been recorded; 122 species of sharks and rays; 400 species of mollusks; 27 species of marine mammals, including arguably the last viable population of dugongs in the western Indian Ocean (WIO); five species of marine turtles; 270 species of hard and soft corals; 13 species of seagrasses; and nine species of mangroves.

6 There are some notable efforts on which we outline in a later section on Marine Species and Habitats Data.

Some of these marine assets are on IUCNs red list. Others are classified as "data deficient" or "not evaluated" and require more research and monitoring to know if the assets are threatened. Even those species that are classified as "least concern" worldwide may actually be a concern for Mozambican habitats due to local threats, such as overfishing, destructive fishing methods and development.

1.1.1 Marine Ecosystem Regions

Mozambique has a wide variety of marine assets that are supported by key marine ecosystem regions that can be found along its coastline. These were first described by Kenneth Tinley in 1971 and have remained largely intact as the accepted marine ecosystems of the country.

CORAL COAST

NORTH

High coral diversity can be found from Quirimbas South through the Primeiras and Segunda Islands

Coral Coast (North) - The first ecologically important marine ecosystem region, located in the northernmost part of the country from the Quirimbas islands southwards down through the Primeiras and Segundas Archipelago, is known as the coral coast. Coral reefs can also be found from Bazaruto Island southward to South Africa, but these are found in relatively deeper waters than the reef corals of the north. The corals are diverse and a critically important ecosystem for marine life, described in more detail in the next section.

WETLAND COAST

CENTER

Between Angoche South to Bazaruot are marshes, estuaries and deltas

Coastal Wetlands & Coast (Center) - The second ecologically important marine ecosystem region is the central section of Mozambique, between Angoche and Bazaruto Island, which is classified as coastal wetlands. The sea along this coast is shallow, contains high sediment loads from rivers, and is where Mozambique's famous shrimp are harvested. Twenty-four rivers discharge into the Indian Ocean along this central section of the coast, each with an estuary supporting mature mangrove forest ecosystems. Black sand beaches can be found between Pebane and the Zambezi River. The areas where the Zambezi and Save Rivers enter the sea are classified as deltas. Wetlands are critical ecosystems for marine life as they provide shelter and breeding grounds for many commercial fish. Mangroves in particular offer some of the most efficient areas to sequester carbon and significant opportunities to generate carbon-finance revenues for communities, if properly managed.

SOUTH

Between Bazaruto and Ponta Do Ouro high dunes and lagoons can be found

Dune Coast (South) - The third ecologically important marine ecosystem region, the dune coast, stretches 850 km (528 mi) from Bazaruto southward to Ponta de Ouro, proximal to South Africa. This part of the coast features sand dunes, some as high as 120 meters (393 feet), and some of the highest vegetated sand dunes in the world. Starting just south of Inhambane, this part of the coast also has fresh and salt-water lagoons, which often flank the ocean. The saltwater lagoons, such as Bilene, are separated from the sea by a sand barrier system, often connected to the sea by one or several "gates" or sandbanks.

1.1.2 Marine Ecosystem Habitats & Ecosystem Services

Important marine ecosystem habitats can be found throughout Mozambique. Each habitat not only provides important ecosystem services, such as producing food, regulating flood waters, mitigating storm surges and waves and sinking carbon, each habit is home to many critical marine species. Each habitat also forms a piece of the blue economy in Mozambique, enabling citizens to earn livelihoods and the country to grow economically. There are also associated threats with each of the ecosystem habitats, which we outline generally in Section II. The marine assets found in Mozambique's main regions include corals, mangroves, seagrass beds and coastal wetlands and lagoons.

$36
BILLION

of global tourism revenues derived from coral reefs

Corals

Coral reefs contain the most diverse and valuable ecosystems on the planet, supporting more species per unit area than any other marine environment.[7] Mozambique has approximately 560,000 km2 of coral reefs.[8] A National Strategy and Plan of Action for Coral Reefs (NSPOA-CR) is expected to be completed for Mozambique in 2020 (see Section III). Coral ecosystems are important for:

1. ***Coastline protection.*** Corals protect coastlines from the damaging effects of wave action and tropical storms by buffering shorelines against 97 percent of the energy from waves, storms, and floods, helping to prevent loss of life, property damage, and erosion. When reefs are damaged or destroyed, the absence of this natural barrier can increase the damage to coastal communities from normal wave action and violent storms.

2. ***Nurseries and reproduction.*** Corals provide habitats and shelter for many marine organisms, which helps support commercial and subsistence fisheries.

3. ***Tourism.*** Healthy coral reefs also support jobs and businesses through tourism and recreation. In Mozambique, these coral ecosystems are already supporting some small scuba diving and sea safari industries, but there is significant untapped potential that can be harnessed if market systems around these ecosystems are developed.

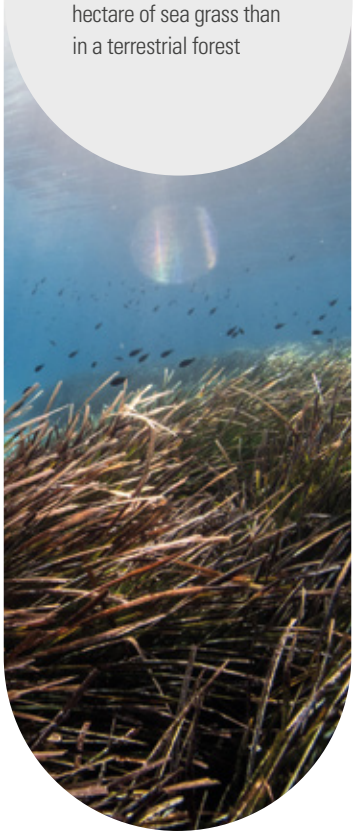
---

7 National Oceanic and Atmospheric Administration, The Importance of Coral Reefs, NOAA website.

8 Obura, D.O., Church, J.E. and Gabrié, C. 2012. Assessing Marine World Heritage from an Ecosystem Perspective: The Western Indian Ocean. World Heritage Centre, United Nations Education, Science and Cultural Organization (UNESCO). 124pp.

2x

more carbon stored in 1 hectare of sea grass than in a terrestrial forest



Seagrass Beds

Similar to grasses on land, seagrasses grow on the bottom of the sea floor, capturing the sun's energy, generating food and oxygen, and providing a critical home for fish and other marine creatures. Seagrass beds are often found in shallower waters and can be damaged by fishermen scraping the ocean floor for shrimp and flatfish, or boat propellers and anchors. The authors have enjoyed diving in the seagrasses of Ponto do Ouro, Barra Bay in Inhambane as well as in Nacala. These vibrant and healthy seagrass beds are home to large communities of seahorses, frog fish, squid, nudibranchs, octopuses and other marine life.

Seagrass is an important part of the marine ecosystem and can be found in many of the seascapes throughout Mozambique. Thirteen species of seagrasses have been recorded in Mozambican waters.[9] And in one study of seagrass beds at Inhaca, researchers found 56 species of marine life from 26 marine families in the seagrasses, demonstrating the importance of seagrasses to marine ecosystems in Mozambique.[10] Seagrass habitats occur adjacent to other key ecosystems such as coral reefs and mangroves. Seagrass beds are known to be highly productive, serve as critical habitats to economically important as well as rare and endangered marine species, and are a critical food source for the threatened dugongs of Mozambique.[11] They are important as nursery grounds, foraging areas and predation refuges for numerous fish and invertebrate populations and provide crucial benefits for commercial, subsistence and recreational fisheries.[12] Seagrasses are important because they provide:

9 ASCLME 2012. National Marine Ecosystem Diagnostic Analysis. Mozambique. Contribution to the Agulhas and Somali Current Large Marine Ecosystems Project (supported by UNDP with GEF grant financing).

10 Gullström, Martin & Dahlberg, Mattis. Fish community structure of seagrass meadows around Inhaca Island, southern Mozambique. Uppsala University, Sweden, June 2004.

11 Pereira et. al (2014) provides references to studies by Duarte and Chiscano, 1999. Edgar et al., 1994; Oshima et al., 1999; Boström and Bonsdorff, 2000.

12 Pereira et. Al (2014) provides references, such as Adams, 1976; Heck and Thoman, 1984; Orth et al., 1984, Bell and Pollard, 1989; Rooker et al., 1998.

1. ***Carbon sequestration*** - Seagrasses are nicknamed "the lungs of the sea" because they can generate enormous amounts of oxygen. A single square meter of seagrass can release as much as ten liters of oxygen a day through photosynthesis. Because they are so photosynthetically productive, seagrass can absorb huge amounts of carbon from the atmosphere. Each square meter of seagrass is capable of absorbing 83 grams of carbon per year, and seagrass meadows hold around 15% of the carbon stored in the ocean.[13] The average hectare of seagrass stores 139.7 metric tons of carbon in its soil, and studies are also finding deep layers of centuries-old, carbon-rich soil beneath these habitats.[14]

2. ***Nurseries and reproduction*** - Seagrass provides food and shelter for many marine organisms such as the Dugong and the green sea turtle both of which are endangered marine herbivores. Many marine species also utilize seagrass habitats as feeding grounds and nursery areas. Fishes such as jacks and snappers forage in the seagrass and while others like snappers spend their juvenile stage in seagrass habitat, eventually moving on to mangroves as they mature. And commercially important species including spiny lobsters, pink shrimp and crabs also use seagrasses as nurseries. The authors have found numerous species, such as the bobtail squid, nudibranchs and ornate ghost pipefish among the seagrass beds of Nacala.

3. ***Sediment Stabilization*** - Seagrass stabilizes sediments with their dense roots, which prevents erosion along Mozambique's coastline. This ecosystem service is especially important during storms and cyclones that often threaten Mozambique's coastline.

4. ***Water Clarity*** - Seagrasses can help dissolve nutrients and trap water sediment which helps to improve water clarity. Seagrasses also trap fine sediments and particles from both land and water.

---

13 The Great Barrier Reef's Seagrass Is an Amazing Carbon Sink, Popular Mechanics, December 18, 2018.

14 The Nature Conservancy (TNC), Mapping the Ocean's Wealth website: www.oceanwealth.org

756

TONNES

of coal emissions are offset by 1 hectare of mangrove

Mangroves

Mozambique has the second highest coverage of mangrove forests in the Western Indian Ocean with 2,910 km2 of mangroves, just behind Madagascar at 2,990 km2. Like coral reefs, mangroves in Mozambique are extremely productive ecosystems that provide numerous goods and services both to the marine environment and surrounding communities. Well-developed mangrove forests can be found in the northern and central regions of the coast and less so along the southern sector, except around Maputo Bay. Mangroves are important for:

1. Coastal protection: The dense root systems of mangrove forests trap sediment flowing down rivers and off the land. This helps stabilize the coastline and prevents erosion from waves and storms. In areas where mangroves have been cleared, coastal damage from hurricanes and typhoons is much more severe. By filtering out sediment, the forests also protect coral reefs and seagrass meadows from being smothered after large storms.

2. Nurseries and reproduction: Mangrove forests are nurseries for many fish species, including coral reef fish, crabs, clams, and shrimp as well as commercially important fish species. Mangroves also support a number of threatened and endangered species that are active in Mozambique, such as turtles (hawksbill, green and loggerhead), which depend at some point in their life on mangroves.

3. Renewable timber and medicinal resource: Mangrove wood is resistant to rot and insects, making it extremely durable for construction, and thus extremely valuable. Many coastal communities throughout Mozambique rely on this wood for construction material as well as for fuel. These communities also collect medicinal plants from mangrove ecosystems and use mangrove leaves as food for animals. NGOs, such as WWF-Mozambique, are working with local communities to plant mangrove for sustainable harvesting.

4. Tourism: Given the diversity of life inhabiting mangrove systems, and their proximity in many cases to other tourist attractions such as coral reefs and sandy beaches, it is

perhaps surprising that only a few countries have started to tap into the tourism potential of their mangrove forests. Bonaire, for instance, offers snorkeling expeditions in and around mangroves to see baby fish, jellyfish, and urchins against a magical background of interwoven roots delving deep into the sandy substrate. Diamonds resort in Mecufi, near Pemba, offers kayaking expeditions through the mangrove forests close to the resort. There is enormous potential to generate revenue around intact and healthy mangrove forests.

Oyster Reefs

Oyster reefs create important habitat for hundreds of other marine species as they provide nursery and nesting sites for fish. Juvenile fish find shelter among the beds, allowing them to grow bigger and providing better food sources for their predators. Oyster reefs filter and clean the surrounding water. Species like mussels, barnacles, and sea anemones settle on them, creating abundant food sources for commercially valuable fish species. Oyster reefs also protect coastlines from storms. Densely packed beds and reefs of oysters form a natural breakwater, dramatically cutting wave heights. They can also occur naturally in intertidal areas where they provide a form of shoreline armoring, preventing erosion and protecting marshes.

Oyster reefs and other bivalves eat algae for food, and in so-doing filter and clean vast amounts of water. A single oyster can filter 180 liters of water every day. Cleaner waters support the growth and health of seagrasses and other plants that depend on sunlight for survival. These plants, in turn, yield additional benefits, like fish production and carbon storage. Scientists call oysters a "keystone species" in recognition of their important role in estuaries.[16]

Oyster reefs have become an endangered marine ecosystem. The authors have found little written about the oyster reefs in Mozambique. Reefs can be seen around Chizavane up to Chidenguele, where the bivalve beds provide a natural barrier to the coast. Oysters can be found north of Maputo,

180

LITRES

of water can be filtered by oysters each day, helping sunlight reach seagrass, which helps with CO^2 sequestration

16 TNC Ob Cit.

50%

LITRES

of the seabed's carbon is stored in wetlands

through Chidenguele to Vilanculos and Bazaruto. The authors have seen oysters on the menus of restaurants in Maputo and restaurant owners say they have sourced oysters typically from Vilanculos.[17] Oysters are also typically found in estuaries, sounds and bays, and salty lagoons, which also indicates to us that they may be found in waters through Beira and north. However, there is a dearth of information written about oysters in Mozambique, indicating a need for further research and study.

Coastal Wetlands and Lagoons

Coastal wetlands of Mozambique are diverse ecosystems that play important roles both for land and ocean-based organisms. According to the Nature Conservancy, coastal wetlands are major sources for carbon sequestration and contain 50% of the carbon stored in the ocean's seabed.[18] These wetlands hold billions of tons of carbon worldwide and are more efficient in drawing carbon from the atmosphere and sequestering it in the soil than terrestrial forests.

While coastal wetlands occur throughout Mozambique, the vast majority can be found along the central coast of the country, where the wetlands are permanently saturated or flooded and hardwood tree species, such as mangrove, can be found. The land around much of the central coast section of Mozambique begins with the barren mud and sand flats that are covered by tidally influenced seawater. These areas then lead to the growth of hardwood trees and seagrasses that offer food, protection and breeding grounds for many commercially important fishes, shrimp, oysters, clams, and crabs. High levels of nutrients found in these areas serve as a critical base of the food web for many commercially important as well as Red-listed marine and coastal species.

---

17 World Wildlife Fund (WWF) website: https://www.worldwildlife.org/photos/women-gleaning-sand-oysters-in-mozambique

18 Ibid.

19 IUCN has developed a Red List of Species and a Red List of Ecosystems, both of which are frameworks for assessing the conservation status of species or ecosystems. It is a tool used to identify species or ecosystems most at risk of biodiversity loss using a standard classification system such as Not Evaluated (NE), Least Concern (LC), Endangered (EN) through to Collapse (CO) for ecosystems to Extinct (EX) for species. More information can be found here: IUCN Red List of Threatened Species.

10+

important coastal bays throughout Mozambique contain important marine life

Wetlands act as natural sponges for the land-based communities around them by trapping and slowly releasing rain, ground and flood waters. Tree roots and other wetland vegetation slow the speed of flood waters and distribute them more slowly over the floodplain. This is particularly important in the wetland zones of Mozambique, which, between Angoche and Bazaruto, have more than 24 rivers flowing to the ocean and are more prone to cyclones and floods. Thus, conserving wetlands not only protects important coastal fisheries, which support livelihoods and protein-rich diets, but also supports climate resilience to severe weather events due to historic trends, Mozambique is characterized as 'high' climate risk for both droughts and floods.

Starting just south of Inhambane, parts of the Mozambique coast are fringed by fresh and salt-water lagoons, which often flank the ocean. The saltwater lagoons, such as Bilene, are separated from the sea by a sand barrier system, often connected with the sea by one or several "gates" or sandbanks.

Coastal Bays

Mozambique has numerous large coastal bays, from Maputo, Inhambane, Beira, Pembane, Moma, Angoche, Nacala, Pemba, Mocímboa da Praia, Palma and numerous others smaller bays (e.g., Memba, Lurio, etc.). The authors found little written on the coastal bays of Mozambique. Some literature is available from a 2005 USAID-supported program that created the Pemba Bay Conservancy. In the Key Biodiversity Area (KBA) study recently completed by the Wildlife Conservation Society (WCS) for USAID, WCS identified the Maputo Bay as an important KBA and proposed it be included as part of the Maputo Special Reserve Protected Area.

Coastal bays around Mozambique were key to colonial Portuguese settlement and trade. In Mozambique, coastal ports were established along the coastal bays, which provided shelter from the stormy high seas. Mozambique's most important ports of Maputo, Beira and Nacala are all formed on bays. Other key cities, such as Pemba, Angoche and Palma (for the oil and gas developments) have bays.

[20] USAID SPEED+ Project, Report by Wildlife Conservation Society (WCS), KBAs Identified for Mozambique, 2020.

Bays are also ideal habitats for many aquatic species and, due to their proximity to human settlement, serve as important areas for fisheries development (fishing infrastructure and aquaculture production). Coastal bays often have beautiful scenery, relatively clean water with diverse ecosystems, and high nature conservation potential. However, there are typically competing demands for the use of coastal bays, which ideally are addressed through specific bay management plans to mitigate threats to marine ecosystems.

1.1.3 Mozambique's Key Marine Species

Mozambican seascapes are home to an extremely rich marine biodiversity, with high coral diversity and sensitive species like turtles, dugongs, sea horses, dolphins, sharks, giant mantas and whales.[21] They also include other, much smaller, marine life as well that are critical for marine ecosystems, including the fish stocks Mozambique's economy relies on – from various types of coral, shrimp, crab, frog fish, octopus, reef fishes and nudibranchs. This section briefly highlights the main species found in Mozambique, some of which are endangered and threatened, as well as others that are classified by IUCN as data deficient or not evaluated, thus requiring more research, study and monitoring.

Marine Species and Habitats Data

Though Mozambique has extremely rich marine biodiversity, most of the information the authors have found is focused on a few species, such as turtles, coral, dugong, mangroves and corals. There are hundreds of species that have little or nothing written about them. For example, seahorses are seldom studied in the region, neither are angler or frogfish. A few reference books are good sources of information, such as *Smith's Sea Fishes* or online databases, such as Fishbase or iNaturalist. At the time of writing this report, the South African Institute for Aquatic Biodiversity (SAIAB) was finalizing a reference book on Coastal Fishes of the Western Indian Ocean. A recently completed book titled *A Guide to the Sea Slugs of the Maputaland Coast,* by Jenny Strömvoll and Georgina Jones is a useful reference for sea slugs that can be found along the dune coast, and Ms. Strömvoll is currently completing another book on reef fishes of Southern Mozambique. Information on turtles, dugongs, rays and sharks, as well as on marine mammals can be found in various reports from projects on these species. Dr. Andrea Marshall, a NatGeo Explorer and co-founder of the Marine MegaFauna Foundation, has written extensively; a bibliography of her work can be found in the footnote.[22] Carlos Perreira from Centro Terra Viva (CTV), as well as other researchers and universities, have written reports on marine species and habitats, many of which are referenced in this

[21] Pereira et al. (2014), Ob Cit.

[22] See bibliography from MMF here: https://drive.google.com/file/d/1FAeiIpZC0sl0u6aUj4CbofSZG0e45hBu/view?usp=sharing

paper. Environmental impact assessments (EIAs), particularly on ocean-based oil and gas projects, also contain useful information on marine species and habitats. BIOFUND's website has an extremely useful database of these reports, which will continue to be populated and serve as a repository for reports.

The authors think there are a significant amount of marine species and habitats that have not been properly identified, studied, reported on and classified to IUCN standards. This dearth of information on these other marine biota may contribute to the decline of species that exist in Mozambique as (a) there is not sufficient knowledge and documentation of these species, which (b) contribute to a lack of protection of these species. To close this gap, a low-cost and useful approach to obtaining a data set could include (a) connecting dive operators, researchers and other interested parties to an online platform so that they can contribute their sightings, photos and other information on species and habitats; and (b) using market systems to drive recreational divers, through photo contests and photo workshops, to contribute their sightings and photos to help strengthen a data set on marine species and habitats in Mozambique. In addition, supporting educational and research opportunities for Mozambique's existing and aspiring scientists, as well as government staff working in coastal sectors, would build local knowledge, support, and advocacy for protection.

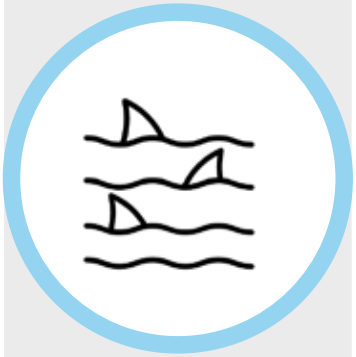
Sea Turtles

Sea turtles are a fundamental link in marine ecosystems. They help maintain the health of seagrass beds and coral reefs that benefit commercially valuable species such as shrimp, lobster, and tuna. Five of the seven sea turtle species are found in Mozambique and nest at various points along Mozambique's coastline: the loggerhead turtle *(Caretta caretta)*, leatherback turtle *(Dermochelys coriacea)*, green turtle (Chelonia mydas), hawksbill turtle *(Eretmochelys imbricata)* and olive Ridley turtle *(Lepidochelys olivacea)*.[23] The green turtle is widespread but only nests north of Inhambane. The olive Ridley and hawksbill turtles are found mainly in the northern part of the country, though the authors have seen the hawksbill while diving in Ponta de Ouro. The loggerhead and leatherback turtles are mainly located south of Inhambane where they nest along the critical sandy beach habitat, but can also be found further north. Turtles also have major cultural significance and tourism value.

[23] World Wildlife Fund (WWF) website: https://www.worldwildlife.org/species/sea-turtle

27
TYPES

of marine mammals can be found in the waters of Mozambique



122
SPECIES

of sharks (73) and rays (35) can be found in Mozambique - highest in the world

Marine Mammals

Mozambique has an immense number of marine mammals that pass through its coastal waters.[24] Various types of whales (including humpback, mink, killer, false killer, pygmy killer, pilot, sperm, pygmy sperm, Blainville beaked, melon-head, and Cuvier's beaked), dolphins (common, spotted, Rissos', striped, long-snouted spinner, rough-toothed, bottlenose, long-beaked and Indian humpback), seals (the Crabeater seal and the Sub-Antarctic fur seal), and of course, the threatened dugong, often seen in the Bazaruto Archipelago, can be found in Mozambique. It was reported that smaller populations of dugongs could be found in Inhambane Bay and Maputo Bay, but the authors have not heard of sightings in the past few years. The coast of Mozambique is known as a winter breeding ground for whales.

Sharks and Rays

With 122 species of sharks and rays found in its waters, Mozambique has the highest diversity of the entire Western Indian Ocean.[25] Mozambique is well known for whale sharks, which drives tourism to see these species, particularly in the Inhambane region. The Southern Part of Mozambique are home to a large aggregation of Bull sharks and schooling hammerheads during the summer months, which is a tourism attraction as well. The authors have also seen species such as hammerheads, black tip, reef, nurse, bull or Zambezi, white, guitar and white tips. Mozambique is also well known for giant manta rays, which is the world largest ray with wingspans of up to 9 meters (30 feet), and is also a major driver of tourism, particularly around the Inhambane area. Sightings of both the whale shark and the giant manta have drastically reduced over the past few years. Threats exist from fishing and poaching of the whale sharks and mantas, as both the whale sharks and mantas can fetch as much as $30,000 each.[26] Other shark species are also threatened from fishing. Published references on sharks and rays in Mozambique are very rare.

---

24 Peddemors, V.M., P.B. Best, K.P. Findlay, D. Gove, B. Rakotonirina, A. Rossouw, and K. Sekiguchi. 1997. Small cetaceans of the south-west Indian Ocean. Paper SC/49/SM33 presented to the International Whaling Commission Scientific Committee, October 1997.

25 See Pereira et. al. (2014) Ob cit.

26 See National Geographic article on Whale Sharks and Mantas.

740
SPECIES

of birds can be found in Mozambique such as the albatross, pelican and flamingo

Coastal and Seabirds

The largely undeveloped estuaries, coastal areas and islands along Mozambique's extensive shoreline support a range of important coastal and seabirds - about 740 species - including penguins, albatross, pelicans, shearwaters and petrels, boobies, frigatebirds, herons, egrets, storks, hawks, falcons, sandpipers, cranes, flamingos, ducks, and geese.[27] The African Penguin, Indian Yellow-nosed Albatross, Black-browed Albatross are all classified as IUCN Endangered.[28] The Zambezi River Delta is a hotspot for migratory species from Europe and Asia as well as being an important site for coastal wading birds. Seabirds play an important role in the marine ecosystem by providing an important connection between land and sea that can help maintain coral reef productivity[29] and even increase coral growth rates.[30] [31] Threats to seabirds include fisheries, as depleted fish stocks challenge the seabirds in finding food, as well as from entanglement on fishing gear, poaching, oil spills, invasive species and conversion of coastal habitats for economic uses.

900+
SPECIES

of tropical reef fish species, 400 species of molluscs and 270 species of hard and soft coral in Mozambique

Other Marine Biota

As we have seen in the preceding sections, Mozambique marine habitats are home to an extremely rich marine biodiversity, including protected species like turtles, dugongs, dolphins, sharks, giant mantas and whales.

But these same marine ecosystems are also home to other, much smaller, often forgotten and understudied/monitored marine life that are critical for marine ecosystems, including important fish stocks. This marine biota includes various types of coral, shrimp, crab, frog fish, bobtail squid, rhinopias, octopus, reef fishes and nudibranchs. Many of these species are data deficient or not evaluated by IUCN and are not accounted for in the Mozambique ecosystem context, where, through overfishing or other local threats, can be threatened,

---

27 Wikipedia: https://en.wikipedia.org/wiki/List_of_birds_of_Mozambique

28 Birdlife International Website: http://datazone.birdlife.org/country/mozambique/marine

29 Graham, Nicholas & Wilson, Shaun & Carr, Peter & Hoey, Andrew & Jennings, Simon & Macneil, Aaron. (2018). Seabirds enhance coral reef productivity and functioning in the absence of invasive rats. Nature. 559.

30 Savage, Candida. (2019). Seabird nutrients are assimilated by corals and enhance coral growth rates. Scientific Reports. 9.

31 From UN Environment Website and Allport, Gary. Notable recent records of terns, gulls and skuas in southern Mozambique including the first country records of Black Tern Chlidonias niger. Bioone, Vol. 138, Issue 2, 2018.

vulnerable, endangered, etc. even though globally the species may be of least concern according to IUCN. In all, almost 900 species of reef-associated fishes have been recorded, as well as 400 species of mollusks and 270 species of hard and soft corals. The other marine biota not only provide critical ecosystem services, but they have a lot of value to drive eco-tourism and research, create jobs and enhance not only community welfare, but community contribution to marine conservation.

4
SPECIES

of seahorses have been confirmed in Mozambique and sightings are rare

Seahorses

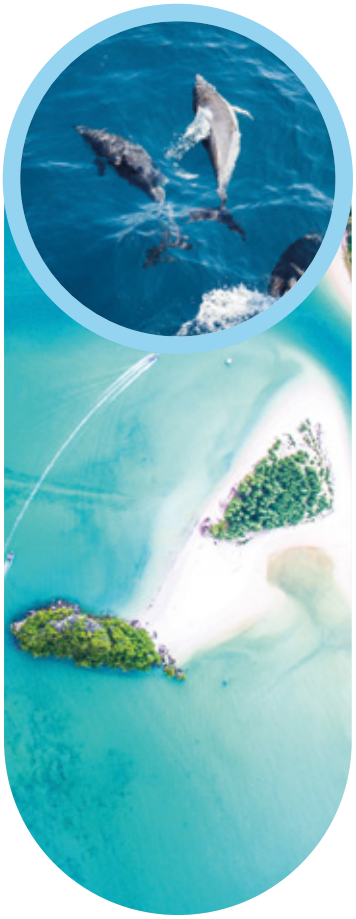
Seahorses are important to marine ecosystems. They prey on bottom-dwelling organisms and are food for invertebrates, fish, sea turtles, seabirds and marine mammals. They live in seagrass beds, mangroves, coral reefs and estuaries. Removing them disrupts entire ecosystems.[33] Little has been written on seahorses in Mozambique. A study by Pereira in 2008 identified possibly four types of seahorses that have been found in Ponta do Ouro, Inhaca, Barra, Bazaruto, Quirimbas. The authors have also photographed seahorses in the shallow (less than 3 meters / 10 feet) seagrass beds in Nacala and Barra in 2019 and Pomene and Ponta do Ouro in 2020. Jenny Stromvoll from Back to Basics has also photographed all 4 species identified by Pereira. While photographing, the authors spoke with local fishermen who confirmed they capture seahorses for sale and one can find dried seahorses in local markets in Nacala, though the fishermen say they keep the larger seahorses for export markets overseas, typically China and Vietnam.

Other key fish species that are important for food security and livelihoods

Given Mozambique's vast ocean resources and that roughly two-thirds of its population live along the coast, it is no wonder that numerous fish species are important for food security and livelihoods. Sustainable fisheries are an essential component of a prosperous blue economy, with marine fisheries helping Mozambique earn roughly $70 million in revenue in 2019 ($65.3 million from commercial exports and $6.2 million from

33 See Ocean Conservancy Fact Sheet on Sea Horses.

34 Pereira, M. A. M. (2008). Report on the Status and Trends of Rare Marine Fisheries Species in Mozambique: Reef Associated Aquarium Fish, Seahorse and the Hump head Wrasse. CDS Zonas Costeiras/MICOA.



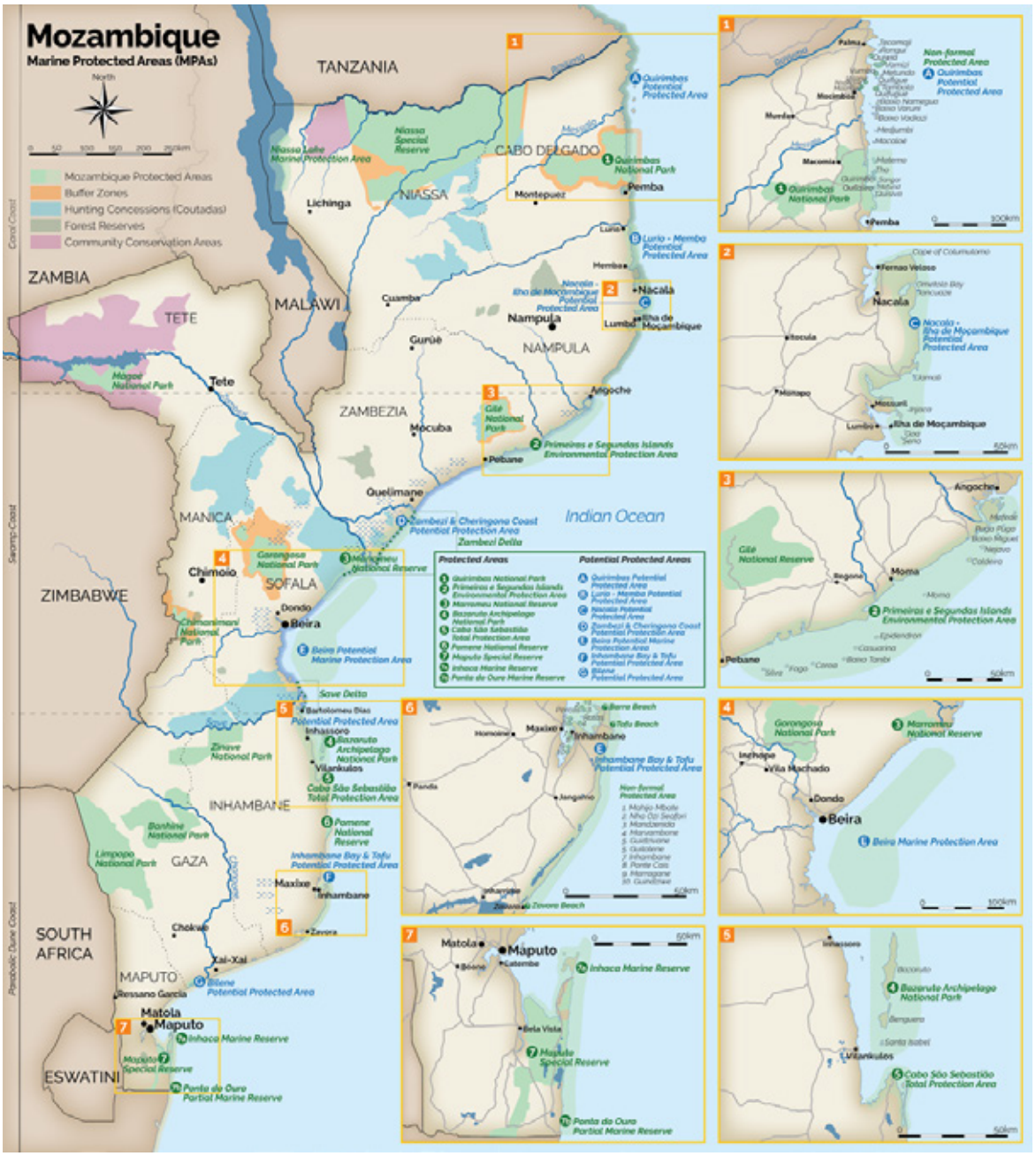
artisanal fish).[35] We provide a brief overview of the fisheries sector in Part 2 of the report (Economic Use of Mozambique's Marine & Coastal Assets), but wanted to provide a high-level overview of some of the fish species that are important for food security and livelihoods. We acknowledge the fisheries sector is important and large and could not adequately cover it in detail in this report, so instead we provide a summary overview and suggest further expansion of the fisheries sector be included in future updates.

Probably the best known fisheries industry is the shrimp industry, which produced 3,720 tons in 2017.[36] In addition to shrimp, the industrial and semi-industrial fishing fleets also catch lobster, shrimp, tuna and various other commercial fish species such as sardines - a bulk of which is exported. Artisanal fishers also catch lobster, crab, shrimp, tuna and various commercial fish species, such as grouper, red snapper, parrot fish, rockfish, sardine (kapenta), octopus, squid and others. In the interior waters, fishers will catch various river fish, such as tilapia (pende). A staple food source throughout Mozambique is horse mackerel (carapau) which is imported from Namibia, and has grown from 6,936 tons in 2006, to over 75,500 tons in 2017).[37]

35 International Trade Center TradeMap

36 See MIMAIP Statistics Bulletin 2006-2017.

37 Ibid


Mozambique
Marine Protected Areas (MPAs)
North
Mozambique Protected Areas
Buffer Zones
Hunting Concessions (Coutadas)
Forest Reserves
Community Conservation Areas
TANZANIA
ZAMBIA
MALAWI
ZIMBABWE
SOUTH AFRICA
ESWATINI
CABO DELGADO
NIASSA
TETE
NAMPULA
ZAMBEZIA
MANICA
SOFALA
INHAMBANE
GAZA
MAPUTO
Indian Ocean
Coral Coast
Swamp Coast
Parabolic Dune Coast
Protected Areas
Potential Protected Areas
Non-formal Protected Area

1.2 Seascape Profiles: Mozambique's Marine Protected Areas (MPAs)

This section provides high-level profiles of the 7 current marine protected areas, beginning with the northernmost MPA and working south to Ponta do Ouro Partial Marine Reserve.[39] A key resource on the country's MPAs is the UNEP/CBDs report *Ecologically or Biologically Significant Marine Areas (EBSAs) Special places in the world's oceans.*[40] Of the 39 EBSAs identified by IUCN, Mozambique has five.

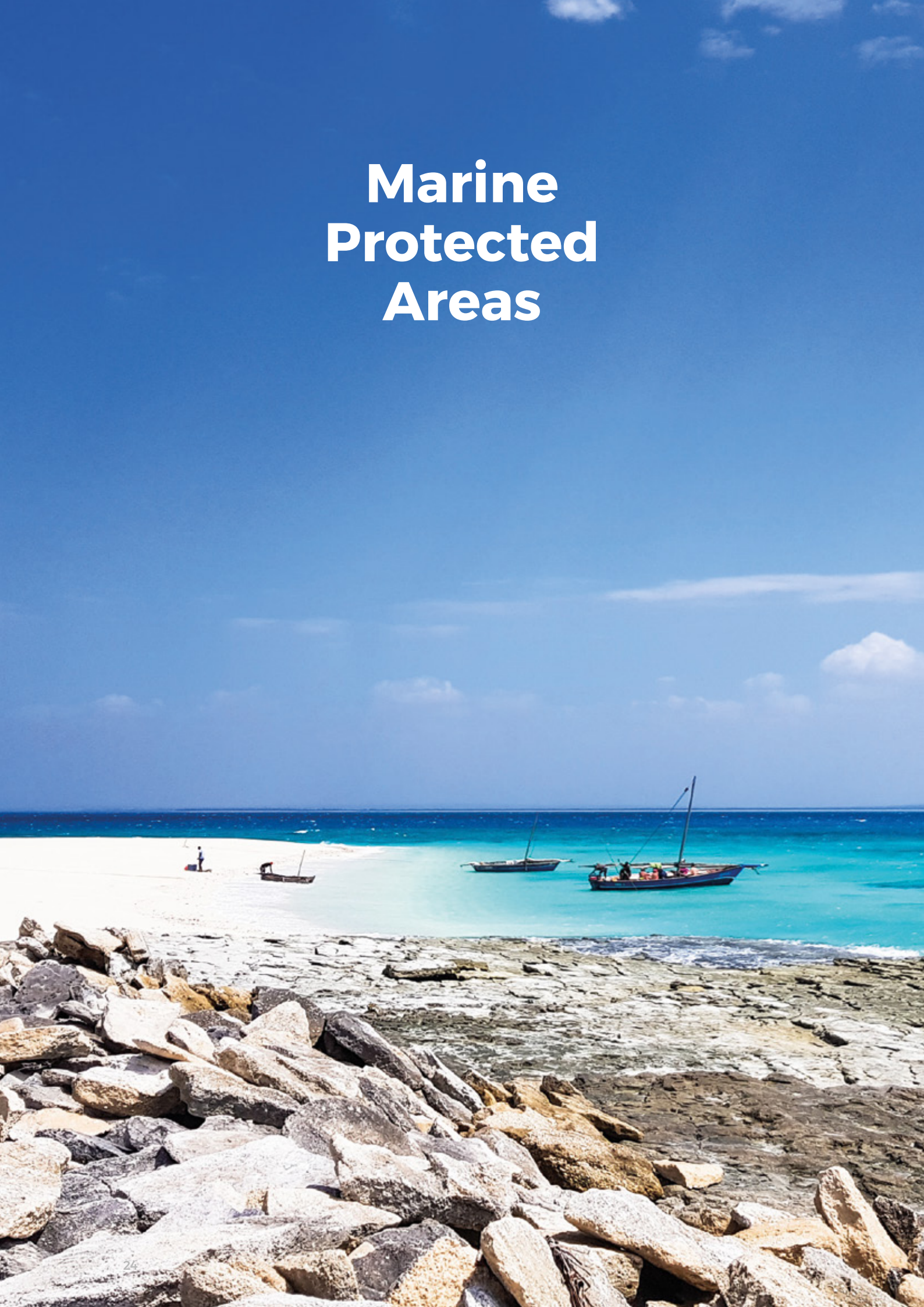
As mentioned in the introduction, the MPA seascape profiles are an effort to aggregate available information into a format that can be understood by various audiences. The authors' intent is to create an easy-to-use reference guide for these seascapes, and thus the team developed a a scorecard with smiley-face icons to offer a quick take on the characteristics of a geographic area, such as ease of access, private sector activity, or value for money with regard to donor support. Note that the scorecard does not have a scientific method and should simply be taken as a the opinion of the authors that might be shared over a cup of coffee any investment in these seascapes would naturally require further detailed studies around a predefined set of parameters tied to the funding entity. Also, please note that the below 7 MPA seascape profiles are also summarized in Table 1 at the end of this section.

38 This map can be downloaded here: https://drive.google.com/file/d/1WFdXhn8q4zfnIoGJ0cnK0JGFOSxsKhFx/view?usp=sharing

39 A high resolution image of the map on the previous page can be downloaded here: https://drive.google.com/file/d/1WFdXhn8q4zfnIoGJ0cnK0JGFOSxsKhFx/view?usp=sharing

40 Lake Niassa is also classified as a protected area, but we have not included it as a separate section in this report. Lake Niassa Partial Marine Reserve can be found within Mozambique's 200km of the eastern shore of Africa's third largest lake (585 km long by 75km wide) and was established in 2011 to conserve habitats and species of Lake Niassa and is a Ramsar Wetland of International Importance. The lake can reach depths of up to 700 meters and is known for its spectacularly clear water and relatively low pollution levels. The lake is reported to have a greater variety of fish than any other lake in the world, including hundreds of endemic cichlid species. There are a couple of upmarket lodges such as Manda Wilderness Community Conservation Area and the Mbuna Bay Lodge. The Mozambican portion of the lake was officially gazetted as a reserve and designated as a Ramsar Wetland of International Importance in 2011. There are three main points of access to the Mozambican shore of Lago Niassa.

Marine Protected Areas



2%

of Mozambique's waters have marine protected area (MPA) status - 8 MPAs - with a further 7 under consideration

$900,000

MONITORING, SURVEILLANCE & PROTECTION

amount African parks spent in 1 year managing only Bazaruto. Imagine the resources required for all of Mozambique.

Marine protected areas are an important tool for conserving marine biodiversity. MPAs can accomplish a broad range of objectives—from protection of habitat and species, advancing sustainable fisheries, promoting tourism, ensuring sustainable use of marine habitats for economic growth and job creation, advancing cultural and public education objectives, and strengthening institutions that support community resilience and development.

Mozambique's 7 MPAs, detailed below, range from "paper parks," a protected area on paper with no real management or enforcement, to robust national parks and reserves with ANAC park rangers and a co-manager, such as Peace Parks in the Ponta do Ouro Partial Marine Reserve and African Parks in the Bazaruto National Park. Mozambique also has a few locally managed marine areas, which are detailed below.

In this report, we refer to these locally managed marine areas as Marine Community Conservation Areas (MCCAs), to keep in line with prevailing community conservation legislation as outlined in the 2017 Conservation Law. MCCAs use customary tenure and resource access and make use of, in most cases, existing community strengths in traditional knowledge and governance combined with a local awareness of the need for action to benefit both communities and coastal resources. Examples of MCCAs have evolved in Vamizi, Nacala, and in Zavora that manage open-access mussel habitats, examples of which could be replicated in other coastal areas.

Expanding MPAs. Currently, 2% of Mozambique's exclusive economic zone, or roughly 7,456 sq miles (12,000 sq kms) are under protection through 7 marine MPAs. Strategic Objective #188 of Mozambique's new 5-year Plan 2020-2024 has a goal of increasing the marine reserves under protection from 2% to 10%. Mozambique has also signaled that it adheres to the draft text released by the United Nations Convention on Biological Diversity (CBD) to have 30 percent of marine resources under protection by 2030, known as 30x30. And Mozambique's last report in 2019 to the CBD indicated a growing commitment to protection of marine resources throughout the country.

MPA Management Costs are High. Meeting this goal of expanding the MPA network is a time-consuming and expensive process, requiring contributions and cost-sharing across the public and private sectors.

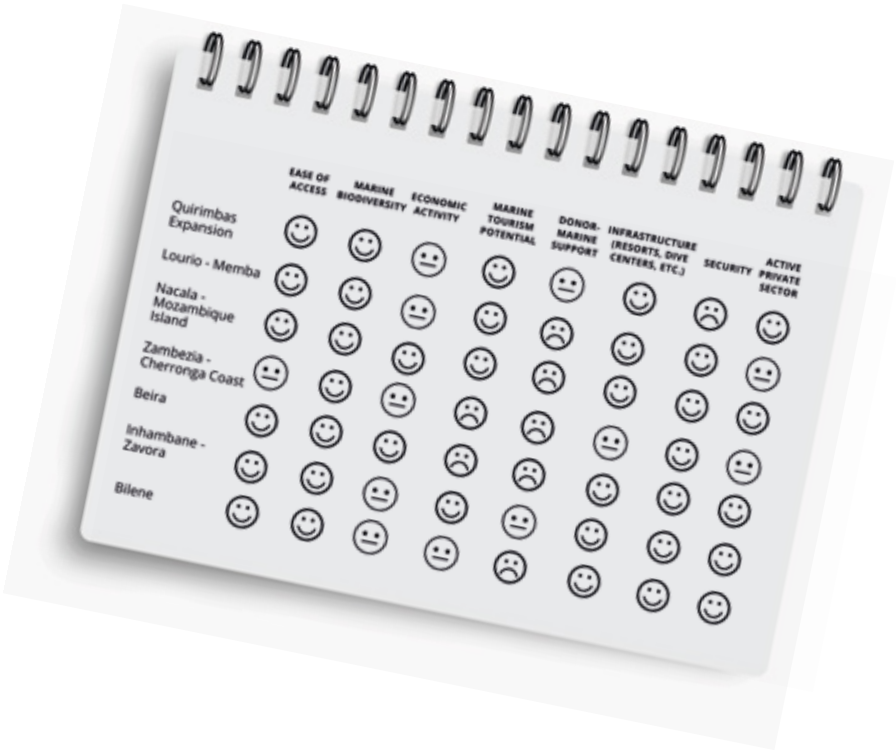
Effective monitoring and control of an MPA can have multiple benefits, including greatly improved deterrence, detection, interdiction, and prosecution of illegal, unreported, and unregulated (IUU) fishing and other illegal activities. However, the cost of MPA management can be quite high the Great Barrier Reef Marine Park, cited as the best MPA in the world, spends around $150/km² per year on MPA management. For comparison, in Mozambique's crown jewel, Bazaruto, BIOFUND estimates that the management cost is about $230/km² per year for management of Bazaruto's 1,430 km² of marine protected area.[41] In a marine park like Primeiras and Segunda with an area of 10,409 km², the annual management costs can be quite costly. Most current MPAs in Mozambique receive very little financial support, and thus the country must be creative on how to align actors across the blue economy to contribute to their common goal. Note that this guidebook provides a short summary of financing options in Section 3.

In the following section, 7 MPA seascape profiles are presented with a summary of the:

- Marine and Coastal Assets
- Threats to Biodiversity
- Blue Economy Potential
- Donors & Partners Active in the Marine Sector

Where possible, links and citations are included for reference.

FIGURE 1. Overview of Attributes for Future MPAs



41 Biofund lists the cost of management at $230/km2/year: http://www.biofund.org.mz/en/area_de_conservacao/bazaruto/.

1.2.1 Quirimbas National Park (QNP)

There is currently no co-management partner for the QNP. From 2002 to 2008, WWF provided approximately $6.75 million in technical and financial assistance to QNP. WWF programs continued, but due to the rise of violent extremism occurring in Cabo Delgado, WWF has decided to reprogram to other marine areas in Mozambique.

42 United Nations Education, Scientific and Cultural Organization (UNESCO), Tentative Lists, properties which they consider to be cultural and/or natural heritage of outstanding universal value and therefore suitable for inscription on the World Heritage List. https://whc.unesco.org/en/tentativelists/5380//

43 Hill, Nicholas & Davidson, J & Marques da Silva, Isabel & Mucave, S & Muaves, Lara & Guissamulo, Almeida & Debney, A & Garnier, J. (2010). Coral and reef fish in the Northern Quirimbas Archipelago, Mozambique – a first assessment. Western Indian Ocean Journal of Marine Science.

Marine Biodiversity Assets

Along much of the powdery white sand beach coastline of the QNP there are numerous mangrove forests and sand flats; just offshore are some of the most diverse and best-preserved coral reefs in East Africa. The Quirimbas is known for its complex underwater reef structures and for its diverse coastal topography, which comprises numerous underwater mountainous reefs, escarpments and plateaus, dipping and peaking in dramatic arrays of color and vitality, which attracts a wide variety of marine life. A series of deep, east-west running channels, beginning at depths greater than 1,000 meters, cut between the numerous Quirimbas islands and gradually level out on the sand flats and various seagrass beds to the west of the main line of islands. Humpback whales travel thousands of miles from Antarctica to give birth and shelter their calves in the protected warm waters of the Quirimbas. More than 400 species of fish live on the sprawling reefs.[44] Large aggregations of the endangered Gray reef sharks (Carcharhinus amblyrhynchos) can be found, along with many species of grouper, snapper and angelfish. Two newspaper articles by a well-known diving journalist and writer call QNP's marine life "one of the healthiest underwater landscapes I have ever seen."[45] Turtles are particularly important in this region with three species — olive ridley, green and hawksbill — feeding and nesting in the region. The green turtles of Vamizi Island are the most important nesting population in Mozambique, and the density of hawksbill nests on the island is the highest known in the country.[46] Dugongs are known to reside in the Quirimbas National Park area, but are scarce and their actual numbers are unknown (one Dugong was identified in an

44 Environmental Impact Assessment Report Deepwater Exploration Drilling Operations in the Rovuma Offshore Area 1, Mozambique, Impacto, 2008 and 2014 EIA Update by ERM South Africa and Impacto.

45 Hill, Nicholas (2010) ob cit.

46 Garnier, J. et al. 2012. Status and community-based conservation of marine turtles in the northern Quirimbas Islands (Mozambique). Oryx 48(3): 359-367.

aerial sighting in 2007, and another in 2009).[47] Dolphins, whales (namely the humpback whale), sharks, including bull sharks, white tip sharks, whale sharks and large populations of manta rays are known to frequent the islands.[48]

Threats

Africa's largest offshore natural gas development project, with $4 billion of capital investment, is planned to occur in a coastal area north of QNP. Hydrocarbon exploration, drilling and the possibility of a hydrocarbon release accident are large threats, though these activities are prohibited within all QNP boundaries. A 10km buffer zone from all park boundaries has been recently proposed to protect the QNP. Threats from oil and gas exploration are well documented in Area 1 EIA, such as whale strikes, destruction of benthic habitats, light impacts on birds and marine life, deposits of fine sediment from dredging, cutting a trench for the pipeline through coral and rock, disposing of dredging material and a host of other threats from the oil and gas operations. Population growth and development from oil and gas operations will also drive urban growth, which may cause additional drivers to marine biodiversity loss due to habitat conversion, overfishing and land-based source pollution. Violent extremism is preventing marine conservation partners, including CTV, Rare and WWF, from implementing activities in Cabo Delgado and more so, stopping activities altogether in the park.

Blue Economy Potential

Prior to the rise of violent extremism, the QNP and adjacent islands attracted close to 3,000 tourists each year to enjoy solitude and exclusivity the QNP offered, particularly the rich marine and birdlife as well as historical sites found on Ibo Island. Of the 32 islands that make up the Quirimbas Archipelago, 11 occur within its boundaries. The main islands with proven tourism potential include:

- **IBO,** which is the most developed of the islands, and has various resorts, including the high-end Ibo Island Lodge, as well as a variety of restaurants.
- **QUILALEA,** which has the luxurious Azura Resort.
- **MATEMO,** which had the Rani-managed Matemo Island Resort, but is now closed.
- **MEDJUMBE,** which has the luxurious Antara Medjumbe Resort.

47 Obura, D.O., Church, J.E. and Gabrié, C. 2012. Assessing Marine World Heritage from an Ecosystem Perspective: The Western Indian Ocean. World Heritage Centre, United Nations Education, Science and Cultural Organization (UNESCO). 124pp.

48 Ibid.

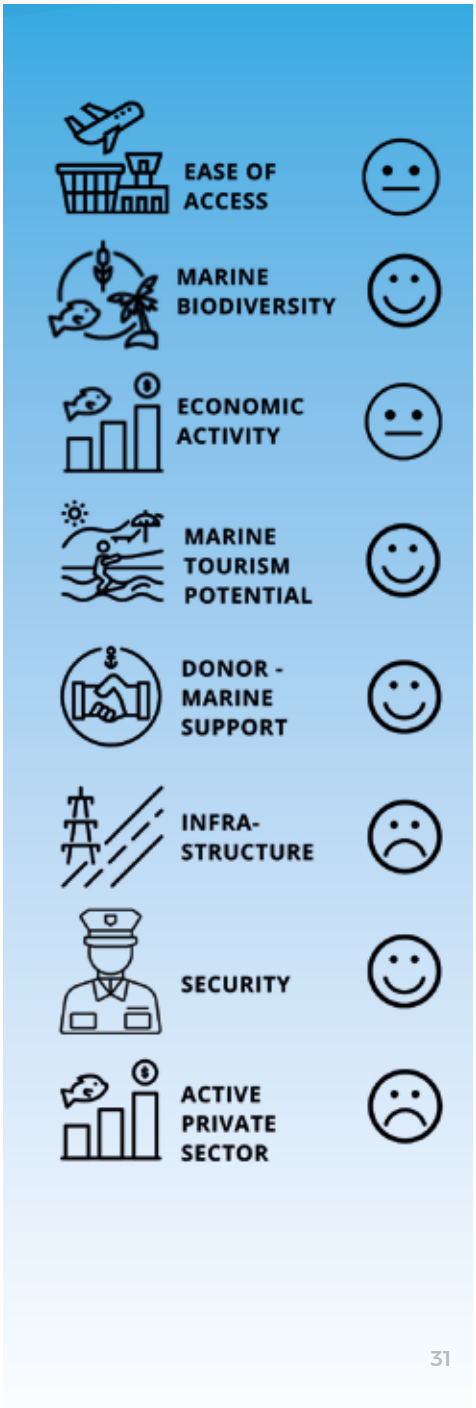
Pemba is the travel hub with an international airport, and many island resorts offer private air transfers. A boat service is available from Pemba, or from Tandanhague, outside Quissanga, about 4 hours' drive north of Pemba. Two paved roads service QNP along the south and center. Dive operators can be found on Ibo and on Quilalea.

The QNP also provides livelihoods for thousands of artisanal fisherfolk, who generally consume and sell their catch in local villages. Commercial fishing is off-limits within the QNP boundary; a lack of surveillance and catch data makes it difficult to gauge the sustainable market potential in the region just outside the park boundaries. Pemba, to the south of the park, is the largest city in the region, contains a commercial port, and serves as an epicenter for growth of housing and operations for the big gas developments in the area.

Donors and Partners Active in the Marine Sector

A number of donors and development partners have been involved in supporting marine activities in the QNP, but given the increase in violent extremism as well as the fallout from the COVID-19 pandemic, many programs and projects have been stalled or cancelled. WWF has shifted their resources from the QNP to other, more-secure areas of Mozambique, such as the Primeiras and Segundas. Some donors and partners with recent activities in the QNP area include: the French Development Agency, the French Environment Fund, WCS, BMZ, WWF, World Bank, Istituto Oikos, Foundation Ibo, ECO Mozambique, Associação do Meio Ambiente (AMA).

1.2.2 Primeiras and Segundas Environmental Protection Area (PSEPA)



Primeiras and Segundas Environmental Protection Area (PSEPA) was established in 2012 as an Environmental Protection Area. With 10,409 km^2 (4,018 square miles) under protection, it is Africa's largest MPA. It has been identified by the IUCN as one of the 39 Ecologically or Biologically Significant Marine Areas (EBSAs) in the Southern Indian Ocean.

The Primeiras and Segundas archipelago is a chain of 10 sparsely inhabited barrier islands and two coral reef complexes off the northern coast of Mozambique spanning across Nampula and Zambezia provinces. The city of Moma lies at the center of the PSEPA; five islands stretch to the north of Moma and to the city of Angoche (the Segundas), separated by a stretch of open water and reefs, and five islands to the south of Moma form the southern PSEPA chain, or Primeiras, to the city of Pebane. Together, these 10 islands—and the stretch of ocean between them and the coastline, rivers and estuaries, and territories up to 20 km (12.4 miles) inland—comprise the environmental protected area. While the barrier islands are largely uninhabited (a few islands may have rangers or guards, such as Ilha de Fogo), a coastal population of 340,000 people, including 40,000 artisanal fishers, depend on coastal resources found in the PSEPA for their shelter, nutrition, and livelihood needs.

Marine Biodiversity Assets

The PSEPA includes extensive and pristine coral reefs, coastal wetlands and estuaries with dense mangrove forests covering over 57,000 ha (220 square miles) with six mangrove species, seagrass beds containing 8 seagrass species, and extensive coastlines that are breeding grounds for its rich bird life. Sightings of the endangered dugong have been reported and five of the world's seven species of sea turtles can be found in the PSEPA, including the loggerhead, green and hawksbill turtles, which nest on the islands and mainland beaches.[50] Migratory whales frequent the PSEPA, as ocean depths can reach over 1,000 meters (3,280 feet) just 35 kms (21.7 miles) from the coast, and a deep-sea upwelling creates rich waters with micronutrients these mammals depend on. A 2008 report calls the reefs of the PSEPA "the best reefs in Mozambique, not only in terms of diversity, but also their conservation status. An abundance of fishes (194 species in 42 families) have been identified as well as 43 hard coral genera and 15 soft corals."[51]

Threats

The waters around the PSEPA are part of the world's largest wild prawn fishery, and as such, is a crucial marine economic zone for Mozambique. Overfishing from industrial and artisanal fisheries, including by-catch, particularly of turtles, is a threat for the PSEPA. Turtle and egg poaching is also of concern and has led WWF to create programs specifically designed to minimize poaching. In addition, BIOFUND notes the following threats for PSEPA:

- Illegal and destructive fishing
- Overfishing
- Illegal mangrove cutting
- Climate change
- Economic development and exploitation of mineral resources
- Illegal and unregulated activities mostly related to illegal fishing and trade in coastal and marine resources.[52]

50 Louro, C.M.M. et al. Report On the Conservation Status of Marine Turtles in Mozambique. Centro de Desenvolvimento Sustentável para as Zonas Costeiras, Ministério para a Coordenação da Acção Ambiental, Maputo. 2006.

51 Muthiga, N. et al. 2007. Status of coral reefs in East Africa: Kenya, Tanzania, Mozambique and South Africa. In: Status of Coral Reefs of the World: 2008: 91-104. Wilkinson, C. (Ed.). Global Coral Reef Monitoring Network and Reef and Rainforest Research Centre, Townsville, Australia.

52 See BIOFUND website on PSEPA.

The area is also known for its 5 mining concessions along the coast and within PSEPA boundaries, the best known is the Kenmare Resources Moma Titanium Minerals Mine in the city of Moma. An infographic by WWF provides a good overview of the area and the mining concession boundaries.[53]

Blue Economy Potential

As the PSEPA is an EPA, the 2017 Conservation Law allows for a variety of blue economy activities, such as commercial fishing, mining, and coastal tourism. The Port of Angoche is a primary fishing port and there are a variety of heavy mining activities, such as the titanium sands operation in Moma and numerous other mining operations throughout the PSEPA. The area has more than 340,000 inhabitants, including approximately 40,000 artisanal fishers. While the islands are largely uninhabited, the coast is home to communities that depend on the PSEPA's natural resources for food, shelter and livelihoods.

While the mining operations contribute to the local economy, they also place considerable strain on coastal tourism operations and nesting turtle populations along the coastline. When the authors visited Pembane Fishing Lodge in November 2020, the mining operator had erected a security gate with a guard that controlled access in and out of the lodge, to the surprise of the lodge owners. Visitors now need to drive through the mining operations to arrive at the lodge.

Given the competing blue economy pressures in the PSEPA from the prawn industry to extractives to tourism coordination among the many regulatory agencies is critical if conservation objectives are to be met. In addition, attention should be placed on the marine spatial plan currently under development and expected to be completed in 2021, to ensure coordinated and harmonious future development of blue economy activities in the PSEPA.

Regarding sustainable marine and coastal tourism, significant challenges remain. As of November 2020, only one luxury lodge was planned (and under construction), the high-end Banyan Tree plans to open in late 2021; no recreational dive operators exist in the PSEPA.[54] Fire Island Conservation is gearing up via the Pembane Lodge to support conservation on and around Ilha Fogo and also to offer diving and fishing operations with support of the Marine Megafauna Foundation.[55] WWF mentioned that Fresh Company appears to be building a lodge on the Islands of Ilha Jovo, but currently there are no operating lodges. Through the years there have been numerous attempts to develop lodges on some of the islands, but operational, financial and logistical issues have thwarted those efforts.[56] The islands also lack cell phone and internet services, so exploring expansion of Vodacom and Google's Loon service (high-altitude balloons that provide mobile network coverage should be considered.[57]

Remoteness and difficulty in accessing the PSEPA further complicates the development of sustainable tourism. To access the Segundas

53 WWF Infographic on PSEPA.

54 See: https://www.banyantree.com/en/mozambique/ilha-caldeira and update on constuction.

55 See: https://fireislandconservation.com/

56 A lodge once operated on Ilha Fogo, but the owner posted a sign that said "no blacks" which infuriated the local population, who ran him off the island and burned down the lodge.

57 See https://loon.com/ and Vodacom Presentation on Loon.

islands, in the northern part of PSEPA, one needs to fly to Nampula and then drive 3.5 hours to Angoche. To access the Primerias islands, in the southern part of PSEPA, one needs to fly to Quelimane and drive 5.5 hours to Pembane. There is an airstrip that was recently rehabilitated with help from Fire Island Conservation, but there are no commercial flights to Pembane. So, accessing the PSEPA is challenging, time consuming and expensive, which severely constrains the ability to tap into market systems to finance marine conservation activities. Actions to help the viability of the sustainable marine and coastal tourism space, such as around access, development of facilities (hotels and dive operations), species identification and awareness raising through photography and guides, would help drive much needed revenues into the region. Without growth of the tourism sector activities in the PSEPA, it will likely remain heavily dependent on international donor and NGO support.

The PSEPA is composed of the following barrier islands:

PRIMEIRAS

- **ILHA SILVA** - is the first of the islands in the archipelago, about 25 kms (15 miles) from Pembane by boat, Ilha Silva is a sand island surrounded by a fringing coral reef and clear waters.

- **ILHA FOGO** - or Fire Island, is about 8 kms (5 miles) north of Ilha Silva, has white sand beaches and abundant reefs over its approximate 44 hectares. Fire Island was purchased in 2014 by American Robert Koski, who had planned on developing a high-end lodge on the island. Plans were scrapped and instead Fire Island Conservation was created to turn the island into a conservation area.[5] Fire Island Conservation is supporting the development of minimal infrastructure on the island to support guards charged with conservation efforts on and around the island.

- **ILHA COROA** - the smallest of the islands, has a wreck on the eastern side of the island in approximately 27 meters (88 feet) of water, a perfect depth for recreational divers.[59]

58 See Fire Island Conservation: www.fireislandconservation.com

59 See Navonics online digital maps on www.navonics.com

- **ILHA CASUARINA** – is one of the largest islands and is heavily forested.
- **ILHA EPIDENDROM** - is the northernmost of the Primeiras islands and has a small lighthouse and a wreck on the west side of the island.

SEGUNDAS

- **ILHA MOMA** - the southernmost of the Segundas islands, is about 48 kms (30 miles) north of Ilha Epidendrom and heavily fished given its proximity to Moma.
- **ILHA CALDEIRA** - medium-sized island with low coastal shrubs, is another 28 kms (18 miles) north of Ilha Moma, on which the upmarket Banyan Tree Lodge plans to open in late 2021.
- **ILHA NJOVO** - is covered with casuarina trees and had plans for a small lodge many years ago that never materialized.
- **ILHA PUGA PUGA** - is small and flat with sandy beaches encircling the 2.4 km (1.5 mile) long island.
- **ILHA DA MAFEDE** - the northernmost of the Segundas islands, is 14.5 kms (9 miles) from the port of Angoche, relatively easily accessible, and has a lighthouse and a sea turtle ranger camp.

Donors and Partners

Despite the historic, current and planned support from several international donors and partners supporting PSEPA including the WWF-CARE Alliance, EU-Biofund, Conservation International and World Bank the relative size, geographical remoteness, and magnitude of drivers that threaten coastal and marine resources, additional financial and technical assistance will be needed to to elevate the PSEPA from a "paper park" to a well-managed protected area.

WWF

Beginning in 2008, a decade-long WWF-CARE alliance programmed conservation and community development programs with coastal communities in the Primeiras and Segundas, while also working with the government and communities to establish the PSEPA. WWF-CARE also undertook the scientific studies, community engagement, ranger programs, and conservation education, which helped the government to formally designate the PSEPA in 2012. WWF also helped the PSEPA develop its first management plan. WWF continues to be the main partner supporting the PSEPA with support from the Blue Action Fund, a $3 million, 4-year project aims to strengthen park administration, community management of resources, livelihood programs supporting agriculture and savings groups, and community grants around heavy sands mining, and on sustaining a multi-stakeholder forum.[60] WWF also programs a roughly $2.5 million annual budget for marine activities throughout Mozambique, which, due to the rise of violent extremism in Cabo Delgado, focuses on a marine policy program as well as support in the PSEPA. WWF has an office in Angoche and staff in Moma and Pebane.

BIOFUND

The Foundation for the Conservation of Biodiversity (BIOFUND) is a not-for-profit, Mozambique-registered institution that serving as an Environmental/Conservation Trust Fund mobilizes, applies and manages financial resources to the exclusive benefit of the conservation

60 Blue Action Fund: Safeguarding Primeras and Segundas Environmental Protected Area Blue Action Fund

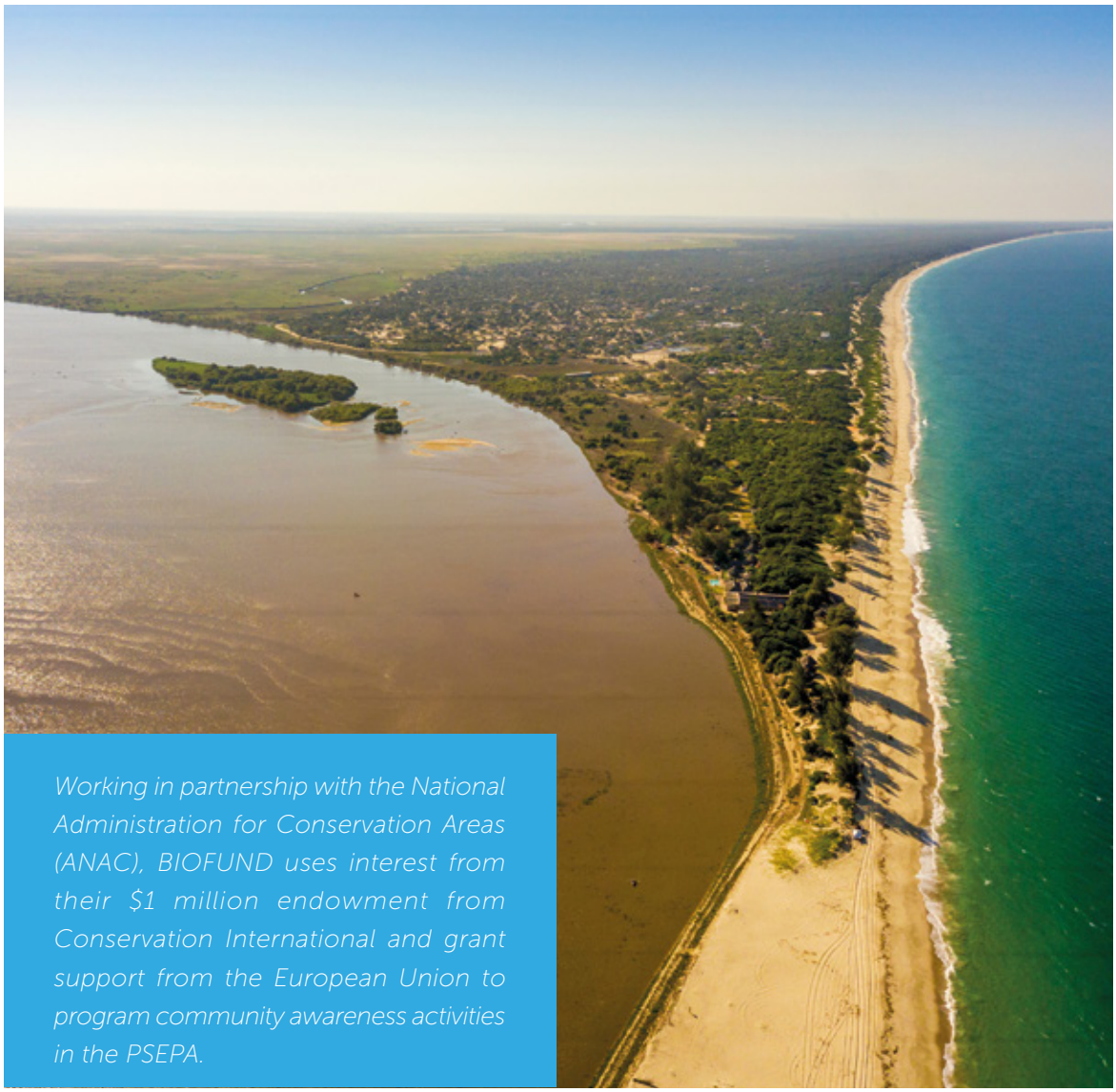
of biodiversity in Mozambique. Working in partnership with the National Administration for Conservation Areas (ANAC), BIOFUND uses interest from their $1 million endowment from Conservation International and grant support from the European Union to program community awareness activities in the PSEPA.

The European Union (EU)

In 2017, the European Union (EU) launched the € 10 million (US $11.29 million) PROMOVE Biodiversity program. Implemented by BIOFUND through 2023, the EU supports the PSEPA and adjacent coastal areas on conservation management, research and strengthening community activities. Under this support, one long-term adviser is planned to support PSEPA in park management beginning in 2021.

Conservation International

Conservation International provided BIOFUND a US $1 million grant in 2015 to form part of BIOFUNDs endowment. Revenues earned from the endowment are used exclusively to support the long-term management and administration of the PSEPA.



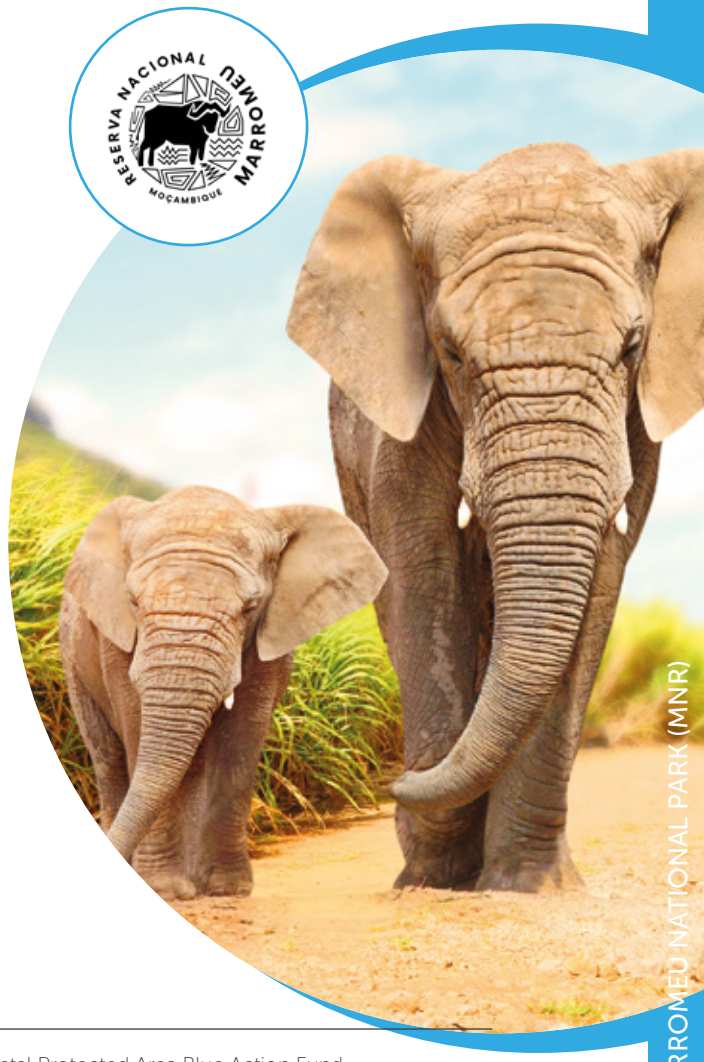
Working in partnership with the National Administration for Conservation Areas (ANAC), BIOFUND uses interest from their $1 million endowment from Conservation International and grant support from the European Union to program community awareness activities in the PSEPA.

1.2.3 Marromeu National Reserve (MNR)[61]

Located in the southern Zambezi Delta in Sofala province, Marromeu National Reserve (MNR) was established in 1960 and proclaimed as a wetland of international importance under the Ramsar Convention in 2004. In November 2020, the government began the process to recategorize Marrameu as a Special Reserve and, under the same regulation, named the Gorongosa Project as co-manager.

The Marromeu Complex covers 6,800 km^2 (2,625 miles^2) and lies along the easternmost coastal area of the greater Gorongosa landscape, which includes Mount Gorongosa to the east. The Marromeu complex is comprised by the MNR, which is approximately 1,500 km2 (580 miles^2), of which 170.3 km2 (65 miles2) are coastal ecosystems (mangroves, estuaries and coastal dunes), two forest reserves, and four hunting concessions (Coutada Oficial no. 10, 11, 12, and 14). It also contains commercial forestry and agricultural lands with operations by the CMM forest enterprise, the LevasFlor forest enterprise, and the Sena Estates, the largest sugar plantation in Mozambique dating back to the late 19th century and the Portuguese Sugar Society of East Africa.[62]

The coastline from Hunting Block 10, which lies on the southernmost boundary of the park and contains 60 kms (37.2 miles) of coastline, through the town of Chinde on the northernmost border of Marromeu, stretches approximately 130 kms (80 miles). The MNR park boundaries itself contain only about 30 kms (19 miles) of coastline. MNR

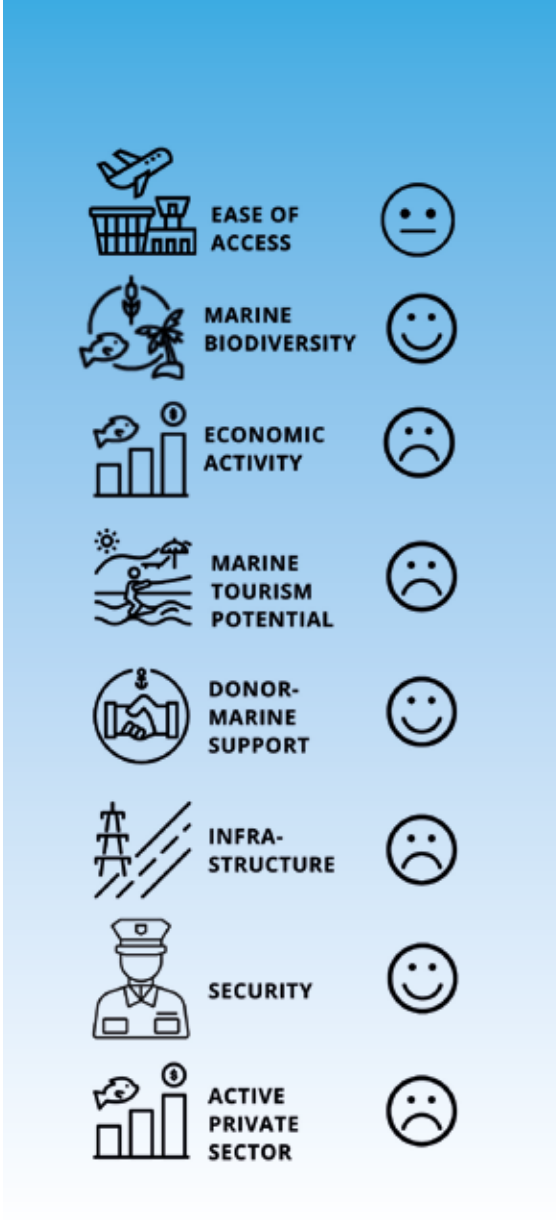


MARROMEU NATIONAL PARK (MNR)

61 Blue Action Fund: Safeguarding Primeras and Segundas Environmental Protected Area Blue Action Fund

62 Pritchard, David, et. al. Ramsar Advisory Missions - No. 62: Marromeu Complex Ramsar Site, Mozambique. Rasmar, 2009

is characterized as an MPA not so much for its ocean-related coastal and marine tourism assets, but more for critical ecosystem services provided through its wetland, estuary, mangrove, seagrass beds and water birds assets, and terrestrial wildlife most notably buffalo, hippopotamus, and Zambezi sharks, making it ideal for the promotion of marine and coastal sustainable tourism activities. With the MNR's new co-management arrangement under the Gorongosa Project, scientific monitoring will be improved alongside conservation law enforcement and ecotourism, with support from the Greg Carr Foundation.



Marine Biodiversity Assets

The Zambezi delta system is the only floodplain along the Zambezi River, and the MNR has multiple major drainage lines to the ocean, providing crucial ecosystem services for agriculture and fisheries. There are extensive mangrove forests as well as coastal dunes, grassland, freshwater swamps, shallow wetlands (known as dambos), and seagrass beds.

This critical wetland supports Mozambique's highest concentration of waterbird species, several of which are classified as endangered or vulnerable, including large reproductive colonies of white and pink-backed pelicans, wattled and crowned cranes, great cormorant, yellow-billed stork, kingfishers and herons.

The floodplains provide important spawning grounds for river and ocean fishes and mangroves support breeding grounds for the prawn fishery on the Sofala Bank, one of Mozambique's most important sources of export revenue. The wet grasslands provide critical dry season grazing lands for livestock. The rich delta soils support the largest sugar plantation in Mozambique and productive flood recession agriculture along drainage ways. The savannas and woodlands provide fuelwood, building materials, wild fruits, honey, and medicinal plants to local communities. The complex also offers exclusive ecotourism and trophy hunting opportunities. Other important ecosystem services provided by the Marromeu Complex include: clean and abundant freshwater (surface and shallow groundwater aquifers) for drinking, cleaning, bathing, and other household uses; papyrus, reeds, palms, thatch grasses, and other resources that can be sustainably harvested from the floodplain; vast wooded areas that provide wildlife habitat, building materials for local communities, storm surge and coastal erosion protection; and floodplains for floodwater runoff.[63]

[63] Beilfuss, Richard D. et. al. Status and distribution of large herbivores in the Marromeu Complex of the Zambezi Delta, Mozambique. 2010.

Threats

Major threats include widespread settlements occuring in the Marromeu National Reserve, especially along the coast and coastal inlets, degradation of the hydrological regime due to climate change, dredging, upstream dams, flood control dykes, uncontrolled fires, illegal hunting for bushmeat trade, and forest and woodland loss (due to charcoal production), unsustainable logging and fuelwood collection, and land conversion for commercial sugar production and small holder agriculture by families of sugar-plantation workers. Development in the form of existing and planned roads and railways also poses a suite of threats.[64]

Blue Economy Potential

Blue economy activities outside of sustainable marine and coastal tourism are not allowed in MNR due to its conservation area status. There are currently no tourist facilities or marine and coastal tourism operators in the MNR, though it does have a tourist development zone so that amenities and facilities can be created in the future. Park administration can arrange camp sites for rental. Accessing MNR is also difficult on the 7-hour 330 km (205 miles) drive from the Beira Airport to the town of Marromeu.

As MNR is primarily a terrestrial reserve, with a coastal component, virtually every report the authors came across focuses on the terrestrial species, such as birds, buffalo, elephants, etc. That indicates a need to identify marine species in the waters of the MNR. These types of identification efforts would be difficult to undertake due to a lack of facilities and equipment (air compressors, boats, gear, etc.), so it may be easiest though a chartered boat with necessary scuba dive facilities. Even then, we think potential for marine and coastal tourism would be limited given the constraints identified above.

The large sugar and prawn industries that benefit from the ecosystem services provided by the Zambezi delta are key private sector anchors nearby the park, who should be a part of any conservation efforts in the region. As the Gorongosa Project ramps up its support to the MNR, conservation-development opportunities will likely arise for engagement by interested stakeholders.

Donors and Partners

As BIOFUND supports and finances the conservation and activities geared towards the sustainable use of natural resources, including the national system of Conservation Areas, **BIOFUND** supports MNR park management. Other donors support one-off aerial surveys and other reports necessary under the Rasmar Convention. Mozambique Conservation Areas for Biodiversity and Development - Phase 2 (MozBio 2), a US $45 million **World Bank** funded project which runs through November 2023, will include some support to the MNR on conservation area management and improve the living conditions of resident communities. The authors did not see any specific marine-focused activities under MozBio 2, only terrestrial based support, including terrestrial based species. After many attempts, the authors were not able to identify any other donor or NGO with a sustained program in MNR on coastal and marine conservation.

64 Ibid.

1.2.4. Bazaruto Archipelago National Park (BANP)

The Bazaruto Archipelago National Park (BANP) is one of Mozambique's oldest and most well-known marine protected areas and was formed in 1971 to protect dugong, marine turtles and other abundant marine life, diverse coral reefs and other critical habitats. Located off the coast of the Vilanculos and Inhassoro districts in Inhambane province, BANP covers a large expanse of ocean and five islands (Bazaruto, Santa Carolina, Benguerra, Bangué, and Magaruque). BANP protects 1,430 km^2 (552 $miles^2$) of marine seascape and is one of the 5 IUCN EBSA zones in Mozambique. The area is truly spectacular and one of Mozambique's marine gems.[65]

BANP has a competent co-management partner in African Parks and receives a great deal of technical assistance and attention from bilateral, regional and NGO partners. The Government of Mozambique signed a 25-year renewable partnership agreement with African Parks, a conservation NGO that leads co-management agreements in Africa. Numerous direct flights from Maputo and Johannesburg, plenty of world class resorts, numerous dive and coastal tourism facilities and the sheer beauty of the coastal and marine assets of the BANP make the BANP a destination in itself, or a required stopping point in a circuit of Mozambique.

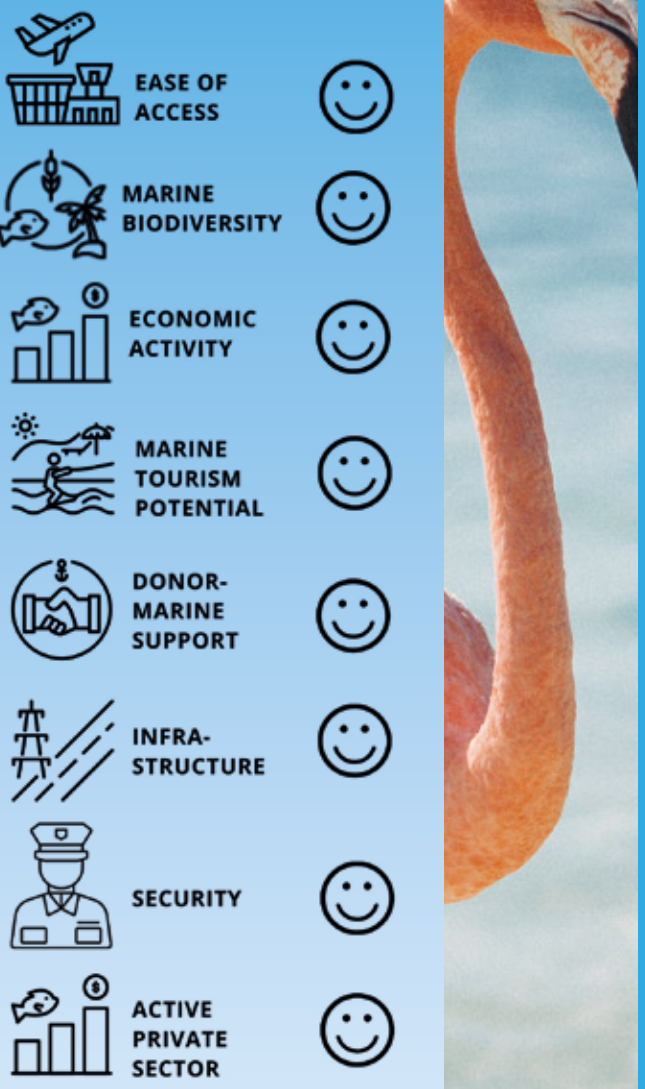
65 Everett, B.I. and Schleyer (editors). A Natural History of the Bazaruto Archipelago, Mozambique, Oceanographic Research Institute, Special Publication No. 8. 2008.

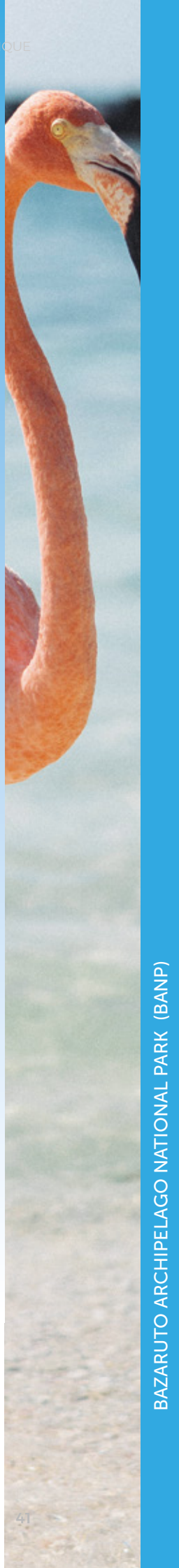
Biodiversity Assets

BANP is at its core a marine protected area in that it is primarily coastal and shallow ocean coverage centered around the five islands that form the core of the BANP. BANPs biodiversity assets have been extremely well documented and monitored since the creation of the park.

Five islands make up the Bazaruto Archipelago. The largest and northernmost island is Bazaruto, a 30km long and 5km wide island, covering approximately 12,000 ha, is dotted with a few freshwater lakes near its southern tip. South of Bazaruto Island is Benguérua, the second-largest island at 11km long by 5.5km wide and covering 2,500 ha, was known to the Portuguese as Santa Antonio, but was later renamed after an important local chief. South of this is Magaruque, the much smaller but more densely populated of the islands, covering 600 ha. The smallest island covering approximately 500 ha is Santa Carolina, also known as Paradise Island, is a former penal colony covering an area of about 2km2 roughly halfway between Bazaruto and the mainland near Inhassoro. The fifth barrier island, Bangué at about 5 ha, is only rarely visited by tourists.

Habitats include sandy beaches, coastal dunes and coastal lakes, mangroves, seagrass beds, coral reefs, deep sea and offshore deep-sea canyons. African Parks reports that the last viable population of 250 dugongs can be found in the BANP, alongside a variety of marine turtles, whales, dolphins, giant mantas, as well as seahorses that are found in the seagrass meadows. There are three seahorses reported in this area: *Hippocampus camelopardalis, Hippocampus kuda* and *Hippocampus histrix*. The latter two are on the IUCN Red List.[66] Extensive seagrass beds have been documented in and around BANP, which are essential habitat for non-





65 Everett, B.I. and Schleyer (editors). A Natural History of the Bazaruto Archipelago, Mozambique, Oceanographic Research Institute, Special Publication No. 8. 2008.

66 Community Partners (ParCO) website: Seahorse Protection

migratory dugong populations. In addition, 153 invertebrate species have been identified in the area, including six species of gastropods that are believed to be endemic to the Bazaruto Archipelago.[67] Extensive coral reefs have been documented as well as the 9 marine mammals species, 500 species of coastal and marine mollusks, and 2,000 fish species. There are also 150 species of birds that have been recorded, including petrels, gulls and flamingos.[68]

Despite BANP being one of the more extensively studied marine protected areas in Mozambique, one typically only comes across reports on turtles, dugongs, whales, mantas, whale sharks and a few other species. Studies on the smaller species critical for marine ecosystems have not been undertaken.

About 80 kilometers north of Vilanculos and 30 kilometers north of Inhassoro is Bartolomeu Dias, a small town with a bay, that is gaining increased recognition for its marine biodiversity, and there is talk about expanding the Bazaruto MPA north to include Bartolomeu Dias. If a potential MPA at Beira is established, it could be extended just south of the Save River to include Bartolomeu Dias.

Threats

The main threats to BANP are unregulated tourism activities and overuse of natural resources, as well as the impact of the 5,800 people who live within the park on three of the islands. Known for its dwindling population of dugongs, the seagrass beds the dugongs feed on are particularly sensitive to coastal tourism activities. And extractive industries, which move machinery through the northern flanks of the park, as well as potential deep-sea oil and gas exploration which at the time of writing was just stopped (i.e., the Sasol deepsea exploration project) may threaten the BANP should these activities pick up in the future.

Blue Economy Potential

The BANP hold tremendous blue economy potential, particularly around coastal and marine tourism as well as marine research activities. There are well-established and high-end lodges and diving centres on Bazaruto Island and on Benguerra Island, as well as numerous lodges, restaurants and other tourist-related infrastructure on the mainland cities of Vilanculos and Inhassoro. Visitors to the islands frequently see marine turtles, humpback whales, and bottlenose, spinner and humpback dolphins, as well as large game fish such as marlins and barracudas. The islands are also renowned for their game fishing. Visitors can travel directly to Vilanculos on flights from Johannesburg as well as through regularly serviced flights on LAM from Maputo, making access easy and convenient.

Donors and Partners

Given its long history as a marine protected area with dugongs, seahorses and rich and abundant marine life, BANP has little trouble attracting donors and partners. The USAID SPEED+ project worked with WCS to finalize a proposed list of Key Biodiversity Areas (KBAs) and the Bazaruto MPA, together with São Sebastião as well as expansion northward past Inhasorro was identified by WCS as KBAs. The designation

---

67 Bandeira, S. et al. 2008. Seagrass beds. In: A Natural History of the Bazaruto Archipelago, Mozambique: 65-69. Everett, B.I., van der Elst, R.P. and Schleyer, M.H. (Eds.). Special publication No. 8. Oceanographic Research Institute, South African Association for Marine Biological Research, Durban, South Africa.

68 AvW Lambrechts, Biodiversity Management Plan, Vilanculos Coastal Wildlife Sanctuary, 2003.

of these sites as KBAs would help justify the establishment of stronger management and conservation measures, especially for the additional area currently not covered by MPA designation, for the protection of the key marine biodiversity found in the area.

The Wyss Foundation

The Wyss Foundation is a private charitable foundation that provides support to the Bazaruto Archipelago National Park in Mozambique through African Parks.

Fondation Segré

Fondation Segré is a Swiss foundation established in 1996 that is committed to help protect biodiversity through the conservation of threatened species and their habitat and the restoration of degraded ecosystems. Fondation Segré has provided over US$3 million through African Parks for support of the BANP MPA.

World Bank

In 2015, the World Bank and the Global Environmental Facility (GEF) executed the $46 million Mozambique Conservation Areas for Biodiversity and Development Project (MozBio) to support the conservation sector with investments made for institutional development, tourism, conservation area management and improved living conditions of communities. In September 2018, the 45-million 5-year Mozbio-2 agreement was signed to increase the effectiveness of conservation area management and improve the living conditions of resident communities. MozBio-1 assisted in signing the latest co-management agreement for BANP with African Parks and has supported sustainable fishing activities in BANP. MozBio also works within BANP to strengthen people's livelihoods with activities that combat the over-exploitation of natural resources and promote conservation agriculture and environmental education. It also plans to improve the impact of tourism on development by expanding revenue collection and improving infrastructure, while ensuring co-benefits accrue to local communities.

Marine Megafauna Foundation (MMF)

With offices in Bazaruto, Vilanculos, San Sebastian, Tofo and Zavora and soon to be in Pomene as a main office, MMF is active throughout the region. For BANP, MMF has an MOU to conduct full-time research in the park and MMF has the only MOU to do research in the Vilanculos Wildlife Sanctuary. MMF focuses on a wide range of endangered, critically endangered and extremely rare and understudied species in

BAZARUTO ARCHIPELAGO NATIONAL PARK (BANP)

and around the park and San Sebastian. MMF has about US $1 million in funding for the next few years to conduct this work here and in the rest of the Inhambane Province. MMF works on manta rays, whale sharks, bull sharks, leopard sharks, devil rays, smalleye stingrays, wedgefish (which happen to be the most endangered fish species in the world but occur in significant numbers in Inhambane), as well as minor programs for potato grouper, other rays, and are beginning a project on marlin.

The Bazaruto Center for Scientific Studies (BCSS) and Kisawa Sanctuary

BCSS, headed by Nina Flohr, is a non-profit marine research facility and ocean observatory that has pushed the existing boundaries of environmentally friendly construction on Benguerra. Expected to launch in 2021, the 741-acre eco-resort will comprise 14 seafront bungalows that together with BCSS, will engage in marine conservation activities in the region.

69 https://robbreport.com/muse/thought-leaders/gallery/eco-warriors-2909844/dsc_7203_b1/

1.2.5. São Sebastião Total Protection Area

The São Sebastião Cape (area 5 on the map to the right), just 20 km south of the Bazaruto archipelago, is geographically similar in terms of assets, threats and potential outlined above for Bazaruto. As such, and together with Bazaruto, it forms part of the 5 IUCN EBSA hotspot sites in Mozambique.

The Government of Mozambique declared it a total protection area in 2003, covering 439.3km²of terrestrial and marine areas (175.7km² is marine protected area). A 25-year co-management agreement (ending in 2028) was awarded to Santuario de Bravio de Vilanculos LDA, or "the Sanctuary", which is responsible for all conservation and commercial activities in 300km² of the protected area. The Sanctuary's modest economic-livelihood activities include local community grants (a population of about 5,800), a lodge and a home development program. Fifty-four residential houses with a maximum 12 beds each and 3 commercial sites for lodges for a total of 120 beds have been approved for The Sanctuary's capital development within the park boundaries. Two islands can be found within the Sanctuary: Lunene and Chilonzeune.

What differentiates São Sebastião Cape from Bazaruto is its protected status - it is classified as a total protection zone, the only total protection zone designation in Mozambique. The protected status designation means the area is oriented towards the reproduction, shelter, feeding and research of certain species of fauna and flora. This is accomplished through protected no-fishing/no-take zones to create a "sanctuary" for fish to breed

and replenish regional fish and invertebrate stocks. The park management works closely with local fishing communities. Despite this designation, a few limited economic activities are allowed in the protected area so long as they do not impact the reproduction, shelter and feeding of the target species identified in the area.

Biodiversity Assets

There are numerous biodiversity assets within the Sanctuary: mangroves, marshes, coral reefs, tidal mud flats, freshwater lakes, estuaries, coastal dunes and Miombo woodlands. Sixty mammal species and all five species of marine turtles found in Mozambique can be found in São Sebastião. Leatherback, hawksbill, loggerhead and green turtles all have been confirmed to nest within São Sebastião park boundaries, while the Olive Ridley turtles have been sighted feeding in waters of the park. Off the coast of São Sebastião, deepsea upwellings bring plankton nutrients that attract large numbers of manta rays and whale sharks, as well as the massive humpback whale. Dugongs can also be found in São Sebastião's protected waters, usually around Bangue Island and further north towards Paradise Island. Schools of humpback dolphins can also be seen in park waters. The 2017 bird census identified 298 species of birds in the Sanctuary.[70]

Seven species of Mangrove are found within São Sebastião and provide nesting and protection for many species of marine life and water birds. Mazarette seagrass beds can also be found within São Sebastião park boundaries which provide food for dugongs and habitat for razor clams, sea anemones, sea stars, sea urchins, and sea cucumbers. The empty shells of the razor clam create good hiding spots for small

and juvenile fish. The anemones sometimes harbor colorful shrimp – the Glass Anemone Shrimp (Periclimenes brevicarpalis). In addition to these resident species, the seagrass beds also provide important habitat for mobile species. In March 2017, a spawning aggregation of cuttlefish was also observed in the newly protected area of the Mazarette seagrass bed. A group of more than 20 individuals were mating and attaching their eggs to the seagrass. Most fish in the Mazarette seagrass bed are small in size. Some are species that live their whole life in the seagrass beds, while others are species that reside in the seagrass beds when they are juveniles and will then migrate to the reef when they grow large. Both fish and shrimp utilize seagrass beds as nurseries. For example, juveniles of some species of butterflyfish, the Malabar grouper (Epinephelus malabaricus), and the Blue-barred parrotfish (Scarus ghobban) have been observed in the Mazarette seagrass bed.[71]

Threats

As with the BANP, the main threats are from unregulated tourism activities and overuse of natural resources, as well as the impact of the approximately 5,800 people who live within the park boundaries. What differentiates São

70 Mozambique Sanctuary Website: Sanctuary

Sebastião from Bazaruto is the limited amount of highly capitalized luxury resorts, marine enterprises, shops and economic activity that can be found within BANP, and a single integrated park manager that handles the tourism operations within a much smaller park, about 85% smaller than BANP.

Blue Economy Potential

Building on the close proximity to the BANP, São Sebastião holds niche marine economy potential, particularly around coastal and marine tourism as well as marine research activities. Visitors can travel directly to Vilanculos on flights from Johannesburg as well as through regularly serviced flights on LAM from Maputo, and a 30-minute boat ride from Vilanculos makes access relatively easy and convenient. Dive operations can service the dive and ocean safari clientele, most of whom stay in the Bazaruto area. However, despite the close proximity to Vilanculos by boat, a drive will take 2.5 hours from Vilanculos, which means once you are in the park, there is a light human footprint and limited economic activity. There are two resorts known by the authors, Nyati Beach Lodge and the Dugong Beach Lodge. At the time of writing, Myati Lodge is no longer open to the public and not functioning as a lodge any more. Outside of these resorts, there are only a few private houses.

Donors and Partners

Other than Santuario de Bravio de Vilanculos LDA, or "the Sanctuary", the legal entity that manages the São Sebastião MPA, our desk research has not found any other donor or partner providing support to São Sebastião. As mentioned in the section on BANF, MMF has an MOU to do research in the Vilanculos Wildlife Sanctuary where they focus on a wide range of endangered, critically endangered and extremely rare and understudied species in and around the park and San Sebastian.

66 Dugong Lodge: Discover Dugong Beach Lodge a Tranquil, Unspoiled Paradise

1.2.6. Pomene National Reserve (PRN)

Halfway between Vilanculos and Inhambane town lies the country's smallest conservation area - Pomene National Reserve, a 50 km^2 reserve established in 1972 that consists of a narrow sandy peninsula, a lagoon and mangrove estuary. Pomene was originally conceived as a hunting concession, however no game species were ever introduced, so PRN continues as a reserve managed by ANAC. Its location between Inhambane and Vilanculos puts Pomene right in the middle of some of the country's richest marine resources. At the time of writing, work has begun to expand the MPA south from São Sebastião through Pomene, ending in Morrungulo. This effort is spearheaded by the Milton Group and Marine Megafauna Foundation (MMF) is moving its main office to Pomene to assist with the efforts. The expansion of this area and creation of an expanded MPA from São Sebastião to Pomene would significantly expand Mozambique MPA network, and protect some of the richest waters in Mozambique.

Biodiversity Assets

Pomene has a small but very rich, productive estuary zone, hosting a diversity of marine and terrestrial species, including coral reefs, seahorses, sea turtles, dugongs and birds. The 196,000 ha marine protection zone includes 140km of coastline and extends 10km out to sea and is home to an exceptional diversity of marine species including iconic marine megafauna such as whale sharks, manta rays, migratory humpback whales, five of the world's 7 sea turtle species and one of the largest remaining populations of dugong in the Western Indian Ocean. The 97,000 ha terrestrial

zone is a rich tapestry of habitats from Miombo woodland, open grasslands, wetlands, coastal dunes and mangrove forests that function as nutrient-rich breeding grounds for the more than 400 fish species that inhabit this stretch of coast. Additional information can be found in Pomene Reserve's management plan.[73]

Threats

The main threats to the marine ecosystem arise from human settlement, unregulated subsistence activities, and the occasional stopping of a small cruise ship just off the coast. Pomene's remote location, limited visitors, few economic activities and small local population has kept Pomene marine environment pristine; documented threats to biodiversity in the reserve are relatively minimal.

Blue Economy Potential

Given the pristine environment, relative distance from urban/commercial areas, and absence of local industry, the highest potential economic activity for Pomene is ecotourism, both marine and terrestrial, particularly as there are plans to reintroduce terrestrial species to the park. Pomene is roughly 2 hours (130 kms) north of Maxixe/ Inhambane, which makes it remote and secluded. The authors were only able to identify a handful of lodges: the Pomene Hideaway[74] (which closed in 2018), Paradise Beach Resort (which is north of the center of Pomene, on the other side of the estuary), the Shipwreck Lodge,[75] Pomene Beach Camp, Hotel Velho (the original colonial hotel which is in disrepair, but said to be undergoing rehabilitation in 2021) and the Pomene View Lodge (which closed in 2016). The only scuba diving facilities are offered at Paradise Beach

73 Management Plan for Pomene (2026): http://www.anac.gov.mz/wp-content/uploads/2017/07/Plano-Maneio-Pomene.pdf

74 Pomene Hideaway Lodge: https://pomenehideaway.com/

75 Shipwreck Lodge: http://www.shipwrecklodge.co.za/

Lodge, though boats and sports fishing activities appear to be available for those visiting Pomene. Interestingly, MSC Cruises has an itinerary with a day stop in Pomene to enjoy various leisure activities, which helps to bring some nature- and marine-based economic activity (reserve tour, snorking, fishing, etc.) to Pomene.[76]

Just south of Pomene is Morrogulo, another top location for marine activities, and it was reported that Piri Piri Divers built a dive center at Casa JVC and is gearing up for operations once COVID-19 issues subsite.

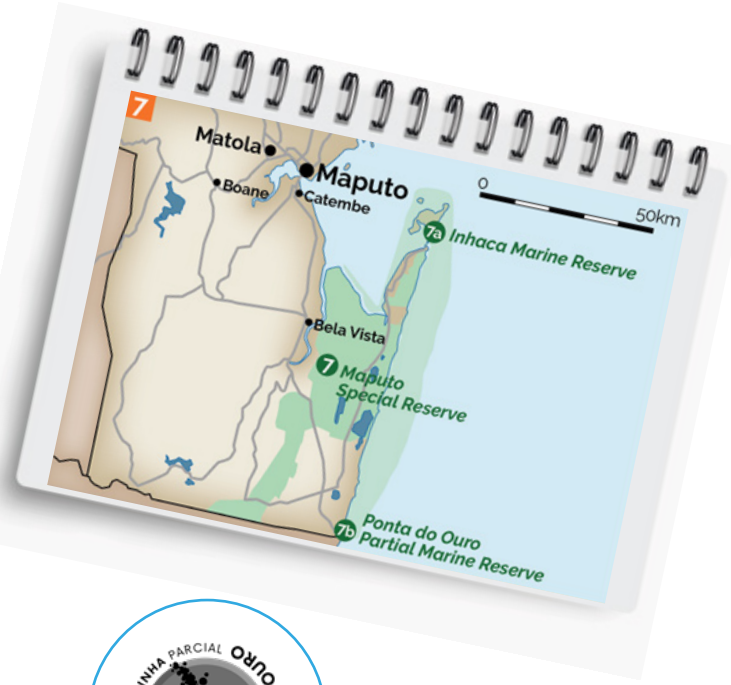
Donors and Partners

ANAC signed a public-private Partnership Agreement with the Milton Group (USA) and Farquhar, LCC (Mozambique) to protect and restore the terrestrial and marine ecosystems to their natural functioning state. The Partnership Agreement includes a real estate development program, environmental monitoring and protection, ecosystem enhancements and alternative livelihood activities for local communities. The Partnership Agreement includes a plan to reintroduce game, support habitat restoration, establish marine and terrestrial anti-poaching patrols, and community partnerships. The Milton Group is in discussions with Singita for the high-end lodge in the area.[77] The Milton Group has realized other developments, such as the Karagani Game Reserve in Mozambique, Singita Kwitonda Lodge in Rwanda, Singita Serengeti House in Tanzania as well as other successful high end lodges in the region. The Marine MegaFauna Foundation (MMF) has begun to work with the Milton Group and Farquhar LLC on marine conservation activities. The Milton Group produced a great video that will give the reader a nice visual overview of Pomene (see link in footnote below).[78]

Conservation International (CI) is planning on undertaking a rapid fisheries assessment from the Save River to Pomene.

[76] MSC Cruises: https://www.msccruises.co.uk/cruises/destinations/south-africa/mozambique/pomene
[77] Milton Group: https://themiltonpartnership.com/projects/pomene-marine-reserve-mozambique/
[78] See the Milton Group Video of Pomene: https://vimeo.com/373704653

1.2.7. Maputo Special Reserve



The Maputo Special Reserve (MSR), an IUCN Ecologically or Biologically Significant Marine Area (EBSA) was established in 1960. The MSR contains both terrestrial and marine components, and is part of the Lubombo Transfrontier Conservation Area (TFCA), a mosaic habitat linked with parks in Swaziland and South Africa. MSR was initially established to protect the elephant population but has since been expanded to cover approximately 1,500 km² of lakes, wetlands, swamp forests, grasslands and mangrove forests and coastline.

The **Maputo Special Reserve contains within its boundaries two MPAs:** the Inhaca Marine Reserve and the Ponta do Ouro Partial Marine Reserve (PPMR). The PPMR is the most developed and well-known MPA in Mozambique and has robust marine market systems; this seascape profile focuses on the PPMR.

1.2.7.1 Inhaca Marine Reserve

Established in 1965, the Inhaca Marine Reserve covers 52 km² and is managed by University Eduardo Mondlane, which operates a marine science field laboratory on the island. As the roughly 150km of coastline between PPMR and Inhaca are identical in marine ecosystems, threats and blue economy potential, we will cover these details in the following section on PPMR.

1.2.7.2 Ponta do Ouro Partial Marine Reserve (PPMR)

The PPMR was established in 2009 and covers 678 km² of rich and well-preserved coral reefs and beaches that harbor critically important

nesting sites for two species of sea turtles. In 2009, the Government proclaimed the Ponta do Ouro Partial Marine Reserve the first marine transfrontier conservation area in Africa. This coastal and epipelagic MPA, incorporates the marine reserves at Inhaca and Portuguese Island in Maputo Bay. The PPMR is home to a rich diversity of marine life and holds impressive tourism potential. The Government has successfully attracted private investment for tourist facilities and concessions in the area and managed to balance the negative impacts of harassing nesting turtles by prohibiting 4x4 vehicles on the beaches. The private sector has positively engaged with protection authorities and proactively watches for illegal fishing, as well as monitoring turtle nests.

The recently upgraded R200 road connecting Maputo to Ponta do Ouro has increased domestic tourism to the area, while also raising pressure on the marine habitats of the area. It also opened opportunities for a stronger economic integration between Ponta and the rest of the country, offering opportunities to expand research and educational activities, as well as awareness building on the need to increase efforts to protect the domestic marine environment.

Biodiversity Assets

The coast between South Africa and the Maputo Bay includes an incredible variety of coastal habitats and species, including sandy beaches, dunes, mangroves, seagrass beds, estuaries, subtropical rocky reefs, marshes, savannahs and grasslands. A high diversity of fish and invertebrates can be found within the PPRM boundaries, including sharks (bull sharks, silvertip, blacktip, tiger, guitar, nurse, and occasionally great whites); rays and skates (the elasmobranch fishes), marine mammals (whales, dolphins and dugong), marine turtles, the Potato grouper (*Epinephelus tukula*), Brindle grouper (*E. lanceolatus*), as well as the largest aggregation of the Giant trevally (*Caranx ignobilis*) ever reported along the coast of Mozambique. This area is particularly important as a nesting area for loggerhead (*Caretta caretta*) and leatherback marine turtles (*Dermochelys coriacea*), both of which can be found in good numbers here as this part of the coast is an important feeding and reproduction area. The shallow and deep rocky reefs of Ponta are also well populated by a large variety of invertebrates, crustaceans, soft corals as well as cryptic fish species.

PPMR is situated along important routes for Southern Indian Ocean migratory whales. It is the Northern limit of migration for the Southern Right Whale, an important migratory stop for

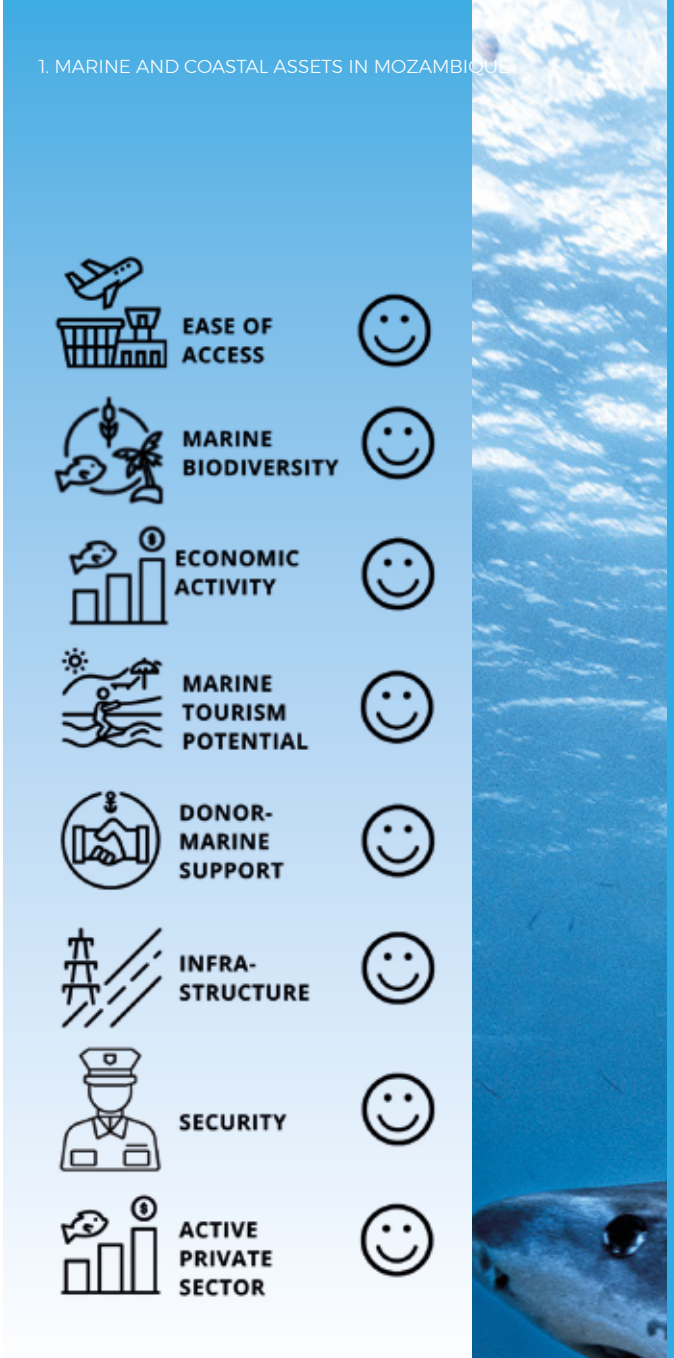
humpback whales on their way to the warmer waters of Inhambane and farther north. Minke whales also occur along the coast between Ponta do Ouro and Inhambane Bay, and the Ponta do Ouro and Ponta Malongane bays are inhabited by a large number of near-shore resident dolphins. Whale sharks also feed in this area during summer.

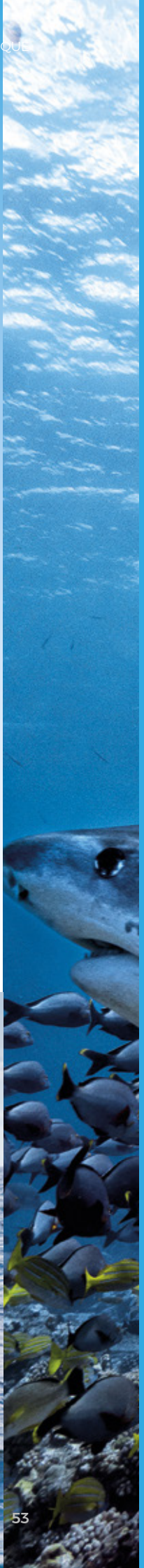
The deep-sea environment in this area is one of the few in the world that is conducive to coelacanths, nocturnal benthic feeders that spend the daytime in caves several hundred metres deep. In this area, they are found primarily in a series of submarine canyons, as corals can be found at depths up to 100 meters. Although they have not been well studied, it is believed that submarine canyons are frequently hotspots of biodiversity, perhaps because of the unusual oceanographic patterns that form within them, such as accelerated currents and dense-water cascades, which transport organic matter from coastal zones to the deepest parts of the ocean.

Besides the richness of its depths, the coastal area from Ponta to Inhambane also presents a unique habitat, characterized by steep and tall (up to 120 m high) vegetated parabolic dune systems backed by salt lakes and closed salt lagoons. Where lagoons are open to the ocean, large estuary areas occur which support seagrass meadows, and rich fish nurseries. The dune system in Ponta do Ouro attain heights of 120 meters and are considered to be the highest vegetated dunes in the world.

Threats

Mega industrial projects proposed or recently implemented have increased the pressure on marine and coastal ecosystems and species of Mozambique. While most large projects are located in the north near the offshore gas fields, there has been talk of constructing a port in Techobanine, right in the middle of the Maputo Special Reserve and not far from the port of Maputo. Techobanine is considered the most pristine section of beach along the MSR coast, and increased marine traffic





in this area will have detrimental effects on the migratory paths of whales and other marine life.

As the tourism business grows in this area, particularly after the opening of the Katembe Bridge, an assessment of marine litter in the area of Ponta do Ouro could shed some light on the capacity of the ecosystem to sustain larger human pressure. Although easily assessed, surprisingly very few studies have been done on marine litter in Mozambique. Assessments carried out in the past in Ponta do Ouro and Malongane; Catembe, Maputo, Inhassoro revealed that plastics, cans and glass (originating from recreational use) dominate the litter, and a considerable amount of waste originate from shipping activities. Given that the inland between Maputo and Gombe is the area of Mozambique with the highest intensity of agriculture activity, with widespread use of pesticides, including DDT and other persistent agricultural chemicals, and other forms of pollution, it is remarkable that no on-going monitoring of marine pollution exists in Mozambique. The shipping channel to the port of Maputo is dredged occasionally, most recently in 2019 funded by the World Bank, thus it is possible some environmental impact assessment have been developed.

With population growth and localized urbanization associated with the upgraded road corridor linking to South Africa, the pressure on PPMR's marine resources are growing, particularly on the rocky shores. Rocky shores are an important resource for the livelihoods of local communities in this area of Mozambique. They are also important for coastal protection. They function as nursery areas for important fish species such as the potato bass and are permanent habitat for a number of species with commercial importance such as oysters, mussels and redbait. Apart from the macroalgae, not much is known about the biodiversity, exploitation and conservation status of rocky shores in Mozambique and more studies could be carried out to understand their importance to the economy of local communities.

Blue Economy Potential

Tourism is far and away the top economic activity in the PPMR. Recreational scuba diving and tourism have grown tremendously in Ponta do Ouro over the last two years, thanks to the proximity to South Africa and the opening of the paved road connection from Maputo. Because of the tourism industry in Ponta do Ouro, local

businesses closely collaborate with the local MPA in data collection, monitoring and conservation activities. A good example of this collaborative effort is the annual marine turtle monitoring program at the PPMR, where companies from a diverse range of backgrounds contribute either through supervision of local monitors, salaries or with materials for monitoring. Dive centers in Ponta also often collaborate in conservation efforts. During the COVID pandemic, several dive centers raised funds to provide basic foods to the local population after the collapse of all tourism activities. This collaboration seems to be benefiting the marine environment. The sustainable diving capacity of the dive sites in Ponta is estimated at about 6,000 dives per site each year, and MPA and dive centers are monitoring to ensure those numbers are not exceeded.

The area of Ponta do Ouro is at the center of what can be a potential transboundary tourism destination between Mozambique and South Africa. Ponta is adjacent to the Maputo Special Reserve (formerly the Elephant Reserve), a small but growing terrestrial park, and to the iSimangaliso Wetland Park and World Heritage Site in South Africa, which is both marine and terrestrial. With the new road infrastructure, which reduced the drive from 8 hours to 2 hours, both Mozambican and South African products could be packaged together for a joint touristic experience that could combine pristine beaches, scuba diving and safari in wet and dry land.

Population growth in the region is expected, in part due to the improved highway and bridge to Maputo, and therefore economic activities will likely grow through the peninsula from Maputo to Ponta. While the authors hope the port of Techobanine never becomes a reality, the PPMR remains connected to the port of Maputo shipping channel and the most prosperous city in the country this means the potential to raise public and private funds for MPA management and conservation activities is high.

Donors and Partners

Donor involvement in the Ponta do Ouro MPA has so far been minimal, centered around smaller NGOs providing financial and technical support through the Peace Parks Foundation, which has been managing the overall technical and financial support since the proclamation of the PPMR, and is often involved in defining the management plan for the area. Given the proximity to Maputo, and the positive track record for public-private relationships that can deliver effective conservation outcomes, Ponta is a great candidate to catalyze important research and awareness activities.

TABLE 1. Overview of Current MPAs in Mozambique

	Name	Legal Designation	Created	Legal Base	IUCN Category	Marine area (ha)	Population	Rangers	Partner	Donor Support
Map # (pg. 22)	Protected Area									
1	Quirimbas (QNP)	National Park	2002	Decreto 14/02 de 6 de Junho	5	118,500	96,000	54	None	French, BMZ, WWF Netherlands & Sweden, World Bank, Biofund
2	Primeiras e Segundas (PSEPA)	Environmental Protection Area	2012	Decreto 42/2012	5	835,730	340,000	0	None (previously WWF/CARE Alliance)	WWF Germany, WWF-USA and WWF Croatia, Biofund
3	Marromeu (MNR)	National Reserve	1960	Resolução 45/2003 de 05 de Novembro	2	17,000	4,400	12	None	World Bank, Biofund
4	Bazaruto (BANP)	National Park	1971	Diploma 46/71 de 25 de Maio, & Decreto 39/2001	5	127,395	5,750	33	African Parks Foundation	World Bank, Biofund
5	São Sebastião	Total Protection Zone	2003	Decreto No. 18/2003 de 29 de Abril	6	17,570	5,804	62	Santuário de Bravio de Vilanculos	MMF
6	Pomene (PNR)	National Reserve	1964	Diploma Legislativo nr 2496 de 4 de Julho de 1964	4	196,000	500	15	Milton Group, Farquhar, LCC	MMF
7	Maputo Special Reserve (MSR)	National Reserve	1960	Diploma n.º 1994 23 Jul 1960, Decreto 40/2011 2 Sept	2	N/A	650	25	Peace Parks Foundation	Peace Parks
7a	Ponta do Ouro (POPMR)	Partial Marine Reserve	2009	Decreto 42/2009	5	67,300	N/A	13	Peace Parks Foundation	A few private donors supporting through Peace Parks
7b	Inhaca	Marine Reserve	1965	TBD	N/A	N/A	N/A	N/A	Eduardo Mondlane University	

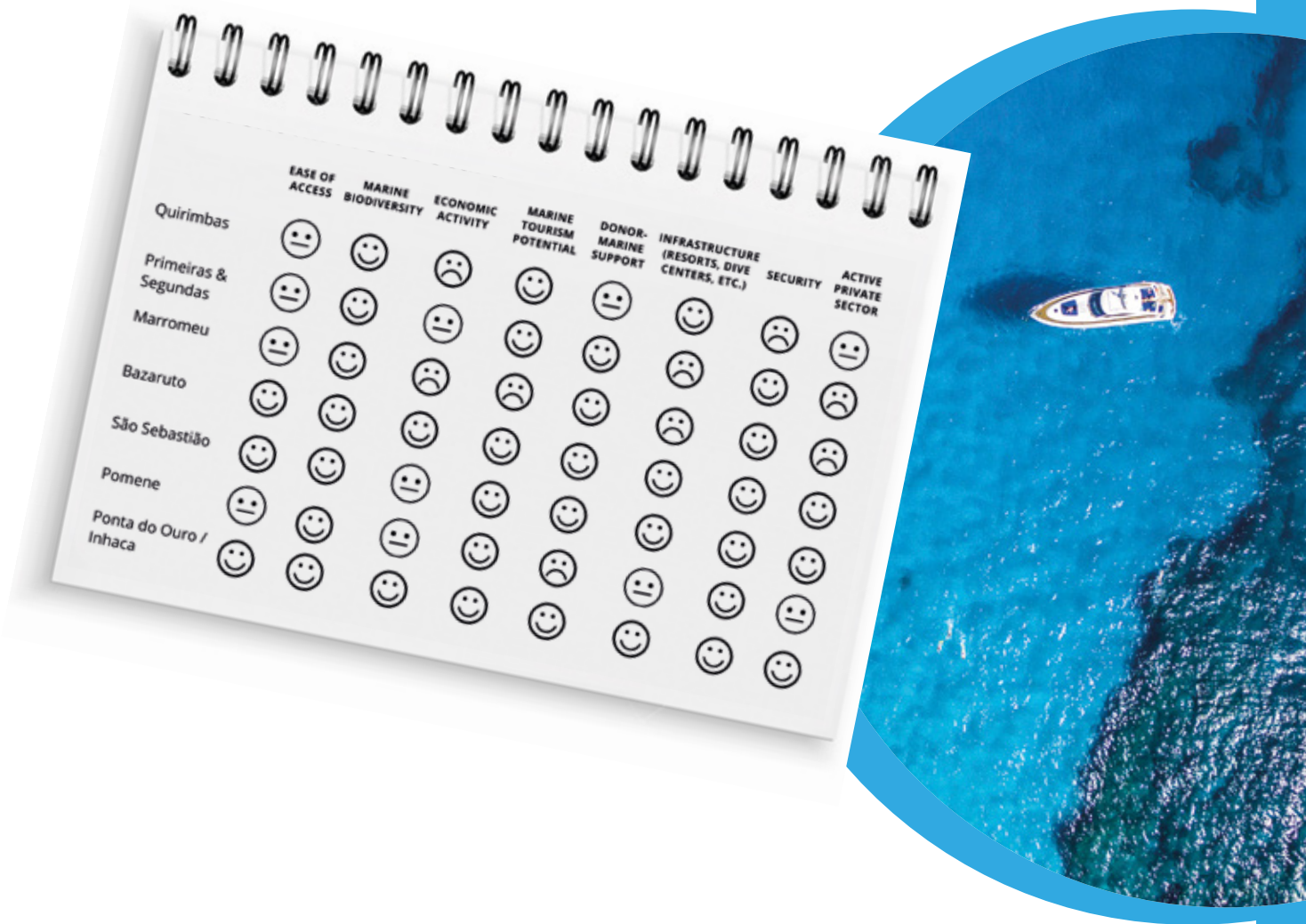
Full table: https://docs.google.com/spreadsheets/d/15bvm0jX23mFlqdORseBiMYdTSkhjhBsMuFbC_FTlz10/edit?usp=sharing

1.3 Seascape Profiles: Seven High Potential Geographies for New MPAs

The GRM intends to increase the total area of its MPAs from 2% of its territorial waters to 10% during the early 2020s. To achieve this, the authors offer the following list of 7 high potential candidates to be granted MPA status. Many of these areas have been identified by Tinley as far back as 1971, and renewed efforts by marine-focused development partners such as WCS, WWF, CTV and others are working to undertake the work necessary to support government efforts to declare additional MPAs in Mozambique. The recently completed Key Biodiversity Area (KBA) study completed by WCS through the USAID-funded SPEED+ project provides additional details and background on these possible new MPAs.

In some of the proposed areas, very little written resources are available, while in others, such as Inhambane and Zavora, much more research and studies have been published. As the authors have spent considerable time in Nacala, we were able to provide our first-hand knowledge for that seascape profile section. Similar to section 1.2, we also include a scorecard to present the context of each seascape again these icons represent author opinion and understanding, thus should not be considered a scientific method or ranking system.

FIGURE 2. Overview of Attributes for Current MPAs



1.3.1. Quirimbas MPA Extended Geography

Expanding Quirimbas National Park (QNP) from its southernmost border north to the border is not a new idea. In 2007, Salomão Bandeira, proposed a "Rovuma/Palma National Reserve " and a transfrontier park connection with Mnazi Bay-Ruvuma Estuary Marine Park (MBREMP) in Tanzania. Expanding QNP would fold in all of the 32 islands in the archipelago, stretching nearly 400km to the border with Tanzania. If QNP park expansion is too challenging of a task given all of the gas exploration and production activities in the area, adapting smaller MPAs around key islands and coastal areas might be a route worth considering, which could be supported financially and technically by the oil and gas firms operating in the area.

The same area, extending into the Tanzania MBREMP, is also identified as an IUCN Ecologically or Biologically Significant Marine Areas (EBSAs) and is part of the earth's 36 biologically richest and most endangered terrestrial ecoregions. The area has the highest diversity of corals recorded in the Western Indian Ocean (along with northern Mozambique), with almost 300 species of coral.[79] The USAID SPEED+ project worked with WCS to finalize a proposed list of Key Biodiversity Areas (KBAs) and the proposed Quirimbas MPA expansion includes areas identified by WCS as KBAs: Palma, Quiterajo and Vamizi. The designation of these sites as KBAs would help justify the establishment of stronger management and conservation

79 IUCN EBSA Report (2012) op. cit.

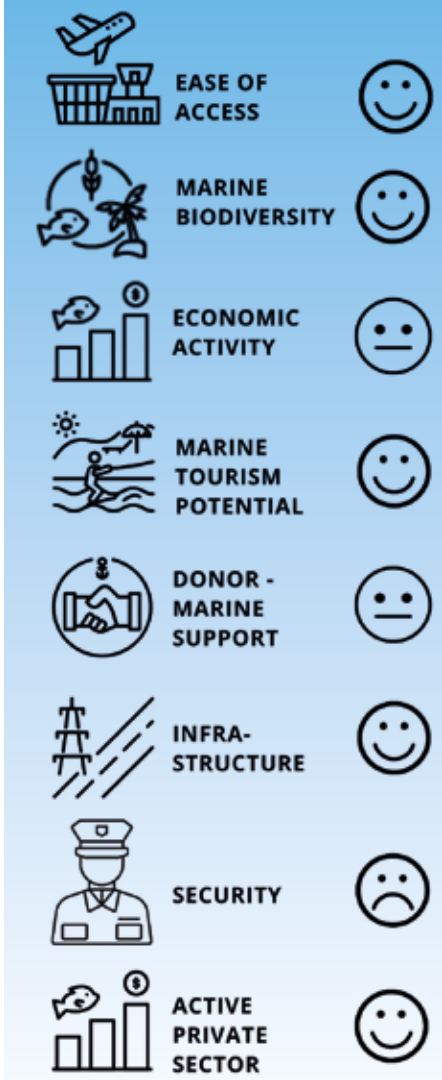
measures for the protection of the key marine biodiversity found in the area.[80]

The biodiversity, threats and blue economy potential in this area are identical to what is presented in the QNP section, so we will not repeat again here. However, it is worth noting that the threat from violent extremists and from offshore gas exploration and development is much more pronounced in the Quirimbas extended geography. Within the proposed QNP expansion zones are a few notable spots worth highlighting: **Vamizi** and the **Saint Lazarus Bank**.

Vamizi

Vamizi is well known for its remarkable marine diversity and ecosystems. A documentary film, called "Vamizi: Cradle of Coral", can be found on Amazon Prime and is worth watching for an in-depth overview of the island and marine biodiversity in and around Vamizi.[81] Vamizi island is small: just 12 kilometers long and 2 kilometers at its widest point, it is also the largest Island in the chain. With long, untouched beaches, mangrove-lined lagoons, and rich blue waters, the island is an important green turtle nesting ground.

The Friends of Vamizi, together with the local Fisheries Council (CCP), established a marine sanctuary that surrounds much of the eastern side of the island and extends three kilometers out to sea and represents a "no-take" fishing zone. It is policed by the CCP. Vamizi has hosted numerous NGO and research activities through the years that have chronicled the positive effect the non-formal marine protected area has on increasing the health and abundance and distribution of reef fish and corals in the sanctuary.[82] The MPAs were government-supported, and capacity building efforts were led by a local conservation



[80] USAID SPEED+ Project, WCS Report: KBAs Identified for Mozambique, 2020. Op cit.
[81] Trailer for the documentary film, Vamizi: Cradle of Coral: https://youtu.be/B6Se3XEOPPg
[82] Friends of Vamizi - Conservation & Community

organization on the island called Friends of Vamizi, which is part of the main high-end AndBeyond resort that was on Vamizi Island, but closed in September 2019.[83]

A sanctuary area was established to protect critical feeding and breeding areas for sea turtles and reef fish, which is thought to have led to a significant reduction in the slaughter of nesting turtles, and an increase in fish catch.[84] The main threat in the area now is violent extremism, and it was reported that in September, extremists took over the island of Vamizi, which would likely have a significant impact on turtle nesting sites.[85] An increasing frequency of climate-related pressures such as droughts, storms and cyclones in the region is likely to impact agricultural food production and increase pressure on the marine environment. And as mentioned previously, threats from offshore gas exploration and production, and the increased coastal development associated with those infrastructure development activities such as transforming the small village of Palma into a 'gas city' will continue to put pressure on Vamizi and other islands in the proposed Quirimbas MPA expansion zone.

Saint Lazarus Bank

About 70 miles east of the northern Mozambique coast, or about a 5-hour boat trip, is the Saint Lazarus Bank, an underwater mountain covering almost 600 sq km. The seamount is full of corals and ranges in depth from between 6-60 meters towards the shallower parts, to deep vertical drop offs of more than 2,000 meters. The powerful Mozambique current carries pelagic eggs and larvae onto the corals around the bank and make it "a very peculiar place on Earth, a biodiversity hotspot, and a paradise for both the organisms living there and those having the possibility to study them."[86] Numerous species can be found around the Saint Lazarus Bank, such as sea turtles, giant game fish such as Kingfish, Barracuda, Marlin, Sailfish as well the White-tipped Oceanic shark. Fishing trips depart from Ibo Island, as well as private dive charters. The Saint Lazarus Bank is classified as a Special Use Zone under Mozambican legislation, therefore permits are required to fish and dive in the area.

Non-formal marine CCAs also exist north of the Quirimbas National Park, in the northernmost set of islands in the archipelago. According to Pereira (2020) there exists six small community sanctuaries in the northern Quirimbas: Nsangue, Quifuque, Lalane, Malinde, Quiwia. These non-formal marine CCAs are not formally recognized by a national authority and are managed by local fishing community councils supported by AMA (a national NGO) and CORDIO.

---

83 See http://www.vamizi.com/ and andBeyond Vamizi Island | Northern Vamizi

84 Garnier, J. & Marques da Silva, Isabel & Davidson, Johnston & Hill, Nicholas & Muaves, Lara & Mucaves, Santos & Guissamulo, Almeida & Shaw, Alison. (2008). Co-Management of the Reef at Vamizi Island, Northern Mozambique. Obura, D.O., Tamelander, J., & Linden, O. (Eds) (2008). Ten years after bleaching - facing the consequences of climate change in the Indian Ocean.CORDIO Status Report 2008. Coastal Oceans Research and Development in the Indian Ocean/Sida-SAREC. Mombasa.

85 Club of Mozambique Online News: https://clubofmozambique.com/news/sa-resorts-under-threat-as-jihadists-occupy-mozambique-islands-171456/

86 Johnsen, E., J. Krakstad, M. Ostrowski, Bjørn Serigstad, T. Strømme, O. Alvheim, M. Olsen, Diana Zaera, E. R. André, N. Dias, L. Sousa, B. B. Sousa, B. Malauene and S. Abdula. 2007 Surveys of the living marine resources of Mozambique. Ecosystem survey and special studies. 27 September - 21 December 2007. 2007.

1.3.2. Lurio to Memba

Lurio sits on the Nampula side of the Cabo Delgado and Nampula border, just south of the Lurio river, and has a bay along the coast, known as Lurio Bay. This proposed MPA stretches from Lurio south approximately 100 kms to the town of Memba, which also has a large bay. This area offers a unique opportunity as the stretch of coast has an abundance of corals and marine life; given the extremely low population density along this stretch, it means there would be little tradeoff between marine conservation and economic activities or fishing. The well-known Nuarro scuba diving lodge can be found in the area; the lodge created a locally-managed marine community conservation area (MCCA) for protecting the marine environment around Nuarro.[87] Nacala sits about 75 kms to the south of Memba, which means access is relatively easy, and goods and services are not far away.

Biodiversity Assets

Along this stretch of coast there are protected mangrove forests, seagrass beds, a high diversity of coral reefs. The only information available to the authors was personal experience diving at Nuarro. Our assumption is that the habitat's assets extend further south into Nacala, where we have also witnessed first-hand many of the same marine life. These include sea turtles (hawksbill and green), seahorses, shrimps, nudibranchs and an abundance of tropical reef fishes. Potato bass, marbled groupers, scorpion-fish, cave sweepers, soldier-fish, squirrel-fish, lion-fish, large school of five line snappers, various types of gobies, various

87 Nuarro Lodge: Diving Mozambique at the Eco Dive Resort
88 Ibid.

types of eels, harlequin crabs, cowries, long nose hawk fish, pipefish (including the rare hairy pygmy pipe horse) have been spotted in these waters. Deeper parts of the coast have pelagic fishes (e.g., sailfish, giant trevallies, dog-tooth tunas, Spanish mackerels, Skipjack tunas, bonitos), napoleon wrasse, rays, dolphins and humpback whales, particularly during the winter season.[88] Additional research and studies would be necessary to properly document the biodiversity in the area and identify main threats and opportunities.

Nuarro Marine Sanctuary - The authors spoke with the manager of Nuarro, Tibea Hammann, who confirmed that a small MCCA was set up with the help of marine biologist Yara Tibirica in 2017. Nuarro worked with Lurio University in Pemba to establish relationships with the local fisheries and marine authorities to set up the Nuarro Marine Protected Area. There are 5 dive sites that are inside the protected area and fishing is prohibited in the protected area.

Threats

Given the low population density and limited economic activities along this section of coast (no mining or gas exploration activities), threats are not as pronounced in this possible MPA as in other MPAs. Still, fishing and other environmental issues that stem from warming seas that can contribute to coral bleaching may threaten biodiversity assets along this section,

88 Ibid.

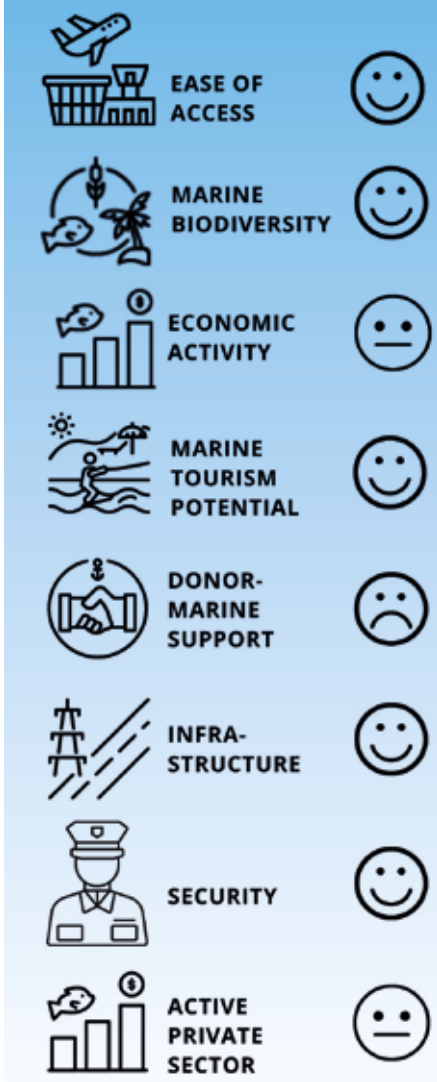
but studies are needed to verify and document threats appropriately.

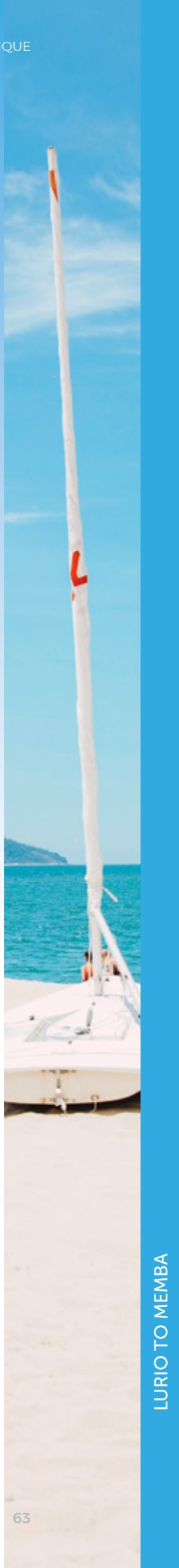
Blue Economy Potential

Given the close proximity to Nacala and the Nuarro Lodge, we think this proposed MPA seascape offers reasonable blue economy potential, particularly for the coastal and marine tourism segments, as well as for marine research segments. The well-established and reputable lodge and dive center, coupled with the proximity of the MCCA, vibrant marine life and even a steel cargo steamship that sank after running into Baixo da Pinda, all make the seascape perfect for ecotourism. The secluded feeling of being at Nuarro means no other divers around and little pressure from multiple tour operators, gives those visiting the area a feeling of being at their very own resorts, with no need to hurry between dives, an amenity often sought after by many in the dive tourism segment.

Donors and Partners

IUCN and RARE are working in this seascape on fisheries management and marine tenure issues and WCS is gearing up to hopefully support marine conservation work in this seascape with funding from Blue Action Fund. Nuarro worked to create a micro MPA in the coastal areas in front of Nuarro and works with the local communities to enforce the MPA.





1.3.3. Nacala to Ilha de Moçambique

Nacala is an area that sports a large number of different habitats and good potential for conservation initiatives that can leverage the involvement of the private sector. The area has received and is receiving considerable investments by large extractive companies, such as Vale, as well as a handful of small-sized tourism operations. Ilha de Moçambique, for instance, was, prior to COVID-19, experiencing improvements in the quality and number of hotel offerings.

Despite its great potential, Nacala is still overlooked by most conservation efforts. Given the level of interest by a number of institutional and private sector partners, well-designed conservation interventions could achieve tangible and sustainable results relatively quickly, taking advantage of the financial contribution of companies such as Vale and the Mozambique Railway Company (CFM), and the involvement and collaboration between small-scale tourism operations and the local fishing community.

Biodiversity Assets

Seagrass habitats in the Nacala Bay Area are now limited to a few areas, particularly on the southern side of the bay, and have seen a significant decline in seahorse populations. These seagrass beds, scattered with coral outcrops are a unique nursery habitat for a number of species, including frogfish, Rhinopias, seahorses, ghost and various types of pipefish, and other species that are difficult to find elsewhere in Mozambique. Dugong are now a rare sight. The tidal movements of water in the bay bring lots of nutrients to growing colonies of corals, that develop from very shallow waters

to depths of 40 meters. A 2012 study by Obura identified 220 species of hard corals and suggested the number could be as high as 297 species an incredibly high amount that merits further study, particularly in light of the importance that this coastal area has for marine repopulation.[89]

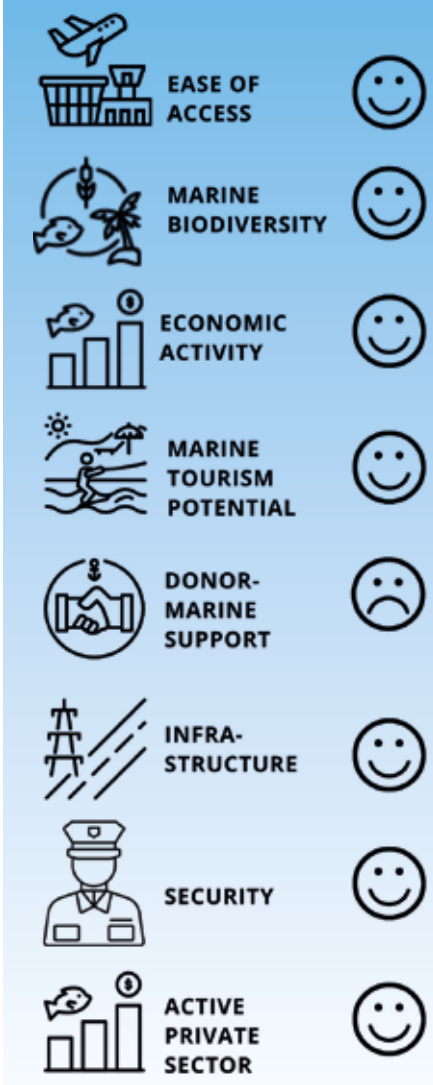
The deep waters off the coast of Nacala bay are often frequented by female humpback whales and their calves, who find rest in the sheltered waters of the bay. Congregations of kingfish have also been witnessed here, possibly as part of the fish reproduction cycle. More studies on the importance of the Nacala bay system for pelagic species are essential to understand how the nurseries in shallow water contribute to fish restocking.

There are abundant coral gardens, some walls and a few swim-throughs, an ever-surprising number of cryptic critters in the lagoon, and ancient shipwrecks in the areas of Ilha de Mozambique. The marine life is diverse, with lots of nudibranchs, leaf fish, ribbon eels, frogfish and ghost pipefish. On the outer reefs, walls and gorgonians are a typical sight of this area.

A unique feature around Nacala are the sinkholes, or underwater caves, resulting from the collapse of limestone bedrock that exposes groundwater underneath. The Yucatan Peninsula in Mexico is world famous for its sinkholes, or cenotes, which attract the dive tourism sector in abundance. Florida, in the US, and Moorak in Australia also have well-known sinkholes to dive.

Threats

The deepwater port in Nacala is both an opportunity and a threat to the nearby marine resources. Several organized criminal operations are run in the North of the country and through the port of Nacala by different syndicates to traffic ivory, drugs, ruby, timber and people. Capitalizing



89 Obura (2012) op. cit.

on, and in turn driving, widespread corruption, these different groups have enjoyed near total impunity (Haysom, 2018).[90] On the back of these illicit traffickers, a large number of marine species have also been exported to Asian markets, including seahorses and sea cucumbers, bringing significant pressure on the local marine ecosystem.

Nacala's population is currently growing at a lower rate than other Mozambican cities. The population is still below 300,000 inhabitants. New investments, however, are likely to strengthen migration to the urban area, raising demand for marine resources. After Sofala province, Nampula has the highest concentration of registered artisanal fishers, who can be seen daily off the coast in small wooden boats. Traditional fishing gear includes trawls, gillnets, hand lines, traps, and harpoons. These fishing activities often take place in essential fish habitats, such as reproduction areas and nurseries, and bring significant damage to the coral reef. Most of the catch is for local consumption or sale in local markets. Given the remoteness of the region and general lack of electricity, the most common methods of fish preservation in the region include sun drying, smoking, and salting.

As part of the gas value-chain developments that are taking place in Northern Mozambique, the bay of Nacala will see a considerable development of new industries and infrastructure that will increase pressure on the marine environment. One of these, for instance, is the construction of a fertilizer plant with production capacity of 500 thousand tons per year. With access to markets in Mozambique, Zambia, Malawi and large markets in Asia, Nacala is the most suitable location in the region for such a large investment due to its established transportation infrastructure (railway, port and roads). The raw material for fertilizer, derived from natural gas, will need to be transported from Palma down to Nacala through a planned pipeline. Following the establishment of the gas fields in Palma, there are also plans to significantly expand the port of Nacala by building an industrial terminal on the North East side of Nacala Bay. Considering the importance of the shallow waters of the bay for fish repopulation and cryptic species, it is essential that part of the bay is protected as MPA.

Blue Economy Potential

It is clear that the main growth driver for Nacala in the foreseeable future is the development of an industrial sector that emerges from the gas investments of Palma. Once the gas and fertilizer investments will come online, the city is likely to benefit by accelerated growth and a growing strategic importance, in addition to being the home of the world's third-largest deep-water port, connecting the sea to Malawi via a rail line built to transport coal. These developments should however be counterbalanced by helping these large investments catalyze resources that support tourism SMEs, fisheries and communities to establish and enforce MPAs. The defense of the strategic nurseries that are scattered across the bay, is fundamental to maintain the fish stock in the area.

[90] Haysom, S. Where crime compounds conflict: Understanding Northern Mozambique's vulnerabilities. The global initiative against transnational organized crime. 2018

A newly constructed world-class airport makes accessibility to Nacala much easier than in the recent past. Because of the easy access, the potential for tourism and scuba diving from Mozambique, South Africa and Europe, is vast. A thriving scuba industry can function as a watchdog for the health of the marine environment, as it is threatened by the new industrial developments. Similarly, the well-established tourism in Ilha de Moçambique provides a second market center (with Nacala) whereby conservation efforts and financing could be tapped.

The blue economy web of actors is larger in the Nacala-to-Ilha seascape than any other proposed MPA, which while complex to coordinate, offers funding, vested interests, people, and industry who can come together to govern the area, as well as begin collecting key data sets to inform future management plans.

Donors and Partners

The World Bank Global Environment Facility Marine and Coastal Biodiversity Management Project had developed a Strategic Development Plan to kick start dialogue activities for an area that comprises the contiguous districts of Nacala-Porto and Mossuril and encompasses an area of approximately 4,700 sq. km (of which 3,700 sq. km is terrestrial). Both of these areas include sites recognized as having globally significant biodiversity, including corals, mangroves, seagrass beds, all five species of threatened and endangered sea turtles and dugongs. The plans however did not lead to the formal establishment of a marine protected area, and no resources for this area have been proposed in the additional financing documents for the Conservation Areas for Biodiversity Conservation and Development II (Mozbio II) project.

Nacala does not attract the same level of donor involvement as other, better-known areas of Mozambique. Most of the conservation activities in the bay, are therefore small-scale and based on the initiative of individual businesses, such as local lodges. A few of these have earmarked nursery areas and have struck an agreement with the local fishing union to employ a few fishermen to protect them. Although these areas are not bigger than 3 or 4 square kilometers in aggregate, the model seems to be working, and the fish population as well as the corals are growing at an impressive rate in these areas. A few examples the authors came across include:

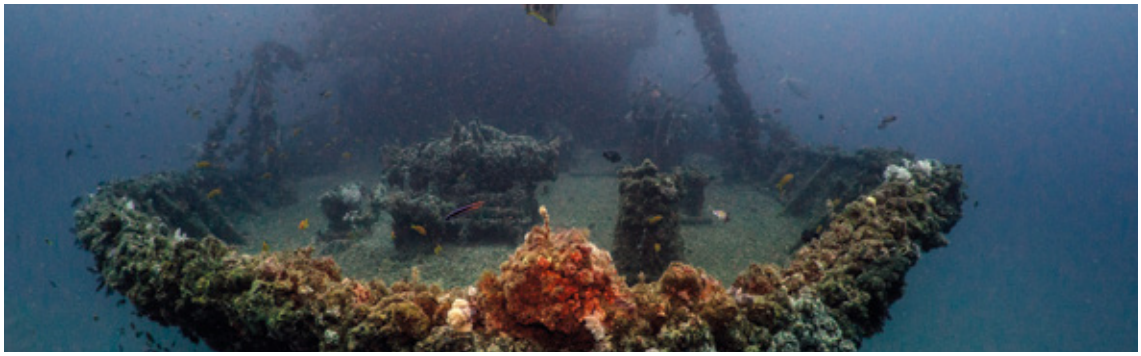
85 Kwalala-Lodges – An Oasis of Relaxation

- ***Bonita Marine Sanctuary*** - is a small (450m in length by 150m depth) non-formal marine protected area advanced by Kwalala Lodge. Kwalala has worked to get the sanctuary acknowledged locally by the provincial maritime department and the Nacala Fishing Association (ASSOPENA). Users that visit the sanctuary pay a fee to Kwala Lodge, which in turn pays ASSOPENA who works to manage and police the sanctuary. ASSOPENA can fine fishermen if they find nets around the reserve. Kwalala Lodge is working on awareness and capacity building of ASSOPENA and local fishermen, as well as working on coral gardening around the reef. Their work has led to improvements: Kwalala lodge reported to the authors they have seen coral growth, more shoals, more species, and better health of the marine ecosystem, which in turn is helping local fishermen to catch fish. Kwalala lodges would like to extend the reef to 1km in length. The authors were amazed by the health of the reefs and the variety of marine life in the sanctuary.

- ***Ossimba Marine Sanctuary*** - follows the same model as the Bonita Sanctuary and is spearheaded by Ossimba Lodge, 13kms from Kwalala Lodge.[92] The Mulula Sanctuary is more remote and has less population pressure. Ossimba Lodge is working with a different fishing association to build capacity and monitor the reef.

- ***Other Nacala Marine Sanctuaries*** - The owner of Kwalala Lodge confirmed the existence of 6 other micro MCCAs in Nacala: Libélula, Melala, Naharenque, Muzuane, Massingirini and Nachiropa. As with virtually all of these small, non-formal MCCAs, there have been challenges in managing the sanctuaries, particularly in monitoring fishing. The authors saw multiple fish traps and nets while diving in the sanctuary. We also learned that in early 2020, a guard at Melala chased away a fisherman that was encroaching the boundaries of a sanctuary, which upset the local fisherman, who retaliated by destroying part of the sanctuary.

Following this experience, the railway company Caminho de Ferro de Nacala (CFN) together with the port, have expressed the interest to scale up this model, by creating artificial reefs. Recently, a small scrap vessel has been identified as a potential asset to be sculled, but progress is being hindered by lack of finance and knowledge on how to complete such a project. The potential for scaling up this approach further, leveraging public and private funding is great. UEM is also supporting a mangrove restoration project associated with the expansion of the Port of Nacala.



92 Ossimba Beach Lodge

1.3.4. Zambezi & Cherringona Coast

Just south of the city of Quelimane stretching about 200 kms south to the Marromeu National Reserve is another possibility for an MPA. This stretch of coast includes the massive Zambezi Delta, which is fed by the nutrient-rich Zambezi River, and is home to the most extensive mangrove system on Africa's east coast. Because of the importance of mangrove ecosystems, not only in fisheries health (which is particularly important in the Sofala Bank area, just south), but in carbon sequestration, the authors think an MPA in this area is critical. The stretch of coast is also identified as an IUCN Ecologically or Biologically Significant Marine Areas (EBSAs) and is part of the earth's 36 biologically richest and most endangered terrestrial ecoregions.

Biodiversity Assets

Mozambique ranks 13th worldwide for total mangrove coverage, containing approximately 2.3 per cent of all mangroves on Earth. This stretch of coast holds Africa's second-largest mangrove system, so conservation of this coastal area is particularly important.[93] The Zambezi River delta, which stretches almost 200 km along the coast and as far as 50 km inland, contains over 155,000 ha of mangroves and accounts for roughly 40 percent of the approximately 400,000 ha of mangroves in Mozambique.[94] The protective underwater roots of mangrove forests are critical for breeding and growth of many estuarine and marine species.

93 Giri, C. et al. 2011. Status and distribution of mangrove forests of the world using Earth observation satellite data. Global Ecology and Biogeography 20(1):154-159.

94 Barbosa, F.M.A. et al. 2001. Status and distribution of mangroves in Mozambique. South African Journal of Botany 67(3): 393-398

Nursery habitats provided by mangroves enable fish and shrimp (Indian, giant tiger, western king, green tiger) and shrimp (speckled and Karuma) to mature, which supports numerous small-scale and industrial fisheries at Sofala Bank, the country's largest and richest fishing ground.[95] More than 340 fish species, primarily demersal, have been recorded from the Zambezi River delta and Sofala Bank.[96] This stretch of coast is also particularly important for sea turtles – in particular green and loggerhead, but also olive Ridley, hawksbill and leatherback – and wintering humpback whales.[97]

Threats

Harvesting of mangrove trees for timber to use in construction, or as fuel, or as food for animals is a threat. Additional pressure comes from tourism developers, coastal construction, and farmers looking to clear mangrove forest for shrimp nurseries or rice production. Climate change and rising sea levels also pose a threat to mangroves, but in many large river delta systems, accretion promotes new mangrove growth in tidal areas while population pressures on back mangrove forests offset any net gains in forest cover. The largest sugar production area in Mozambique is located near the delta, which also puts pressure on the system.

Blue Economy Potential

Given the importance of this stretch of coast to the commercial fishing industry in Mozambique, the blue economy potential is significant. As outlined in Section II, Mozambique earned roughly $70 million in revenue in 2019 from its fisheries sector ($65.3 million from commercial exports and $6.2 million from artisanal fish). Protecting nurseries for fish and prawn is critical for the sustainability of the Sofala fishing industry, and thus partnering with industry for MPA management would make good sense.

Also, if harnessed, credits or payments for carbon sequestration could bring in much needed revenue for local communities to conserve and plant more mangrove forests (see Section III on financing marine conservation). As mentioned earlier, mangroves are perhaps the most efficient ecosystem for carbon sequestration. Debt for nature swaps to create an MPA for this stretch of coast might also be considered. The authors are not aware of any marine of coastal tourism potential on this stretch of mangrove and delta coast.

Donors and Partners

The authors did not come across any information on donors currently dedicated to working on marine conservation activities in this area, except for those working in and around Marromeu. USAID provided support to the USFS under the USAID Mozambique Global Climate Change Sustainable Landscape Program in 2014 for the "The Zambezi River Delta Mangrove Carbon Project: A Pilot Baseline Assessment for REDD+ Reporting and Monitoring."[98] Ad-hoc donor activities we have come across in this area are around mangrove conservation.

---

95 Brito, A. and Pena, A. 2007. Population structure and recruitment of penaeid shrimps from the Pungué River estuary to the Sofala Bank fishery, Mozambique. Western Indian Ocean Journal of Marine Science 6(2): 147-158.

96 Brito, A. 2012. An interview-based assessment of the incidental capture and mortality of sea turtles in Mozambique's Sofala Bank commercial shrimp fishery. Revista Moçambicana.

97 Findlay, K. et al. 2011. Distribution and abundance of humpback whales, Megaptera novaeangliae, off the coast of Mozambique, 2003. Journal of Cetacean Research and Management (Special Issue) 3: 163-174.

98 Stringer, Christina et al., The Zambezi River Delta Mangrove Carbon Project: A Pilot Baseline Assessment for REDD+ Reporting and Monitoring. USAID, WWF, USFS, UEM, Mozambique Ministry of Agriculture, National Aeronautics and Space Administration. 2014.

1.3.5. Beira Marine Protected Area

The continental platform that forms the Sofala Bank the largest platform on the east African coast extends for about 900 km from Angoche district in Nampula province south to the mouth of the Save River at the border of the provinces of Sofala and Inhambane. The proposed Beira marine protected area extends about 200km, from Marromeu National Reserve, south to the Save River (other parts that make up part of the Sofala Bank are protected MPA, e.g., the Primeira and Segundas, Marromeu, or proposed for an MPA, e.g., the Zambezi and Cherronga Coast), with the core of the MPA in Sofala Bay.

Most of this proposed MPA is made up of muddy sediments and relatively shallow, flat bottom, reaching depths of only around 20 meters. This makes this area not attractive for coastal and marine tourism, other than perhaps some deep-sea fishing expeditions, but instead supports a great variety of marine and estuarine fauna and is one of the most important fishing grounds of Mozambique. This proposed MPA could extend just south of the Save River to include Bartolomeu Dias, or alternatively, the Bazaruto MPA could be expanded northward to include Bartolomeu Dias.

Biodiversity Assets

The most comprehensive information on the biodiversity assets of this region comes from the environmental impact assessment prepared by Impacto and ERM for the proposed Sasol offshore hydrocarbon project (the Sasol project

decided not to advance in 2020), which is summarized below.[99]

In the proposed Beira MPA, four main estuaries are found: the Pungue (located at Beira), Buzi, Gorongosa and Save River estuaries, with the highest density of mangrove forests in the Machanga district bordering the Save River and Inhambane province. Mangrove forests form an integral part of these estuaries. This area of the Sofala Bank is world famous for fisheries of crustaceans which include shrimp, lobsters and crabs. Most well-known are the prawns of the Sofala Bank, and two varieties the white prawn (*Penaeus indicus*) and brown or ginger prawn (Metapenaeus monoceros) make up over 90 percent of the prawn catch in the Sofala Bank. Other species such as the Tiger prawn *(Penaeus monodon*), the flower or banana prawn (Penaeus japonicus) and the zebra prawn (*Penaeus semisulcatus*) can also be found in these waters.

Rock lobsters can also be found in the intertidal rocky shore and rocky reefs and crabs are found in a diversity of habitats ranging from sandy flats and shores, rocky shores, mangroves, and salt marshes, seagrass, coral reefs, and deeper water. The Mangrove mud crabs are common in the estuaries and the mangrove creeks at Sofala Bank (from Govuro Bay and northward) while the blue crab species are found in the shallow waters of the Sofala Bank.

Within the floodplains of the Govuro and Save Rivers, Red-breasted Tilapia, Mozambique Tilapia and Black Tilapia are known to occur. Additionally, many additional species have been identified in the Sofala Bank, such as anchovies, sardines, jaks, herring, mackerel, barracudas, lizardfish, goatfish, hartails, pufferfish, thornfish, snappers, rabbitfish, spotted halfbeaks and a variety of other species. In the deeper waters off the continental shelf, there are sailfish, marlin (black, blue and striped), wahoo, dorado, giant

[99] Impacto and ERM, Offshore Hydrocarbon Exploration Drilling Operations In The Sofala Concession Area, Sofala And Inhambane Provinces, Mozambique. Environmental Impact Assessment Report Final Report, Prepared for Sasol Petroleum Sengala Limitada. 2011.

kingfish and migratory tuna. Sharks are also found in the waters of the Sofala Bank, including the Zambezi, dusky, blacktip, hammerhead and tiger sharks.

Particularly important in and around the Sofala Bank are the five species of sea turtles that have been found, and that are often caught in the fishing gear of fishermen: green, loggerhead, olive-Ridley, leatherback and hawksbill turtles. The leatherback turtles feed on the zooplankton found in the area. The loggerhead and leatherback turtles can nest towards the south of the Sofala Bank and into São Sebastião, while green turtles tend to nest in the north of Mozambique and travel through the waters of the proposed Beira MPA. Two seal species have also been identified in the area: the crab-eater seal and the subantarctic fur seal.

Threats

Major threats to this part of the Sofala Bank include habitat loss, particularly mangrove forest clearing, IUU, overfishing and the bycatch of turtles, sharks and other species in the fishing nets of semi-industrial and industrial fishermen. Dredging of the Sofala Bay due to high sediment drifting and an active commercial port and pollution from run-off into the bay are also key threats to the marine biodiversity in the area. Cyclones are also particularly acute in this area of Mozambique, with 30 cyclones being recorded between 1958 and 2008.

Blue Economy Potential

The blue economy potential of the proposed Beira MPA lies primarily in ensuring the productive fishing grounds in the area remain healthy and sustainable. There is little coastal and marine tourism potential given the lack of coral reefs and the shallow and muddy waters of the Beira MPA. As with the proposed Zambezi and Cherronga coast MPA, harnessing carbon credits for the mangroves in the region we think also holds potential. Similar to the Nacala area, significant potential exists to engage the private sector operators through the Beira port as well as the local fishing industry.

Donors and Partners

The World Bank provided a cyclone-recovery grant support to RARE to support artisanal fisheries management in the proposed Beira MPA. Ad hoc assistance and support around the fisheries sector have been provided. The USAID SPEED+ project worked with WCS to finalize a proposed list of Key Biodiversity Areas, which included this proposed Beira MPA seascape as a KBA. The designation of this site as KBA would not only help justify the establishment of stronger management and conservation measures, but also help to preserve a globally important population of leatherback turtles as well as other marine biodiversity in the area.[101]

[100] Ibid.

[101] USAID SPEED+ Project, WCS Report: KBAs Identified for Mozambique, 2020.

1.3.6. Inhambane Bay to Zavora

The coastal area of the district of Inhambane, which includes Vilanculos, Tofo, Barra and Zavora, is the most important tourist destination in Mozambique. The attraction of the area is largely driven by coastal and maritime tourism. Scuba diving is prominent in the area, and the destination is well-known for manta rays, whale sharks and humpback whales, who attract divers from all over the world. Despite their importance for the local economy, whale sharks and manta rays are still lacking targeted forms of protection in Mozambique. Much of the area where these animals are concentrated, which ranges from Praia de Zavora to the São Sebastião channel, is not yet protected.

The reefs of Tofo receive a considerable amount of attention due to the numerous tourism businesses that operate in the area and the continuous work of the Marine Megafauna Foundation monitoring mantas and whale sharks. However, the bay of Zavora, which extends from the Tesene Lagoon to the Dongane Lagoon, benefits from far less attention, although it is characterized by an increasingly threatened ecosystem. Zavora is a hot spot for impressive marine biodiversity, including considerable numbers of manta rays, whale sharks, humpback whales, and sea turtles, but also a large number of nudibranchs and coral species.

Similar to Zavora, another important area of attention are the shallow wetlands and lagoons that are formed in the Inhambane bay. These areas, such as the lagoon in proximity to Barra, are an important reproduction area for a large number of reef and pelagic fish, but also support a considerable variety of endemic species, such

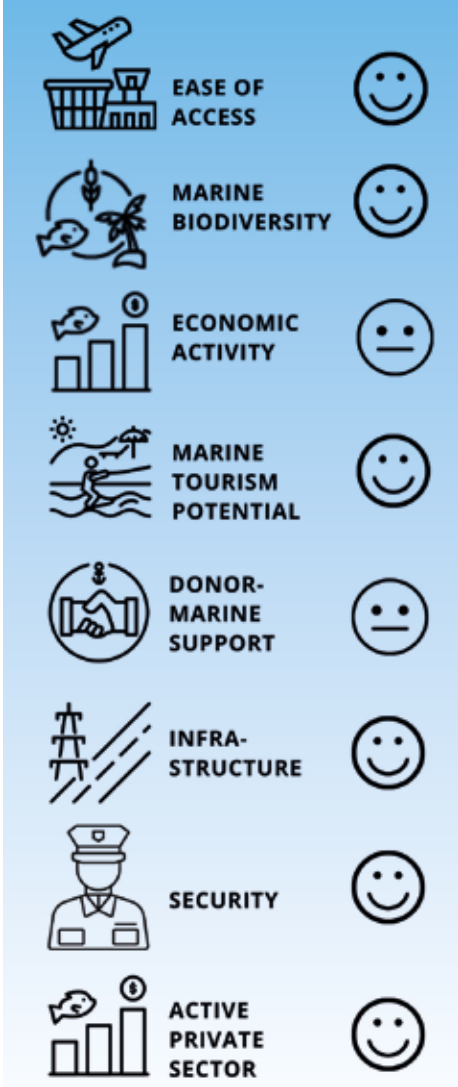
as seahorses, who are increasingly under pressure because of illegal trade.

Biodiversity Assets

More than 250 species of fish inhabit the waters and reefs of Inhambane, including 18 that had never been recorded elsewhere in Mozambique. Preliminary studies have also revealed more than 140 different types of opisthobranchs[102] in the area. These small, colorful mollusks are a favorite amongst underwater photographers and could be a real magnet to place Zavora on the regional tourist map. The bays are also largely frequented by mantas and whale sharks, although more recently, these animals prefer the waters of Zavora to Tofo due to lower tourism pressure in Zavora bay. The area also has dugongs and five species of sea turtles, as well as coral reefs, mangrove forests and extensive seagrass beds.

There are two recognized species of manta rays in the world, both of which are found in the waters of Inhambane. The giant manta is a migratory large fish, traveling with ocean currents to areas where upwellings of nutrient-rich water increase prey concentrations, and the reef manta, who tends to be more localized in nearshore waters, though undertaking migrations on both a daily and longer-term basis. Both species are found on the reefs of Inhambane, in two principal cleaning stations:[103] one known as "Manta Reef", which is a 250 square meter rocky reef, and the other is Giant's Castle, a deeper narrow reef plateau, just outside of Tofo bay.

Another main characteristic of this stretch of coastal waters is that this area also boasts a high concentration of whale sharks due to the presence of an abundant food source. Reaching up 20m in length, these large fish are filter feeders, and like other large planktivorous animals, such



[102] Opisthobranchs is an informal name for a large and diverse group of specialized complex gastropods which used to be united in the subclass Opisthobranchia.

[103] Areas where "cleaner" fish remove parasites, mucus and dead and diseased tissue and scales from rays and sharks. But this is not the only phenomenon at play.

as baleen whales, they tend to aggregate on a seasonal basis, to take advantage of seasonally abundant, high-density patches of zooplankton. In the tropics and subtropics, these usually revolve around fish or crab spawning driven by oceanographic and climatic processes. The area of Inhambane, however, is unique, with whale sharks present in large numbers year-round – estimated to a mean monthly density of roughly 30 sharks per 100 km2. The cause for such high concentration appears to be a unique confluence of several different local upwellings that bring cool, nutrient-rich water to the surface and promote the growth and distribution of phytoplankton on which these filter feeders subsist, creating an almost constant buffet that sustains one of the largest single aggregations of the largest species of fish in the world.

Threats

A notable trend in this coastal area is the observed, accelerated loss of terrestrial and marine biodiversity, due to the increase of population, the expansion of agriculture, the development of tourist activities in absence of a resource management plan as well as logging and poaching of marine species. A driver of the loss of marine life is a sharp increase in illegal commercial fishing, with growing use of fishing nets even in tidal pools, seriously undermining the capacity for fish stock to reproduce. As a consequence of the increased pressure, the population of mantas has sharply decreased in recent years.

There are few places in the world where whale sharks and mantas are found in large numbers. In sub-Saharan Africa, Mozambique stands out for having year-round whales and sharks, with Inhambane as a major shelter. Although these species are on the IUCN Red List as globally vulnerable (IUCN, 2012), no protection measure is in place in Mozambique. The main threats to these species are the commercialization of shark fins and of manta's meat on the Asian market, as well as the growing pressure of tourism activity. The creation and enforcement of a large no-take MPA in these areas could play a fundamental role in sustaining the population numbers of these important species.

Small cryptic creatures in the lagoon of Barra have also become harder to find. Seahorses are actively hunted by local fishermen and sold to the Asian market. The same fate is reserved for other species, such as sea cucumbers.

Blue Economy Potential

Like in Bazaruto, the highest potential blue economy sector in Inhambane Bay to Zavora is ecotourism. Manta rays and whale sharks are the main reasons why Mozambique, and Tofo in particular, has become a known international tourist diving destination. Tourism is one the major economic activities in the district of Inhambane, attracting domestic and international holidaymakers from South Africa, Europe and beyond, who visit Vilanculos and or Tofo.

Zavora also sports the largest artificial reef of Mozambique, with the wreck of the Klipfontein, a large passenger ship that sank to 55 meters of depth, after hitting a sunken U-boat in January 1953. The ship is 152 meters in length and was carrying 9933 tons in cargo and 150 passengers. It is now a shelter for a large number of marine species, and a point of call for sharks such as the Zambezi shark.

Donors and Partners

The USAID SPEED+ project worked with WCS

97 Areas where "cleaner" fish remove parasites, mucus and dead and diseased tissue and scales from rays and sharks. But this is not the only phenomenon at play.

to finalize a proposed list of Key Biodiversity Areas (KBAs) and the proposed Inhambane to Zavora MPA also falls within the proposed KBA. The designation of this site as KBA would not only help justify the establishment of stronger management and conservation measures, but also help to preserve a globally important population of manta rays as well as other marine biodiversity in the area.[104]

In addition, there are some small-scale conservation activities run by international NGOs and touristic volunteer programs, in partnership with the local businesses. These may include identifying and tagging whale sharks, mantas, and dolphins, monitoring coral reefs, as well as turtles and seahorses in the Inhambane estuary.

As described in the BANF section, the Marine Megafauna Foundation (MMF) runs long-standing research projects on a variety of marine species, including species common to this area. MMF has also taken over the Zavora Marine Lab.

Conservation International (CI) signed an MOU with ANAC to assist with planning a Save River to Zavora protection zone and related integrated management plan.

The authors have heard of two non-formal MCCAs in Inhambane Bay and in Zavora and one in San Sebastian:

- ***Inhambane Bay*** - There is a group of nine small community sanctuaries in Inhambane Bay (see map on the right): Marragane, Guindziwe, Ponte Cais, Guilalene, Guidzivane, Marambone, Mahigo Mbate, Mandzenika, Nha Dzi Sector). According to Pereira, these sanctuaries are in the process of being gazetted under the Fisheries Law (Law 22/2013 of 1 November) and Conservation Biodiversity Law (Law 5/2017 of 11 May). Bitonga Divers and Ocean Revolution are leading the efforts, together with the support of the Community Council for Fisheries Management and the Community Fisheries Council.

- ***Zavora*** - The authors were told in an interview with Yara Tibirica and Nakia Cullain from the Marine Lab in Zavora that a non-formal marine CCA was formed to protect one of the famous rock pools for mussels.[105] The village chief of the area controls access to the mussels, and only on certain dates are people allowed to go to harvest. Women mainly harvest the mussels and people come from far away. The small fee that is charged to harvesters is used to help purchase equipment and labor necessary to protect and maintain the mussel reefs. While we have not been there to see first-hand this example, we do think it is worthwhile investigating more.

- ***San Sebastian*** - Dr. Andrea Marshall of Marine Megafauna Foundation described an MCCA in San Sebastian where a contract was signed with provincial representatives of MIMAIP, the Community Fisheries Council, and private sector operators in San Sebastian. The MCCA was working well for years, protecting a small rock pool, and species thrived in the protected area. Due to recent economic impacts tied to declining tourism revenues during the COVID-19 pandemic, we were told the community became frustrated and decimated the protected area through the use of nets; the communities are now seeing far fewer fish and may have to relocate.

104 USAID SPEED+ Project, WCS Report: KBAs Identified for Mozambique, 2020.

105 Zavora Marine Lab / Marine Action Research. http://marineactionresearch.com/

1.3.7. Bilene

About 180 kms north of Maputo lies Bilene, a small resort town on a beautiful lagoon. The proposed MPA would run south from Bilene roughly 100 kms to the town of Maniça across two provinces: Maputo and Gaza. This part of Mozambique's coast is known for its fresh and salt-water lagoons, which often flank the ocean. The saltwater lagoons, such as Bilene, are separated from the sea by a sand barrier system, often connected with the sea by one or several "gates" or sandbanks.

The USAID SPEED+ project worked with WCS to finalize a proposed list of Key Biodiversity Areas (KBAs) and the proposed Bilene MPA is already designated as a KBA due to the prevalence of two threatened freshwater fishes that occur in the lagoons around this area. The designation of this site as MPA would not only help justify the establishment of stronger marine management and conservation measures, but also help to preserve the marine and terrestrial biodiversity in the area.[106]

Biodiversity Assets

The most comprehensive overview of the marine assets in this region is in the 2012 Impacto study evaluating the coastal zones of the area.[107] The reports list the prevalence of loggerhead, green, and hawksbill turtles found in the Bilene area. The same study listed 186 species of fish that can be found in the Bilene marine ecosystem, such as groupers, snapper, mullets, shamans,

106 USAID SPEED+ Project, WCS Report: KBAs Identified for Mozambique, 2020. Op cit.

107 Impacto, preparação for MICOA and the Province of Gaza. Projecto de Avaliação Ambiental Estratégica da Zona Costeira – Moçambique. June 2012.

ruffians, surgeons, parrot fish, among others. A smaller scale study looking at the Bilene lagoon, identified 49 species of fish. The study identified 46 species of invertebrates, such as gastropods, bivalves, crustaceans, sponges, corals, anemones, among others. And 30 species of seabirds were identified. The study lists all of these species in an annex to the report. Two threatened freshwater fish found in the lagoons of the area: *Serranochromis meridianus* (EN) and *Chelia brevis* (EN).[108] [109]

Threats

The main threats to this area are from coastal development and habitat loss from agricultural development. While there exists some population pressure from the lodges around Bilene, it seems to be minimal on fisheries.

Blue Economy Potential

The main blue economy potential in Bilene centers on coastal and lake tourism. There are plenty of lodges and restaurants and it is easily accessible from Maputo. There are no dive or ocean safari operators that we were able to identify, as most tourism is for beach goers. While it is an important area for marine conservation, the authors think the marine market systems and economic incentives that can help drive marine conservation and mitigate economic pressures on marine resources are not as pronounced as in other current or potential MPAs identified in this reference guide.

Donors and Partners

We have not come across any dedicated donor project for the Bilene MPA.

108 USAID SPEED+ Project, WCS Report: KBAs Identified for Mozambique, 2020. Op cit.

109 Balidy, HJ; HH Pacule; AJ Matavel; JC Horril; M Mechisso; GM Mulhovo; AR Zunguze, SS Mbié (2008). Reserva Especial do Bilene. Situação Biofísica e Socioeconómica Actual. Volume 1. CDS Zonas Costeiras e DPCA - Gaza/MICOA.

2. ECONOMIC USE OF MOZAMBIQUE'S MARINE & COASTAL ASSETS

Section I provided an overview of Mozambique's marine and coastal resources, or marine assets. This section details how these assets are being used, including:

2.1. Overview of Mozambique's Ocean-Based Economy

2.2 The Blue Economy Productive Sectors

2.3 Threats to Mozambique's Marine Ecosystems & Species

The benefits derived from the country's blue economic sector, from nutrition to livelihoods and beyond, are vast and require an integrated ecosystems approach beyond what is provided by this desk study to quantify. This section simply scratches the surface in terms of how many sectors of the country's economy are dependent on the sustainable use of domestic coastal and marine resources.

Weaving Together the Blue Economy with an Integrated Ecosystem Approach

Coastal and marine ecosystems provide a host of critically valuable services, some of which are well understood and quantifiable. But most others are more obscure, poorly understood, and very difficult to evaluate and quantify. For instance, the health of the fisheries sector is critically dependent on healthy ecosystems, such as mangroves and seagrass beds, for feeding, breeding, and nursery grounds for various fish stocks while imperfect in Mozambique, data exists to help quantify the monetary value of the fisheries sector. But a service such as storm surge protection or resilience to coastal erosion, sea-level rise, and other impacts of climate change is much less certain and can be difficult to quantify and value. Carbon sequestration value is even harder to measure, monitor and manage.

Awareness and valuation of ecosystem services is limited in Mozambique. Many tools and methods, including those articulated by the Convention on Biological Diversity (CBD) and the FAO, can be used to apply an ecosystem approach to the management of human activities in ocean and coastal areas. These may include fisheries management measures, other species management measures, integrated coastal and marine area management, marine spatial planning, marine protected areas, and activities supporting carbon sequestration. Overall, integrating the various management approaches undertaken by different sectors into a comprehensive and cohesive plan, with ecosystems as the central framework, remains a complex challenge.

It often takes a common measure, like monetary values, to bring the various actors together to solve common issues tied to biodiversity conservation. In fact, most experts in agriculture or health/nutrition assume biodiversity conservation is for animal lovers, missing the point that the vibrance of both sectors ag productivity and nutrition are ultimately based on healthy ecosystem services, like species diversity, nutrient cycling, and more. International donors and development partners should consider playing a role in advancing ecosystem valuation studies and to help mainstream the importance of marine ecosystem protection throughout government.

A government-wide marine ecosystem approach that might be supported to support the blue economy in Mozambique is the integrated coastal and marine area management (IMCAM) model as outlined by the CBD as well as through a larger marine spatial planning (MSP) exercise.[110] As MIMAIP and *ProAzul* mature, the hope is that the ecosystem-based approach that leverages the energy of market systems becomes the manner with which these diverse sector experts come together.

[110] https://www.cbd.int/marine/imcam.shtml

2.1 Overview of Mozambique's Ocean-Based Economy

Mozambique has 1,721 miles (2,770 km) of coastline, which, to give perspective, is just 444 miles less than the entire east coast of the United States, which stretches from eastern Maine to the Florida Keys.[111] And with vast productive sectors in these waters, the task of inventorying, managing, monitoring, enforcing and protecting this vast amount of coastline is an enormous and expensive endeavor that relies on the ability of development partners, non-governmental organizations (NGOs) and the private sector to support.

Mozambique's coast is one of the country's most valuable natural resources. Coastal resources natural gas, fisheries, agriculture, tourism, mining and forestry contribute significantly to the national income and provide social and economic benefits to an estimated two-thirds of the population. This dependence on the coast also puts pressure on the various sectoral development plans that intersect each other and create overlaps and gaps with regards to institutional roles, jurisdictional competence, powers of enforcement etc., resulting in haphazard and uncontrolled development along the coastline.

Across Mozambique's development plans, the authors have witnessed a concerted and increasing acknowledgement to the importance of marine conservation and a shared commitment towards action, but the sheer scale of Mozambique's marine assets necessitates significantly more resources to be dedicated to conservation efforts.[112] The ability to harness market forces across the blue economy can assist government, donors and NGOs in (a) focusing on policy reforms across the sector to ensure sustainable development of markets dependent on the blue economy; (b) financing marine conservation efforts, (c) establishing the networks and resources to effectively monitor protected area status, and (d) contributing to identification and health of marine species, which is critical to creating new marine protected areas (MPA) and evaluating effectiveness of those MPAs in existence.

Mozambique's marine assets have a high economic value, and if conserved, monitored and used in a responsible and economically sustainable fashion, these assets hold tremendous possibilities to mutually benefit the livelihoods of the communities. Some of this economic value, of course, is in artisanal and small-scale commercial fishing. But there is also tremendous economic value in the coastal and marine tourism segment, which includes scuba diving, underwater photography and sea safaris. The authors believe this segment holds tremendous potential, both for economic development as well as for marine conversation.

Overarching Mozambique's efforts for coastal conservation efforts, it has made progress in protecting its marine assets through establishment of marine protected areas (MPAs)

---

111 Mozambique's coastline is 33% more (or 428 miles / 689 kms) longer than the entire west coast of the United States (Washington, Oregon and California of 1,293 miles or 2,081 kms).

112 These include the National Climate Change Strategy (2013-2025), Agenda (2025), the 5-year Plan (2020-2024), Mozambique's National Biodiversity Strategies and Action Plans (NBSAP), among others.

over the past years (see Annex 1 for an overview of the legal frameworks for MPAs). Currently, 2% of Mozambique's exclusive economic zonE,[113] or roughly 7,456 sq miles (12,000 sq kms) are under protection. This 2% of waters under protection are made up of 7 key MPAs, which are outlined in Section 1 of this reference guide.

Strategic Objective #188 of Mozambique's new 5-year Plan 2020-2024 has a goal of increasing the marine reserves under protection from 2% to 10%.[114] Mozambique has also signaled that it adheres to the draft text released by the United Nations Convention on Biological Diversity (CBD) to have 30 percent of marine resources under protection by 2030, known as 30x30.[115] And Mozambique's last report in 2019 to the CBD indicated a growing commitment to protection of marine resources throughout the country.

2.2 The Blue Economy Productive Sectors

In Mozambique, nearly two-thirds of Mozambique's population resides in the coastal region, and fishing sustains the health and livelihoods of many, also generating export revenue from shrimp and commercial fishing. Offshore oil and gas exploration and production is beginning, and seaborne trade to service the extractive industries and commerce is growing. Other marine sectors, such as scuba diving and marine research are active throughout Mozambique, with areas such as Ponta do Ouro, Inhambane and Vilanculos internationally known. With limited government resources and a general lack of attention (for example on policy, monitoring, conservation) on marine ecosystems, additional resources can help the Government of Mozambique and conservation partners tap into Mozambique marine resources in a responsible and economically sustainable fashion.

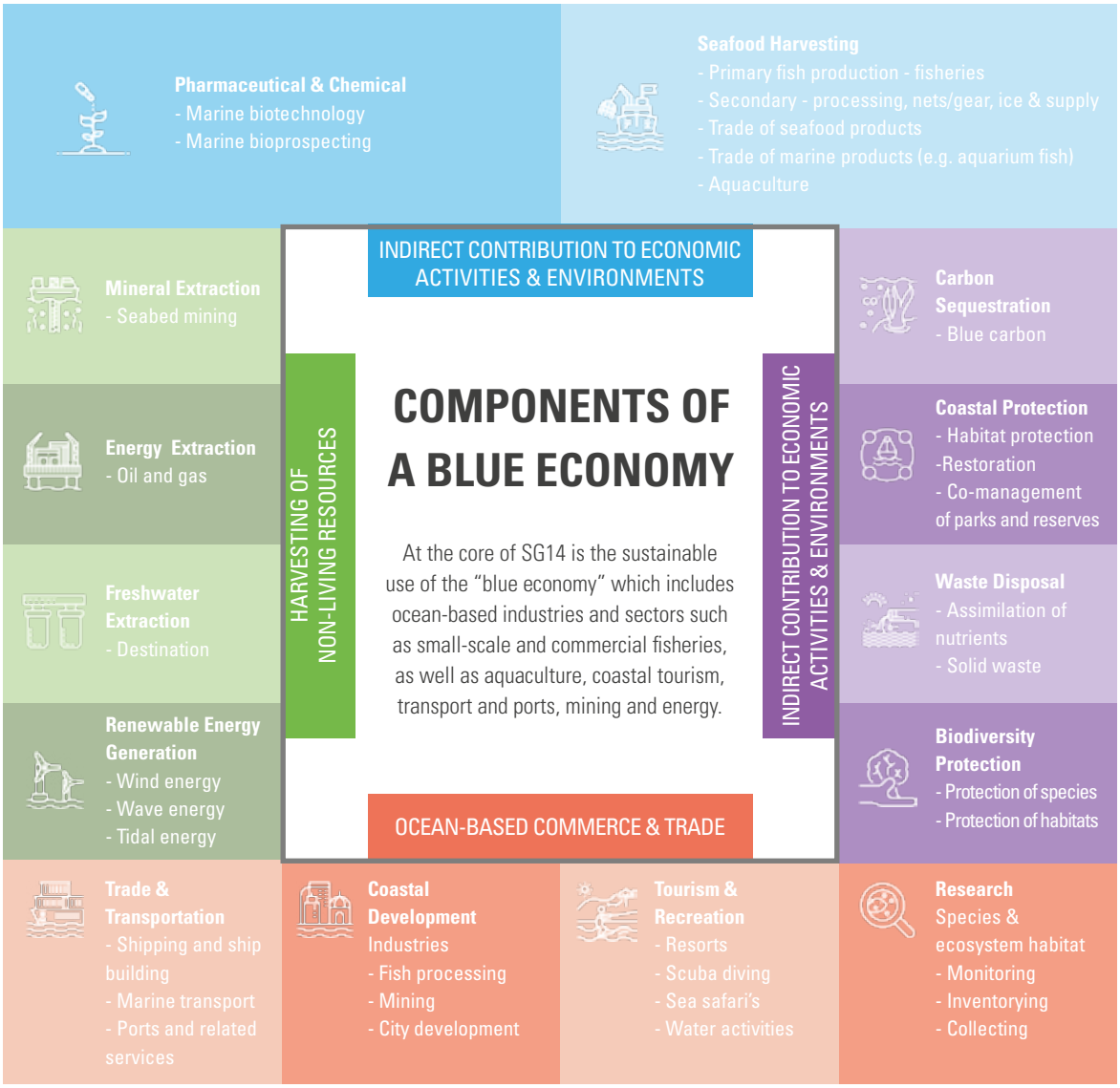
113 An Exclusive Economic Zone (EEZ) comprises an area which extends from the coast to 200 nautical miles (370 kilometers) off the coast. Within this area, nations claim and exercise sovereign rights and exclusive fishery management authority over all fish and all Continental Shelf fishery resources. The concept of an EEZ was adopted at the Third United Nations Conference on the Law of the Sea (1982).

114 Mozambique 5-Year Plan 2020-2024. This is a translated copy done by USAID SPEED+.

115 Convention on Biological Diversity. Zero draft of the post-2020 global biodiversity framework. February 2020

The World Bank, in their report "Blue Economy", highlights a useful set of marine and coastal sectors, captured in Figure 1 below. These sectors contain industries that depend on renewable marine resources, such as fisheries; non-renewable resources, such as seabed mining and offshore oil and gas; trade, such as shipping, marine and coastal tourism and ocean monitoring and surveillance; and indirect contributors, such as marine and coastal area management, protection, and restoration.[116]

FIGURE 1. Components of the Blue Economy



116 World Bank, Blue Economy: Increasing Long-term Benefits of the Sustainable Use of Marine Resources for Small Island Developing States and Coastal Least Developed Countries, 2017. The section of this report uses parts and is based on this World Bank Blue Economy report, which should be referenced for more in-depth information and recommendations.

As the figure above shows, the blue economy is large and contains productive sectors that hold immense economic potential for Mozambique, and at the same time need to be managed to ensure Mozambique's marine assets are not degraded. In this section, we provide only brief overviews of fisheries, marine and coastal tourism, marine extractive industries, maritime transport/shipping and indirect contributors, such as carbon sequestration and biodiversity protection. We include the fisheries sector because it is important for the economy, local communities, government and donors. At the same time, because of its direct link to community livelihoods, there are more donors (e.g., Norway) and NGOs (e.g., WWF) involved in supporting the fisheries sector. Other marine conservation areas, such as policy/MPA expansion and market system development to harness the financial resources of tourism, receive less direct support by the donor community.

2.2.1 Coastal and Maritime Tourism

Marine and coastal tourism in Mozambique not only brings in important foreign exchange revenues and creates employment, it can support biodiversity conservation programs. Getting the market systems around MPAs working efficiently is critical for sustainability as the saying goes, a rising tide lifts all boats.

In 2018, tourism generated $331 million in revenues for Mozambique, almost 5 times more than its fishing sector.[117] And the authors believe these numbers underestimate the impact tourism can have on the Mozambican economy and on the marine conservation sector. Mozambique's marine biodiversity is the main draw for marine and coastal tourists, so it is vital that Mozambique protects its marine assets in order to continue sustainable growth of these sectors.

In Mozambique, marine and coastal tourism includes diving, research, maritime archaeology, surfing, cruises, ecotourism, and recreational fishing operations. While the natural assets are world class, the enabling environment to unlock the potential of the sector lags behind

5x

more revenue than fisheries - $331 million in 2018 - World Bank

[117] World Bank Open Data: https://data.worldbank.org/

its SADC neighbors. Transport and infrastructure is a financing challenge, for example, however small policy changes like offering e-visas are needed to make Mozambique an attractive destination that can compete with the likes of South Africa in the region. MIMAIP is charged with being the central driving force to address enabling environment actions for the blue economy, and will need to coordinate across the government to address constraints in the tourism sector. In terms of seascape-based activity design that could help improve management and coordination needed to attract tourism investment, MIMAIP could consider:

1. ***Marine community conservation areas (MCCAs)*** - a few private sector lodges in Mozambique have been active in setting up local MCCAs. For instance, Kwalala Lodge in Nacala set up a small 450m x 150m protected reef, called Bonita Reef, in Nacala. They have worked closely with the fishing association and local officials to help educate fishermen on the importance of having protected reefs. The program is all self-funded, and revenues from diving help with education programs, but more could be done. Expanding programs such as these to other private sector operators holds potential, and is part of the enabling environment for tourism.

2. ***Expansion of marine protected areas (MPAs)*** - the private sector involved in coastal and marine tourism in Mozambique understands their growth is tied to the conservation of the marine assets and are often the most vocal in advocating for protected areas and monitoring activities. Further, it is the private sector that pays the park fees, such as in the Ponta Partial Marine Reserve, that helps fund ANAC and other monitoring and conservation programs.

3. ***Identification and marketing of marine species*** - there is only a small subset of species that are actively monitored in Mozambique, such as turtles, dugongs, whale sharks and mantas. Typically, scientists monitor and record data. But there is a growing segment of recreational divers contributing to identification and monitoring. A recent journal article in 2020 found that recreational divers were able to effectively identify, and record species provided to them in a monitoring slate.[118] Programs such as these can be expanded to the dive centers around the country. Furthermore, a program to connect the dive and safari operators throughout the country to share information on reef health, species sightings and fishing operations might be useful in advancing marine conservation efforts the crowd-sourced photos and data can also be used in marketing to the international diving community.

4. ***Destination development through artificial reefs and fish aggregating devices*** - Artificial reefs are man-made structures that mimic characteristics of a natural reef. Over the course of months and years, corals grow on the man-made reefs that attract fish, and create a new and healthy marine environment. Artificial reefs increase habitat, which in turn can increase fishing and diving opportunities. A review by the US National Ocean and Atmospheric Administration (NOAA) on artificial reefs outlines the numerous benefits artificial reefs have for marine environments.[119]

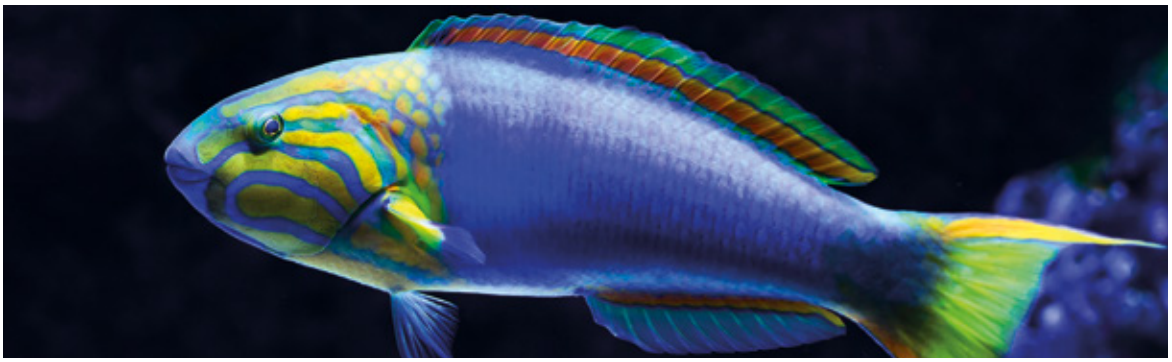
---

118 Edson Aparecido Vieira, Leonardo Rodrigues de Souza, Guilherme Ortigara Longo, Diving into science and conservation: recreational divers can monitor reef assemblages, Perspectives in Ecology and Conservation, Volume 18, Issue 1, 2020, Pages 51-59.

119 Kathy Broughton, Office of National Marine Sanctuaries Science Review of Artificial Reefs, NOAA Office of National Marine Sanctuaries, 2012.

Recently, many countries have developed large artificial reef programs, such as Jordan, which sunk military equipment and is now an international dive destination.[120] Florida has numerous famous artificial reefs, and Australia is currently constructing a $2.38 million artificial reef, which will be the largest artificial reef in the southern hemisphere.[121] Kwalala Lodge is working with Vale to create an artificial reef in Nacala with a decommissioned tug-boat, but the project is stuck waiting for necessary studies and approvals required under Mozambican legislation (Decree 21/2017 - Legal Regime for the Use of the Marine Space - RJEUM). Mozambique also has some famous wrecks, such as the Klipfontein wreck in Zavora, as well as numerous undiscovered wrecks. Creating new artificial reefs and marketing the existing reefs can help draw more tourists to Mozambique and expand marine environments and fish stocks.

5. ***Establishing research centers and citizen scientist programs*** - USAID and the US Embassy supported the creation of the Marine Lab in Zavora in 2012, which is still functioning today and offers internships for university students in marine sciences; the lab supports monitoring of marine species in surrounding areas. The US $10,000 grant helped establish the Marine Lab, which demonstrates that a relatively small amount of funding can have big impacts for marine conservation efforts. And targeted citizen scientist programs, similar to one run by the Marine Megafauna Foundation in Tofo, can be useful in harnessing recreational diving to identify and photograph marine life. The citizen scientist program may be piloted in some of the MCCAs with local fishermen to identify species, GPS location and other critical data required for marine monitoring and ultimately marine conservation programs.



2.2.2 Fisheries

Sustainable fisheries are an essential component of a prosperous blue economy, with marine fisheries helping Mozambique earn roughly $70 million in revenue in 2019 ($65.3 million from commercial exports and $6.2 million from artisanal fish).[122] As two-thirds of the Mozambican population live along the coast, the economy is highly dependent on the ocean for protein, livelihoods and social safety nets. Women are active in fish processing and marketing. Healthy fisheries mean more jobs, increased food security and well-being, and resilience against climate change.

120 New York Times article: Jordan Creates Artificial Reef From Decommissioned Military Vehicle, New York Times, July 2019

121 Government of Western Australia. Department of Primary Industries and Regional Development, website article: Artificial reefs.

122 International Trade Center TradeMap

COASTAL MOZAMBIQUE

66%

of Mozambicans live in the coastal zone

POPULATION

20%

rely on fisheries for their income, with even more dependent on the industry for food security

ARTISANAL FISHERS

70%

of fish caught in Mozambique is by artisianal fishers for subsistence or local markets

PROTEIN

27%

of protein intake in Mozambique comes from fish

Mozambique's fishing sector is divided into 4 main groups: artisanal, semi-industrial, industrial and sport. The sector is regulated by the Ministry of Seas, Inland Water (MIMAIP).[123]

1. ***The artisanal fishing sector.*** The artisanal fishing sector has particular importance for the country's food security and livelihood as artisanal fishers can be found in all coastal provinces and also around lakes, rivers and lagoons inland. It is estimated that there are more than the 400,000 artisanal fishers that were reported officially in the 2012 fishing census, and the total catch from the artisanal marine sector represents around 90% of the total catch of the country.[124] Fishing usually takes place from beaches or near coastal waters (generally within 3 nautical miles) using dhows, canoes and small motorized boats less than 10m in length. Fishing operations are conducted with a wide range of gears, including nets (beach, boat and gill), hand lines, and longlines. The artisanal fleet usually conducts daily fishing trips using one type of gear, but in some cases multiple gears are employed simultaneously. Beach-seines are responsible for most of the catches, around 38% of the total catch. The catches are composed mostly by small pelagic fishes and small demersal species. Tuna and tuna like species represent a small portion of the catch (less than 3%), with Narrow-barred Spanish mackerel being the main species landed from this group.

123 Ministério das Pescas, Instituto Nacional de Desenvolvimento de Pesca de Pequena Escala, Censo de Pesca Artesanal. 2012.

124 MIMAIP, Boletim Estatístico da Pesca e Aquacultura 2006 – 2017.

ARTISIANAL FISHERS

18,197

licensed artisanal fishers in 2017, which catch about 70% of fish for subsistence or local markets

SEMI-INDUSTRIAL FISHERS

3,410

number of licensed semi-industrial boats in 2017 - shrimp trawling and line fishing for makrel

2. *The semi-industrial fishing sector.* The semi-industrial sector was made up of roughly 3,400 licensed boats in 2017 between 10 to 20 meters in size. The semi-industrial fishing sector typically trawls in shallow water for shrimp around the Sofala Bank and also for mackerel by line fishing.

3. *The industrial fishing sector.* The industrial fishing sector has roughly 44 licensed boats, fish mainly in EEZ for tuna as well as shrimp in the Sofala Bank. These license fees bring in millions of dollars of revenue to the Ministry of the Seas, Inland Water and Fisheries each year.

4. *The Recreational and sport fisheries.* The Recreational and sport fisheries sector saw roughly 6,200 licenses issued in 2017, primarily along Mozambique's Dune Coast area using lines.

INDUSTRIAL FISHERS

125

number of licensed industrial boats in 2017, 31 of which were foreign flagged - primarily shrimp and tuna in the eez

Long-term sustainability of fisheries is threatened by overexploitation, land-based pollution, and inadequate fisheries monitoring control and surveillance systems at both national and regional levels.

While this sector is extremely important, it is vast and there are many important actions that might be considered for supporting. For the immediate future, support might be provided to the artisanal fisheries sector, particularly around education on good fishing practices, sustainable nurseries, and the importance of coordination within and among fishing associations. Organizations such as WWF, Rare and others are providing limited support in these areas, but more should be done, particularly to help ensure the growth of fish stocks.

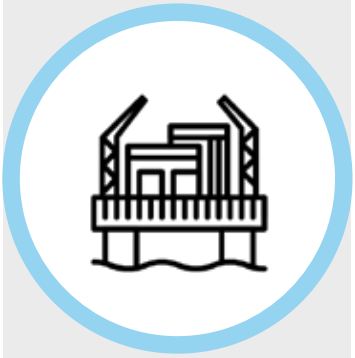
2.2.3 Extractive Industries

Marine-focused extractive industries are a key part of the blue economy in Mozambique and have an impact on marine ecosystems. Offshore oil and gas exploration are currently underway in the offshore areas of Rovuma, Zambezi and Angoche and Inhambane and set to expand in the coming years. Deep-sea habitats remain understudied and poorly understood, and the impact that extractive industry operations are likely to have on deep sea ecosystems and the wider functioning of ocean is unclear. Their impacts and potential risks need to be managed accordingly. While the environmental impact assessments have been done, the authors think more needs to be done to ensure the population growth at extractive industry centers is managed and does not negatively impact existing marine and coastal assets. The possible growth of deep seabed mining also needs to be accounted for in the Mozambican context, where currently legislation and oversight ability is non-existent. Overshadowing all of this is the growth of violent extremism in the north of Mozambique,

SPORT FISHERS

6,221

number of licensed sport fishers in 2017 - primarily along the coral coast



OIL AND GAS EXPLOITATION

100
TRILLION CUBIC FEET (TCF)

of proven natural gas reserves, the 3rd largest in Africa after Nigeria and Algeria

which not only poses an additional threat to marine ecosystems, but prevents marine conservation efforts from proceeding.

Offshore oil and gas (O&G) exploration

With over 100 trillion cubic feet (TCF) of proven reserves, and likely more, there is little doubt this will drive the growth of the north of Mozambique. This growth will undoubtedly have an impact on the marine ecosystems, so it is critical to advance work on the protection policies, spatial planning and education required to effectively conserve the marine assets along the coral coast. Of particular importance is putting in place an extension of the Quirimbas MPA north through the border with Tanzania, as proposed by Salamao Bandeira in 2007 as the Rovuma/Palma National Reserve and a transfrontier connection with Mnazi Bay-Ruvuma Estuary Marine Park in Tanzania, which sits just 3 kms (1.8 miles) from the northernmost point of the Rovuma Offshore Area 1 gas field.

The risk from a rapid increase of economic activity and associated population growth around the extractive industry centers, could directly threaten significant marine biodiversity in these areas. Key coastal zone issues include unmanaged coastal development, in particular illegal tourism operations; unclear user rights; overfishing, loss of supporting coastal ecosystems such as mangroves; lack of community involvement in decision-making and management; limited investment in alternative income earning opportunities for local communities; breakdowns of local resource management systems; pressure caused by resettling populations; weak institutional and limited financial capacity to manage coastal resources; an unclear legal framework governing certain marine and coastal resources; and overlaps and gaps in institutional mandates and jurisdictions.

These offshore sites have undergone extensive environmental impact studies and have risk mitigation and emergency plans in place. For the studies we have seen, drilling is in deep water, typically 200 meters (656 feet), but as deep at 1,800 meters (5,900 feet).[125] At these depths, deep-sea habitats remain understudied and poorly understood, so the impact that oil and gas operations are likely to have on ecosystems and the wider functioning of the ocean systems is unclear. It is planned that for some operations, gas will be transported from wells via submerged pipelines to onshore processing facilities.

There is some impact on the seafloor-dwelling organisms and microorganisms, but much more needs to be done to study the impact on these ecosystems. In areas where scans of the deep seabed can identify marine activity, oftentimes they can be avoided during drilling and construction. Because of the depths, seagrasses, mangroves and some corals are not found - typically only mud and sand are found at these depths, though in some areas at depths of 2,500 meters (8,200 feet) and around thermal vents and canyons, researchers have found giant clams, octopuses, crabs, and tube worms. And fish, such as the slime head fish, which can live to 250 years, live at these depths, as do other fish species such as deep roving sharks, eels and octopuses. Another recent study in Greenland found vast coral gardens at 488 meters (1,600 feet) full of pastel soft corals, sponges, sea stars, anemones, rockfish, shrimps, and snails.[126]

---

[125] Environmental Impact Assessment Report Deepwater Exploration Drilling Operations in the Rovuma Offshore Area 1, Mozambique, Impacto, 2008 and 2014 EIA Update by ERM South Africa and Impacto.

[126] Long, Stephen, et al.. Identification of a Soft Coral Garden Candidate Vulnerable Marine Ecosystem (VME) Using Video Imagery, Davis Strait, West Greenland, Frontiers in Marine Science, Vol 7, 2020.

The environmental impact studies for Mozambique also indicated minimal impacts on some of the deeper ocean-going marine mammals (dolphins, whales, sharks, etc.) and pelagic fish (tuna, swordfish, marlin) as well as turtles, which may fringe the drilling rigs. The real danger lies in a hydrocarbon accident in which diesel, gas or other hydrocarbons are released. Other issues such as noise, vessel collisions, vessel traffic and discharge and the visibility of offshore rigs which may impact the remote and exclusive vibe high-end tourists seek out when visiting the Mozambican coast.

Regardless of the impacts or risks to marine ecosystems, some of these activities along the coast have been approved to proceed and they are moving forward. The Sasol proposed gas exploration site north of Bazaruto was recently stopped due to environmental concerns and the concession areas were returned to the government. For those areas that are moving forward, we think the work that needs to be done now lies in creating the necessary conditions to manage the growth that will occur in the Quirimbas once the effects of violent extremism and COVID-19 allow the developments to advance, and the associated impact on marine ecosystems from fishing, waste, discharge and greater use of the marine space by vessels.

Deep Seabed Mining (DSM)

Mozambique's ocean geography is such that in most of its EEZ (200 nautical miles (370 kilometers)), depths can reach 2,500-3,000 meters (8,200 - 9,800 feet). This is particularly true around Inhambane to Vilanculos, and Nacala north through the border with Tanzania, where these depths are within 160 kilometers (100 miles) from shore, and occasionally much closer than that.[127] Just as deep seabed exploration has found large deposits of gas, further exploration will undoubtedly find other mineral resources within Mozambique's EEZ.

Deep-seabed mining is the new frontier for finding precious resources. Rising demand for metals such as nickel, copper, zinc, aluminum, manganese, lithium and cobalt used to produce items such as smartphones, solar panels and batteries, coupled with diminishing on-land deposits, has led mining companies to search for these resources in the sea, typically below 200 meters (656 feet) from the ocean's surface. Long off-limits due to the depth, difficulty and cost of mining, many of the largest mineral corporations now have underwater mining

DEEP SEABED MINING

65%

of the Earth's surface area is ocean at depths of 200m or more, where deep seabed mining occurs

[127] Cordio, Marine Spatial Atlas for the Western Indian Ocean: MASPAWIO interactive depth map.

programs. For instance, De Beers Group is using a fleet of specialized ships that drag machinery along the seabed to mine diamonds, which has resulted in 1.4 million carats being extracted from the coastal waters of Namibia in 2019. Similar activities are happening in Papua New Guinea, Japan and South Korea to exploit offshore deposits.[128]

As mentioned in the previous section on oil and gas exploration, deep-sea habitats remain understudied and poorly understood, the impact that mining operations are likely to have on ecosystems and the wider functioning of ocean systems is unclear. While the deep seabed in most places seem to typically be mud and sand, microorganisms and the surrounding ecosystems are largely unknown. To extract resources from the seabed, miners suck material to the boats through long hoses, extract the resources, then dump the slurry that remains back into the water, which contains toxic concentrations of mercury and lead, and can drift for miles, potentially impacting ecosystems as it resettles on the seabed. And since mining covers large swaths of the ocean floor, as opposed to a defined area for gas and oil extraction, it potentially has far more impact on the marine ecosystem. This makes it difficult to thoroughly assess the potential impacts of deep-sea mining and to put in place adequate safeguards to protect the marine environment.

Mozambique currently lacks comprehensive and dedicated regulation and enforcement regimes for its EEZ, which can be problematic. Greater attention to deep-sea bed mining through the development of policies and regulations can help Mozambique stay ahead of the curve and respond to requests for licenses to mine the deep seabed in Mozambique. For instance, Mozambique might adopt a policy that activities proceed with the highest degree of caution to avoid irreversible damage to the ecosystem and that appropriate social and environmental safeguards are in place as part of strong governance arrangements for this emerging industry. Furthermore, building knowledge and capacity on deep-seabed mining can better help Mozambique participate in discussions for geographies that fall outside of its EEZ, under the jurisdiction of the International Seabed Authority (ISA).[129]

128 Hylton, Wil S. History's Largest Mining Operation Is About to Begin, The Atlantic, Jan/Feb 2020.

129 The World Bank prepared a series of measures that can be considered in order to implement the precautionary approach to seabed mining to the fullest extent possible. See pg. 19 of Blue Economy: Increasing Long-term Benefits of the Sustainable Use of Marine Resources for Small Island Developing States and Coastal Least Developed Countries, 2017.

2.2.4 Maritime Transport and Related Services

Mozambique has a long and extensive maritime history dating back centuries. Mozambique's extensive coastline offers some of Africa's best natural harbors (deep-water and river mouth ports), which enable shipping to play an important role in Mozambique's blue economy. Arab and Indian traders, dating back to the 10th century, used these harbors as trade centers. The current city of Beira was a primary trade center, providing a critical link for trade with hinterland countries. Trade settlements also developed north of Beira in Angoche, Quelimane, Mozambique Island and Pemba. The Portuguese explorer Vasco de Gama arrived in 1498 and the Portuguese then used Inhambane as a trading center, and in 1781 made Delagoa Bay, now Maputo as their main maritime transport hub. Around these maritime transport ports one can witness a variety of related maritime services, such as port services, ship repair and other sectors to service the shipping industry.

MARITIME TRANSPORT, PORTS AND RELATED SERVICES

16

number of opreational ports in Mozambique - issues arise such as pollution, underwater noise, introduction of invasive species and spills

Today, Mozambique currently has 16 ports, with another one scheduled to be constructed in 2021 (Macuse for the Moatiz corridor) and one possibly in Techobanine - which would bring the total number of ports in Mozambique to 18.[130] Due to its low lying coastal plain, most of the ports, with exception to Pemba and Nacala, have been developed in shallow bays, river mouths and estuaries, which pose problems in handling large modern ocean-going vessels. Despite a high number of ports, Maputo, Beira and Nacala are the primary commercial ports of Mozambique and continue to be an important part of Mozambique's economy, enabling key segments of the economy to function, such as fishing and the import and export of raw materials, consumer goods, essential foodstuffs, and energy. As the oil and gas industry comes online, maritime transport will be an even more crucial part in Mozambique's economy. In June 2020, cabotage services began after a long hiatus, connecting domestic shipping services to key ports throughout the country.

The steady growth of the shipping industry in Mozambique and its related services impact marine ecosystems. Ships contribute to marine and air pollution, ocean litter, create underwater noise, and can introduce and spread invasive species. Shipping accidents can also release

130 Ports include: Maputo, Matola, Xai Xai, Inhambane, Maxixe, Beira, Chinde (expected to start in 2021), Pembane, Moma, Angoche, Quelimane, Macuse, Mozambique Island, Nacala, Pemba, Mocimboa da Praia, and Palma. Techobanine Port is under consideration.

vast amounts of fuel into the ocean, such as the Katina, which spilled 500 tons of heavy fuel oil (HFO) into Maputo Bay when the ship's hull split apart in 1992.

These challenges and threats to Mozambique's marine ecosystems need to be taken into account. While international regulations require the shipping industry to invest significantly to reduce emissions and waste, and to improve ballast water treatment, attention can be placed on other shipping related activities within Mozambique's control.

For instance, Mozambique's capacity to dispose of hazardous waste produced by shipping and oil exploration is limited, and non-existent in parts of the country. In addition, Mozambique's ability to handle shipping emergencies, such as oil spills, is limited. Mozambique's National Naval Institute (INAMAR), part of the Ministry of Transport and Communications, is responsible for responding to oil pollution at sea. A National Oil Spill Contingency Plan (NOSCP) is under development and will help outline an overall response to emergency spills. But even once the NOSCP is approved, challenges still remain on capacity, technical equipment (e.g., ships and dispersants) and financial resources to adequately respond to environmental disasters. The Government cannot acquire and maintain all the equipment that is needed along the entire length of the coastline. Mozambique also has a national disaster risk reduction plan (2017-2030), however it does not address oil spills.

Driven by the growth of the oil and gas sector, the most comprehensive work done to date to address emergency preparedness related to shipping (as well as oil and gas exploration and production) was developed under the UN Environment and Norway's Oil for Development Program. Their report provides concrete recommendations, such as ensuring the NOSCP addresses environmental sensitivity mapping details; oil spill response is included in the national disaster risk reduction plan; ensuring coordination mechanisms between Government and oil and gas operators specifically to address spills related to the oil and gas; and encouraging greater private sector participation in hazardous waste disposal.[131]

New Port Development

Two new ports, Macuse and Techobanine, are on the horizon for Mozambique. Construction of the ports and associated shipping traffic will have an impact on the marine ecosystems around the port, so environmental impact assessments (EIAs) will be a critical component of the port development plans. The authors have not seen the EIAs for either port, but we think a review, particularly of the Techobanine proposed port which would sit in the middle of the Ponta do Ouro Partial Marine Reserve (POPMR) is important.

Port of Macuse

The Port of Macuse will be a deep-water port, with capacity between 25 and 100 metric tonnes per annum (Mtpa) to accommodate dry bulk carriers up to 150,000DWT. It is located at the mouth of the Macuse River, in the Maquival Administrative post, Nicoadala District, Zambezia Province. The construction, to be carried out in three stages, will include a coal terminal (with capacity for vessels of 150000DWT), a terminal for petroleum products (with capacity for vessels of 1000DWT) and two wharves for roll on – roll off vessels and berthing of tugs. The port is expected to be ready to commence operations in 2020/21. The port forms part of the Moatize-Macuse Logistics Corridor and is planned to connect the Moatiz coal mine in Tete to the Port of Macuse. According to Impacto,

131 UN Environment, Strengthening Environmental Management in the Oil and Gas Sector in Mozambique, 2018

who carried out the EIA, the development of the infrastructure and facilities is likely to cause impacts on the environment the EIA has not been made public. But given the fact that Impacto conducted the EIA, we are confident a sound analysis was undertaken, and appropriate mitigation measures were included in the EIA.

Port of Techobanine

Just north of Ponta do Ouro, and within the Ponta do Ouro Partial Marine Reserve (POPMR) and bordering the Maputo Special Reserve, talks have been underway to develop a US $1 billion new deep-water port and industrial complex in the Techobanine area to serve Mozambique and neighboring countries, including South Africa.[132] The authors have dived and photographed the underwater ecosystems of the Techobanine area and witnessed first-hand the coral and marine biodiversity in the area. We know the beaches of the area include turtle nesting grounds, and most dive operators in Ponta are extremely worried about the negative impact such a port and industrial complex would have on biodiversity in the area. What we have been unable to understand is why the Port of Maputo or Matola could not handle the envisaged cargo volumes given the proximity. From the little we know, advancing with the Port of Techobanine would be a mistake from an environmental perspective.

It is difficult to know with a great deal of certainty the plans for the Port of Techobanine, which has been discussed for well over 10 years. It is mentioned in the Mozambique Railroad Company's (CFMs) audited financial statements in Mozambique's January 2019 Gazette.[133] The most recent public news was that President Nyusi supports the project, saying that he "believed the project would be an asset for the country, as it would bring the Chibuto heavy sands exploration project."[134] The authors have also seen that a Memorandum of Understanding for the project was signed with neighboring countries Botswana and Zimbabwe.[135] The then Minister of Transport and Communications Zuculo announced a government tender to undertake the economic and feasibility studies in July 2012.[136]

The same news reports referenced above identify important names and organizations that are involved with the project, such as Joaquim Chissano Foundation, the Muiake company, the China Railway International Group, Bela Vista Holdings (BVH), South African public rail company Transnet, and General Jacinto Veloso 2, an influential former Frelimo security minister who claims to own some of the land in which the port complex is proposed.

An EIA was delivered to the then Ministry of Environment by the time the article was written in 2010, but we do not know who undertook the EIA.[137] Review of Impacto's website did not list an EIA for Techobanine. However, the authors did find it difficult to understand how an EIA would be approved on a site that forms part of the earth's 36 biologically richest and most endangered terrestrial ecoregions, has been placed on UNESCO's tentative list, and includes 80% of all loggerhead and leatherback turtle nesting sites in Mozambique. The variety of ecosystems found in the POPMR and the many ecological linkages between them provide habitat for a significant

132 Symons, Kate. The tangled politics of conservation and resource extraction in Mozambique's green economy. 2018

133 Details are listed in the Mozambique Boletin de Republica, Series 3, No. 14 of 21 January 2019 and detailed in CFMs Audited Financial Report produced by PwC on page 446 of the Boletin.

134 https://clubofmozambique.com/news/beijing-projected-construction-of-techobanine-port-and-railway-report/

135 https://clubofmozambique.com/news/chinas-chec-involved-in-us1bln-port-in-ponta-techobanine-maputo/

136 Macuahub article on Techobanine Economic and Feasibility Study. July 2012.

137 Emídio Beúla, Porto de Techobanine avança no meio de controvérsia, July 25, 2010. Blog Article on Techobanine in Macuahub.

diversity of African biota. Increased attention to news of development of the Port of Techobanine is essential, including requesting to see the EIA or supporting development of a new EIA as over 10 years has passed since the last once was undertaken, and high-level discussions with Government should begin if plans appear that port development is advancing. A priority analysis should be to value the ecosystem services provided by the POPMR to the Mozambican economy, then compare that to the anticipated revenue from the port investment if the primary revenue driver is heavy sands extractive exports, the decreasing economic viability of these extractive resources (as seen in Canada) should be considered in any such economic analysis.

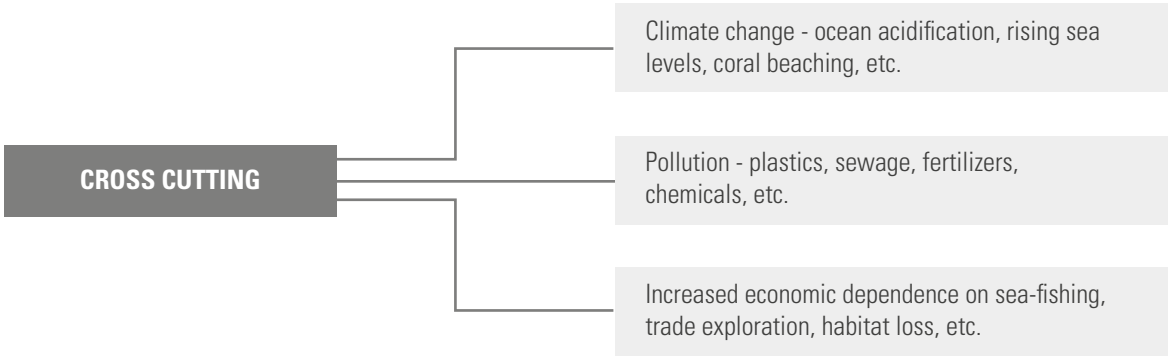
2.3 Threats to Mozambique's Marine Ecosystems & Species

The ocean provides us with food, oxygen production, natural protection and jobs for coastal communities. Humanity depends on the ocean to thrive, yet its resources are overexploited and rapidly depleting, posing serious risks to ocean health and its capacity to stabilize our climate, provide safe food, and support jobs and economies. Economic activities on land and in the marine environment have an impact on marine ecosystems. These impacts threaten the interconnected and fragile marine ecosystems that form a critical part of our life on land, our oxygen, our food sources, our climate, and our economies. Being aware of our impacts and properly managing and mitigating these threats can help ensure healthy marine ecosystems, which in turn benefits everyone. Marine conservation has proven highly beneficial for people, marine life and climate stability, and demonstrated the remarkable resilience and power of regeneration of ocean resources.

In this section, we provide a high-level overview of some of the main threats to marine ecosystems by blue economy activities and to specific marine assets in Mozambique. The list is not meant to be exhaustive, but rather illustrative. For some blue economy sectors, species and habitats that are well studied, such as oil and gas development, turtles, dugongs, whales or mangroves, the threats and mitigation activities may be well documented. However, the authors have found many species, habitats and geographies/seascapes along Mozambique's coast where little or no studies and information exist. In Section 1 on MPAs of Mozambique, we included a summary of a few key MPA seascape priority threats. However, deeper analysis of the threats, and more importantly, monitoring and mitigation of threats is critical to safeguarding Mozambique's marine assets. This is an expensive and time-consuming endeavor, but we think small and strategically planned steps can help to better document and understand Mozambique's marine ecosystems and their associated threats. With this information, policy makers can then better design associated support measures.

2.3.1 Cross-Cutting Threats

There are numerous cross-cutting threats to the ocean, such as from climate change, which enables the ocean to absorb more carbon dioxide, and which increases ocean acidification and bleaches coral, and increases sea temperatures, which affects marine species, and rises sea levels which impacts coasts. Increased pollution is also impacting our oceans, particularly plastics. The increased economic dependence on the ocean creates many threats to marine ecosystems, from fishing, to potential for shipping and oil rig accidents, to habitat loss and coastal development.



The major human impacts include, among others, the following:

1. ***Climate change.*** A warming planet with more carbon dioxide in the atmosphere contributes to changes in sea temperature, in ocean acidity, in oceanic currents, in sea levels and in stronger and more frequent storms. This threatens marine life, habitats, and the communities that depend on them.

2. ***Overfishing.*** Rising demand for seafood products coupled with technological improvements to allow increased capture of fish stocks and access to fish stocks in more remote and deeper ocean depths (e.g., the orange roughy), has led to unsustainable fishing and a decline in fish stocks. Fish stocks are further exploited by illegal, unreported, and unregulated fishing.

3. ***Coastal development.*** Unplanned and unregulated industrial, agriculture, mining and tourism development in the coastal areas contributes to loss and degradation of critical habitat, develops infrastructure in suboptimal areas, creates overlaps in land and marine use areas, and places increased economic pressures on fishing, pollution and sewage. Proper land use planning coupled with marine spatial planning and key biodiversity areas as well as enforcement can help ensure coastal development proceeds in harmony with marine ecosystems.

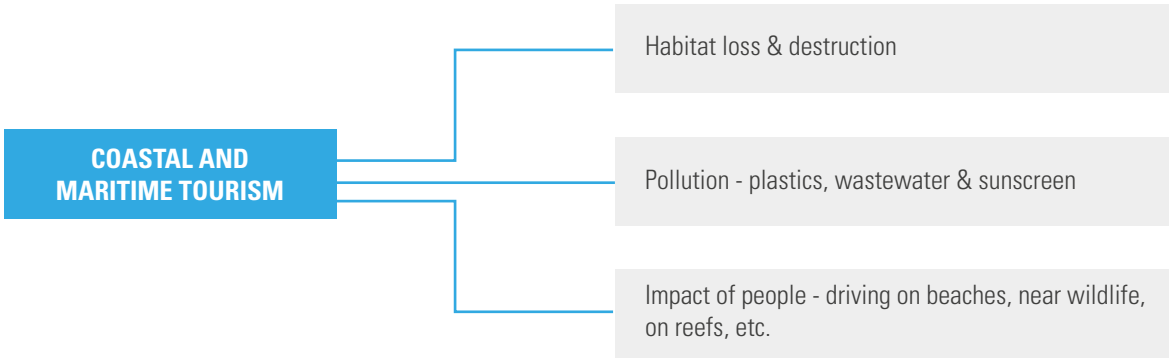
4. ***Marine pollution.*** Excess nutrients from untreated sewage, agricultural runoff, and marine debris such as plastics find their way into coastal waters and impact the marine ecosystems. Plastics are also a growing and serious threat to marine ecosystems. Mozambique is currently considering a ban on single use plastic bags, with a proposal aimed to be presented to the Council of Ministers by September or October 2020.[139]

2.3.2 Threats by Blue Economy Activities

Each one of the blue economy activities presents a threat to marine ecosystems.

Coastal and Maritime Tourism

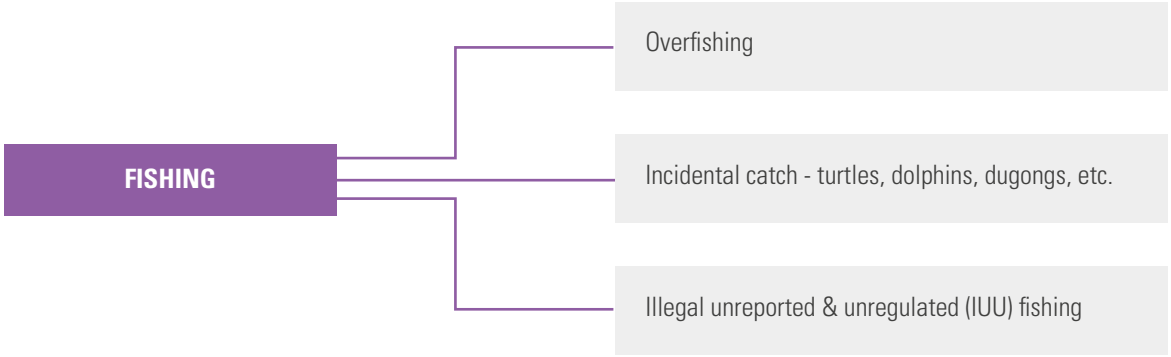
Coastal areas are some of the most productive and biologically diverse on the planet. They are home to mangroves and sea grasses and are breeding grounds for sea turtles. And Mozambique's coasts are also the most densely populated areas of the country, with two thirds of the population living in coastal zones. As Mozambique's coasts offer stunning destinations for holidaymakers, they have also seen growth in development of resorts and increased numbers of tourists, who buy more fish and contribute to pollution (both plastics and wastewater). If not managed correctly, a variety of threats can impact marine and coastal habitats. Development can lead to clearing of mangrove forests and damage to seagrass beds from boats. The waste from tourists needs to be treated and discharged properly. Seafood caught to satisfy tourists' demand needs to be harvested sustainably. And snorkeling and scuba diving needs to be done responsibly, to avoid damaging corals from touching and boat anchors. Given resource constraints in Mozambique, creating, implementing, monitoring and enforcing regulations to curb the impact of marine and coastal tourism can be a challenge.



[139] See Article on Plastic Bags, Club of Mozambique, July 2020.

Fishing

The artisanal fishing sector has particular importance for the country's food security and livelihoods as artisanal fishers can be found in all coastal provinces and also around lakes, rivers and inland lagoons. It is estimated that there are more than the 400,000 artisanal fishers that were reported officially in the 2012 fishing census, and the total catch from the artisanal fishing sector represents around 90% of the total catch of the country.[140] Twenty percent of coastal families rely on fisheries for their income and twenty seven percent of the protein consumed by Mozambique's population comes from fish. And the commercial fishing sector is important for prawns, tuna and other species of fish. With a growing dependence on fishing as a food, livelihood and export revenue source, more and more pressure is placed on fish stocks. Threats such as overfishing, IUU fishing and incidental catch of protected species such as turtles, dolphins and dugongs are associated with fishing. Threats need to be managed properly, through training of artisanal fishers, management of fish stocks and monitoring and enforcing fishing regulations.

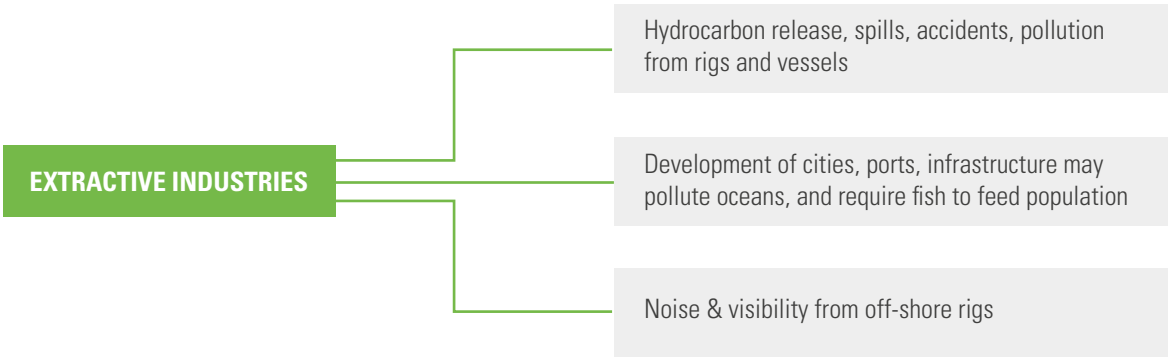


Extractive Industries

Marine-focused extractive industries are a key part of the blue economy in Mozambique and have an impact on marine ecosystems. Important reserves of oil and gas are located in the offshore areas of Rovuma, Zambezi and Angoche and Inhambane, where exploration and extraction are underway and set to expand in the coming years. Deep-sea habitats remain understudied and poorly understood, and prospecting, drilling, and transport can seriously damage sensitive marine areas and disturb marine species. Because deep-sea habitats are understudied, environmental risks are often inadequately assessed, and projects typically advance regardless of their ecological value. In addition, the environmental and social standards adhered to by extractive companies vary and can be difficult to monitor. Once drilling and prospecting begin, threats include hydrocarbon accidents in which diesel, gas or other hydrocarbons are released. Other issues include noise, vessel collisions, vessel traffic and discharge and the visibility of offshore rigs, which may impact the remote and exclusive vibe high-end tourists seek out when visiting the Mozambican coast. And the growth of cities around extractive industry infrastructure, such as Palma, will increase population, who will need fish for their diets. Development around these cities, including development of ports, will increase pollution and discharge into the

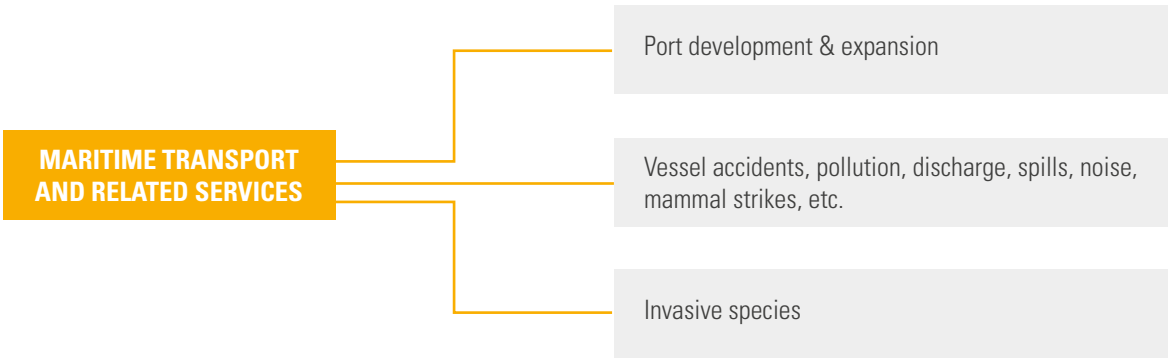
[140] MIMAIP, Boletim Estatístico da Pesca e Aquacultura 2006 – 2017.

oceans. Mozambique also is known for sand mining operations, which have impacts on Mozambique's dunes and coastal habitats, such as turtle nesting grounds.



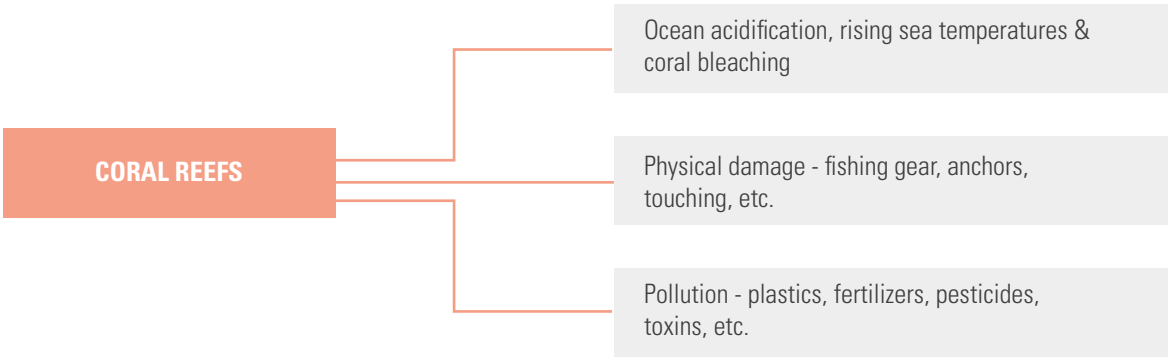
Maritime Transport and Related Services

Today, Mozambique currently has 16 ports, with another one scheduled to be constructed in 2021 (Macuse for the Moatiz corridor) and one possibly in Techobanine - which would bring the total number of ports in Mozambique to 18. The steady growth of the shipping industry in Mozambique and its related services impact marine ecosystems. Ships contribute to marine and air pollution, contribute litter, create underwater noise, and can introduce and spread invasive species through their ballast water. Shipping accidents can also release vast amounts of fuel into the ocean, such as the Katina, which spilled 500 tons of heavy fuel oil (HFO) into Maputo Bay when the ship's hull split apart in 1992. Development of contingency plans, such as the National Oil Spill Contingency Plan (NOSCP), which is under development and resources to implement the NOSCP can help in the case of an accident. Encouraging greater private sector participation in hazardous waste disposal can help ensure the growth of the industry and that waste is cared for appropriately. And should new ports be identified for construction, or current ports expanded, environmental and social impact studies need to be developed and evaluated transparently, and appropriate mitigation measures put in place. In the case of Techobanine, these environmental and social factors need to be balanced with the eco-tourism activities of the area.



2.3.3 Threats to Mozambique's Marine Ecosystem Habitats

Each of Mozambique's marine assets also has an associated threat.



Corals

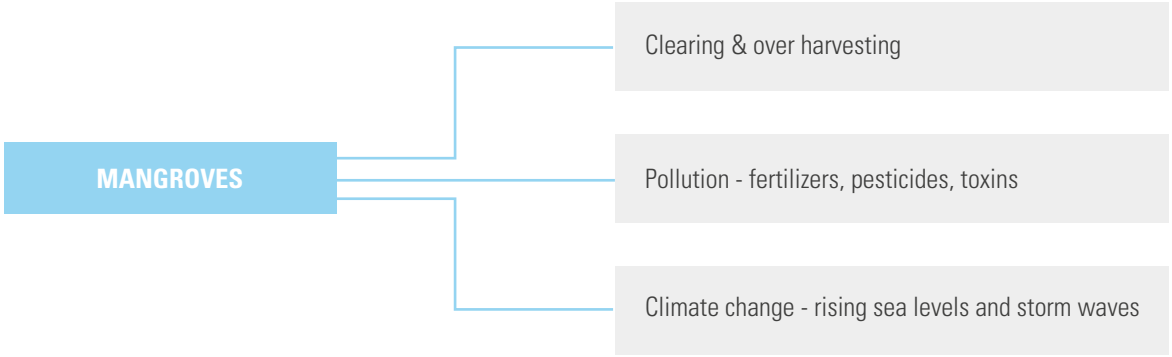
Coral reefs are particularly vulnerable to climate changes and to local threats, such as our activities on land. Increased ocean temperatures can cause coral bleaching, which turns once colorful corals white because algae needed by corals are not produced in warmer waters. Changing ocean chemistry caused by increasing levels of carbon dioxide in seawater leads to ocean acidification, which causes corals to grow more slowly. And because most coral reefs are found near shore and in relatively shallow water, they are particularly vulnerable to the effects of human activities, both through direct exploitation of reef resources, and through indirect impacts from adjacent human activities on land and in the coastal zone. Coral reefs can experience physical damage or destruction from coastal development, dredging, quarrying, destructive fishing practices and gear, boat anchors and groundings, and recreational misuse (touching or removing corals). Pollution that originates on land can find its way into coastal waters. There are many types and sources of pollution from land-based activities, such as sedimentation from coastal development, which can interfere with the ability of corals to feed, grow and reproduce. Urban stormwater runoff can carry plastics, sewage, fertilizers and chemicals from forestry, agriculture and industry into the oceans, which negatively impacts coral reefs. Overfishing can alter food-web structure and cause cascading effects, such as reducing the numbers of grazing fish that keep corals clean of algal overgrowth. Blast fishing (i.e., using explosives to kill fish) can cause physical damage to corals as well. Coral harvesting for the aquarium trade, jewelry, and curios can lead to over-harvesting of specific species, destruction of reef habitat, and reduced biodiversity.[141]

[141] See US Environmental Protection Agency (EPA) on coral reefs threats.

Mangroves

As with coral reefs, mangroves are particularly vulnerable to climate changes and to local threats, such as our activities on land. Rising sea levels caused by global warming and climate change can negatively impact mangrove forests, as they require stable sea levels for long-term survival. Stronger-than-normal waves and currents reaching the coast from storms and coral destruction can undermine the fine sediment in which the mangroves grow. This can prevent seedlings from taking root and wash away nutrients essential for mangrove ecosystems.

Cleaning and overharvesting of mangrove forests and trees to make way for tourist developments, industrial areas, aquaculture, salt farms, as well as for use as firewood, construction material pulp, charcoal and animal food also leads to loss of mangroves. Dams and irrigation can also impact mangroves by reducing the amount of water reaching mangrove forests, changing the salinity level of water in the forest. And fertilizers, pesticides, and other toxic man-made chemicals carried by river systems from sources upstream can kill animals living in mangrove forests, while oil pollution can smother mangrove roots and suffocate the trees.[142]



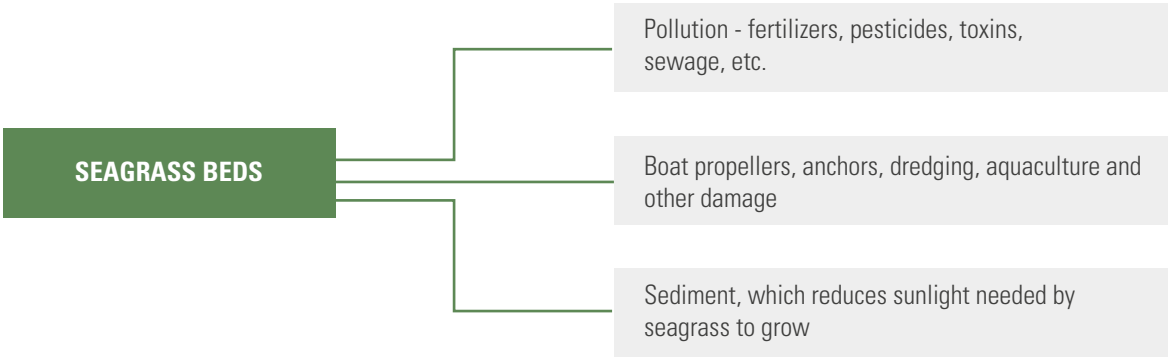
Seagrass Beds

Seagrass beds are also found near shore and in relatively shallow water and as such, they are particularly vulnerable to the effects of human activities. In their paper on threats to seagrasses, Grech et. al identified 18 possible threats to seagrass beds. For the Indo-Pacific region, the top threats included run off (urban/industrial, agriculture, sewage). Nutrients from agricultural and residential fertilizer use, sewage discharges, and animal waste can lead to an excess of nutrients in coastal waters where seagrasses are found. The nutrients can lead to the growth of algae that blocks sunlight and consumes oxygen the seagrasses require. Suspended sediments also reduce light. This sediment can come from land development runoff and through drains. Boating activity may also stir up sediment, reducing light levels. Other threats to seagrass include damage to the leaves, stems and roots by boat propellers, trawlers' nets, dredging and aquaculture. In addition to these direct human activities, climate change, sea level rise, and increasing severity of tropical storms were seen as potential risks for seagrasses.[143]

---

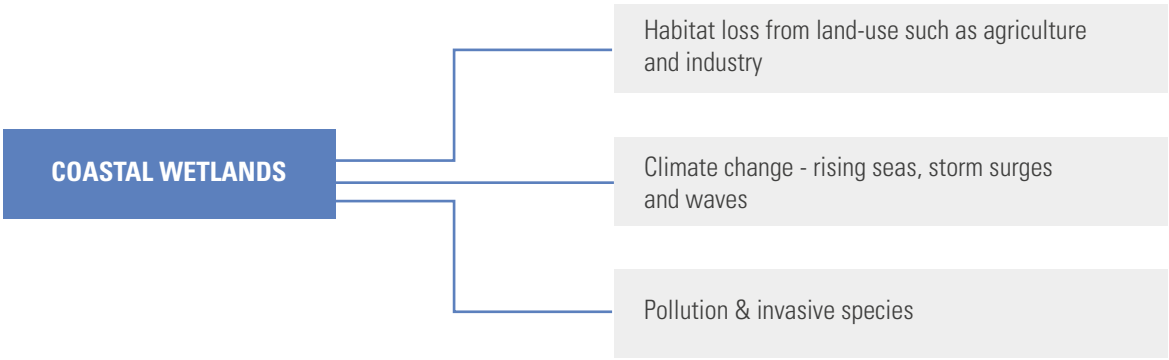
142 See World Wildlife Fund (WWF) on mangroves threats.

143 Grech, A., K. Chartrand-Miller, P. Erftemeijer, M. Fonseca, L. McKenzie, M. Rasheed, H. Taylor and R. Coles (2012). A comparison of threats, vulnerabilities and management approaches in global seagrass bioregions. Environmental Research Letters.



Coastal Wetlands and Lagoons

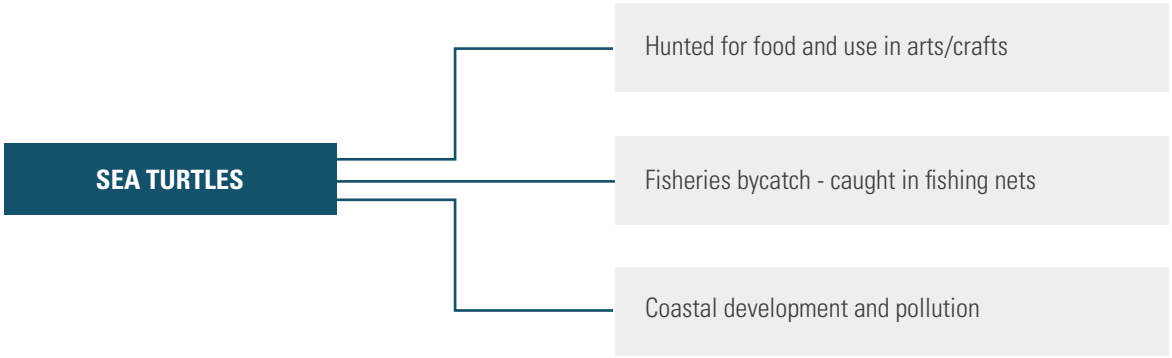
Coastal wetlands of Mozambique are diverse ecosystems, comparable to rain forests and coral reefs, that play important roles, both for land and ocean-based organisms. Coastal wetlands and lagoons trap 50% of the carbon stored on the seabed. And wetlands act as natural sponges for the land-based communities around them by trapping and slowly releasing rain, ground and flood waters. Yet coastal wetlands continue to decline. Major threats to wetlands include climate-change effects, pollution, land use change, and invasive species. Rain, rivers and streams wash sediment off the land and into estuaries and the sea. This can be sped up by clearing land for buildings and industry. Sediment can build up and smother the seabed, killing creatures living in the mud.[144]



[144] Hansen, V. AND K. Reiss. Threats to Marsh Resources and Mitigation. Chapter 16, J. Ellis and D. Sherman (ed.), Coastal and Marine Hazards, Risks and Disasters. ELSEVIER, AMSTERDAM, Holland, , 467-494, (2015).

2.3.4 Threats to Mozambique's Key Marine Ecosystem Species

Mozambican seascapes are home to an extremely rich marine biodiversity, with high coral diversity and sensitive species. These species are subject to various threats.



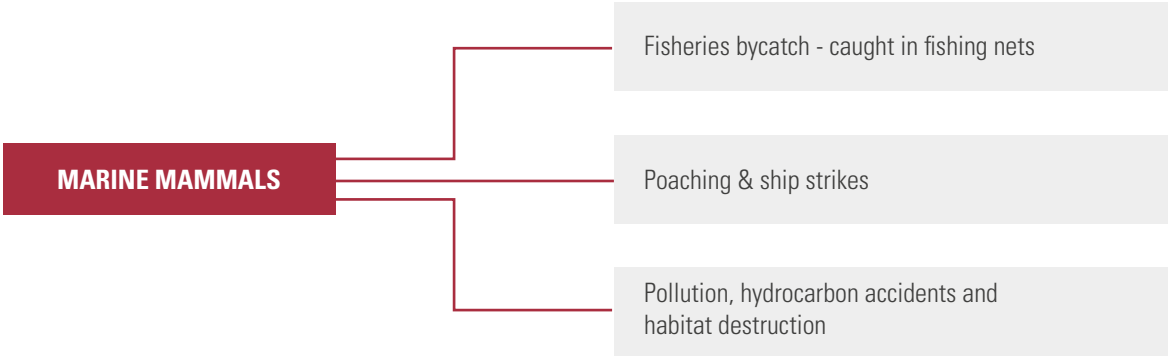
Sea Turtles

Sea turtles are a fundamental link in marine ecosystems. They help maintain the health of seagrass beds and coral reefs that benefit commercially valuable species such as shrimp, lobster, and tuna. Mozambique has 5 species of sea turtles, 2 of which are critically endangered - the leatherback and the green sea turtle. Turtles have major cultural significance and tourism value. However, in Mozambique, sea turtles and their eggs are captured for food, and their shells are sought after for jewelry and other ornamental products. Turtles are also accidentally captured in fishing gear. Climate change has an impact on turtle nesting sites as it can alter sand temperatures, which then affects the sex of hatchlings. Driving along the beaches, which is common in Mozambique can also affect nesting sites, as does coastal development. Plastic pollution, discarded fishing gear, petroleum by-products, and other debris injure sea turtles through ingestion and entanglement. Ocean pollution can also weaken the turtles' immune systems and disrupt nesting behavior and hatchling orientation.

145 From WWF and SWOT.

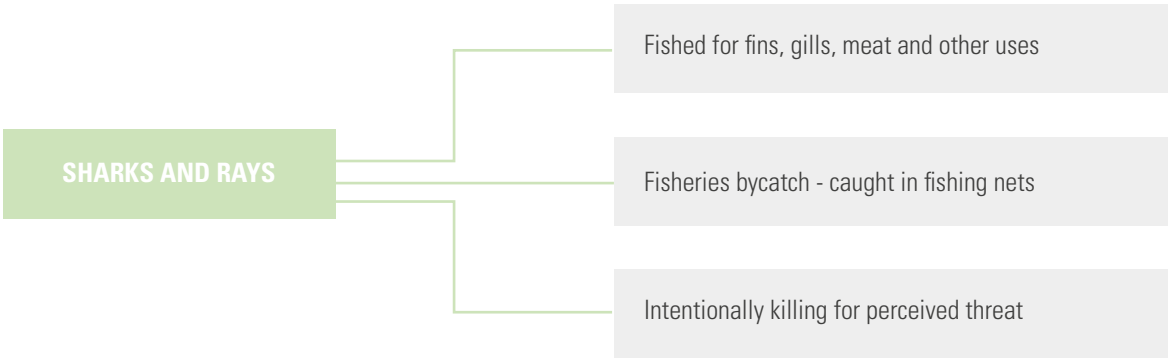
Marine Mammals

Researchers have counted 27 different species of marine mammals in Mozambican waters.[146] Various types of whales (the humpback, mink, killer, false killer, pygmy killer, pilot, sperm, pygmy sperm, Blainville beaked, melon-head, and Cuvier's beaked), various types of dolphins (common, spotted, Rissos, striped, long-snouted spinner, rough-toothed, bottlenose, long-beaked and Indian humpback), and of course, the dugong, which is threatened, and which is found in the Bazaruto Archipelago. Threats to marine mammals are largely from human impacts, including accidental capture in fishing gear, habitat destruction, poaching, pollution, harassment, and ship strikes.[147] Dolphins and whales have been found dead along Mozambican beaches. Deep sea oil and gas exploration and developments, and increased vessel traffic, will undoubtedly affect migratory patterns of mammals, and risks of hydrocarbon accidents threaten the marine mammals in Mozambican waters.



Sharks and Rays

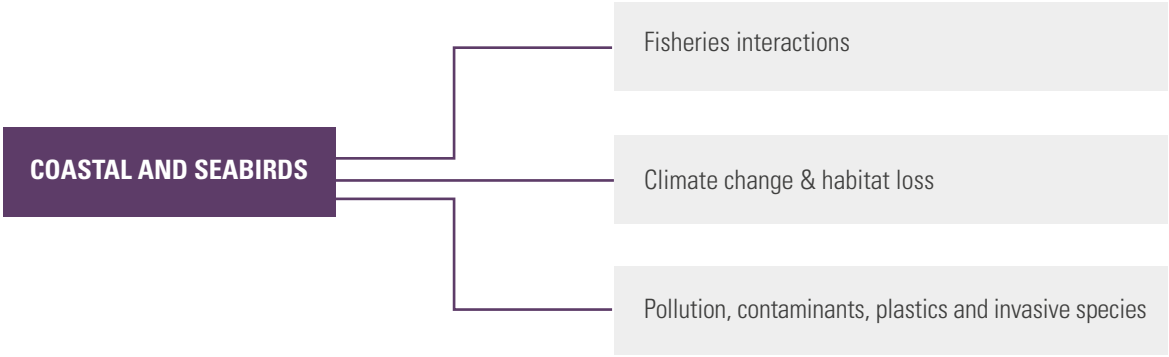
With 122 species of sharks and rays in its water, they are prime targets of fishing vessels in Mozambican waters. Fishing is the primary threat to sharks and rays as there is increasing global demand for meat, fins, liver oil, gills, and other shark and ray parts and products.[148] Unintentionally caught sharks and rays also account for declining shark and ray populations, however, markets and depleting fishery resources have made shark and bycatch profitable. Some of Mozambique's biggest sharks and rays, and also a big tourist attraction, is the giant manta and whale shark, both targets of poachers because each can fetch up to $30,000. Another threat is the intentional killing of sharks due to the perceived risk that they pose to people, fishing gear or target species.



146 Peddemors, V.M., (1997). Op cit.
147 See NOAA.
148 See WCS and IUCN.

Coastal and Seabirds

The tropical waters around Mozambique support a range of coastal and seabirds such as the penguins, albatross, pelicans, shearwaters and petrels, boobies, frigatebirds, herons, egrets, storks, hawks, falcons, sandpipers, cranes, flamingos, ducks, geese - in total, 740 species, many of which depend on the oceans, coasts and marshes of Mozambique.[149] In an important 2019 study, scientists reviewed publications on threats to all 359 seabird species worldwide, identified the main drivers of seabird declines and quantified the magnitude of the impact of each threat. They found the top three threats to seabirds were: invasive alien species, fisheries interactions, and climate change/severe weather.[150] Overfishing, which makes it more difficult for coastal and seabirds to find food, hunting/trapping, habitat destruction through development, oil spills, contaminants such as plastics, and disturbances are also threats which need to be managed accordingly.



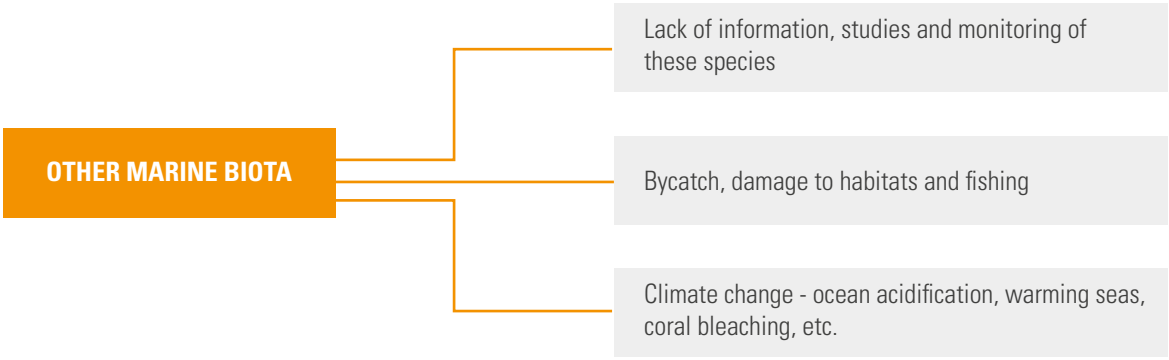
Other Marine Biota

As mentioned earlier, Mozambique's marine ecosystems are also home to various types of coral, shrimp, crab, frog fish, bobtail squid, Rhinopias, octopus, reef fishes and nudibranchs. Many of these species are data deficient or not evaluated by IUCN and are not accounted for in the Mozambique ecosystem context. This is too broad of a category that includes too many species for the authors to provide any specific threats. But there are some general threats associated with this other marine biota. The biggest general threat we see is a lack of information, awareness and scientific studies on this other marine biota. Without these Mozambique cannot effectively classify, monitor and protect these species. We think generally there are also other local threats such as bycatch, damage to habitats and fishing. For instance, we have heard stories of fishermen catching frogfish in their traps, then beating the them to death as they are afraid of the fish. We have also heard stories of fishing for sea cucumbers for sale overseas. And overall general threats brought about by climate change—ocean acidification, warming seas, coral bleaching—will affect this other marine biota.

---

149 Peddemors, V.M., (1997). Op cit.

150 Maria P. Dias, Rob Martin, Elizabeth J. Pearmain, Ian J. Burfield, Cleo Small, Richard A. Phillips, Oliver Yates, Ben Lascelles, Pablo Garcia Borboroglu, John P. Croxall, Threats to seabirds: A global assessment, Biological Conservation, Vol 237, 2019, Pages 525-537



Seahorses

As with the other marine biota, there is a general lack of information on seahorses in Mozambique. The study by Pereira in 2008 identified possibly four types (out of 54 species that are known to exist worldwide) of seahorses that have been found in Ponta do Ouro, Inhaca, Barra, Bazaruto, Quirimbas. We are certain there exist many more types of seahorses in Mozambican waters. The authors have photographed seahorses in the shallow (less than 3 meters / 10 feet) seagrass beds in Nacala and Barra in 2019 and we know seahorses can be found in Ponta do Ouro at the Stables dive site.[151] Seahorses are under threat worldwide for three main reasons: (1) traditional Chinese medicine trade, which takes more than 150 million seahorses a year from the wild, (2) the curio trade, which takes approximately one million seahorses from the wild, and (3) aquarium trade, which takes an estimated one million seahorses from the wild it is thought that less than 1,000 survive more than six weeks.[152] The authors have spoken with fishermen in Nacala and Inhambane who confirmed they capture seahorses for sale and we have seen dried seahorses in local markets in Nacala, though the fishermen say they keep the larger seahorses for export markets overseas, typically China and Vietnam.

151 See blog article from Back to Basics Scuba.

152 See the Seahorse Trust.

3. GOVERNANCE OF MOZAMBIQUE'S MARINE & COASTAL ASSETS

The marine sector, from our analysis, involves 10 ministries and 40 agencies/ offices within the Mozambican government. Their roles include scientific research, tourism, trade, transportation, fishing, oil and gas production, and more. Governing the sustainable use of the country's coastal and marine assets is highly complex, requiring information sharing and coordination on a scale seen in few other areas of the national economy. It is notable that of these 40 governmental agencies, only about 5-10% have any physical presence whatsoever in the country's marine protected areas.

Section 3 includes the following:

Figure 2 provides a general visual overview of the overall marine governance framework, showing the numerous actors involved in the blue economy. Given the web of governing bodies, the authors find it useful to think about governance falling into two main categories: (1) outside marine protected areas (MPAs); and (2) inside marine protected areas. The following sections 3.1 and 3.2 begin to lay out the governance framework in this manner.

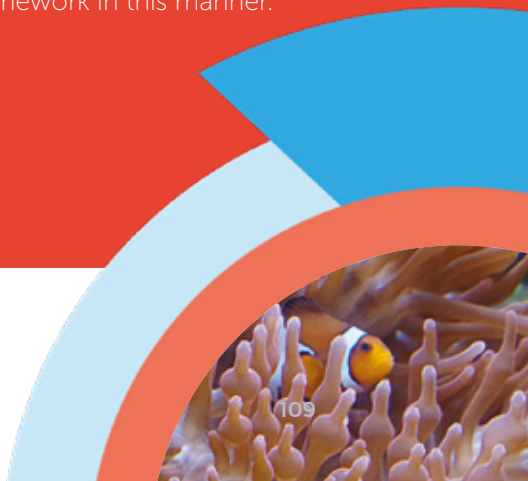
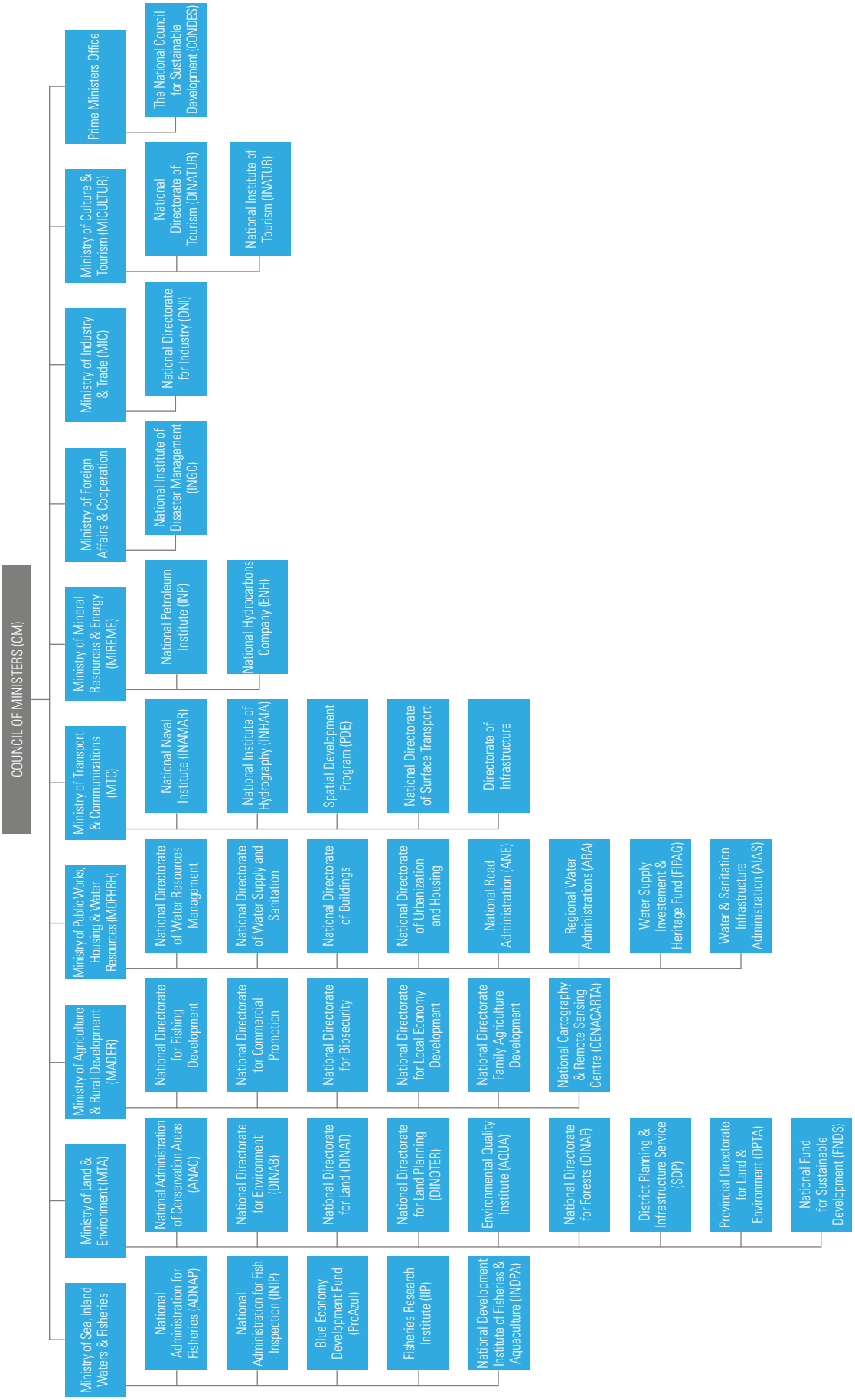
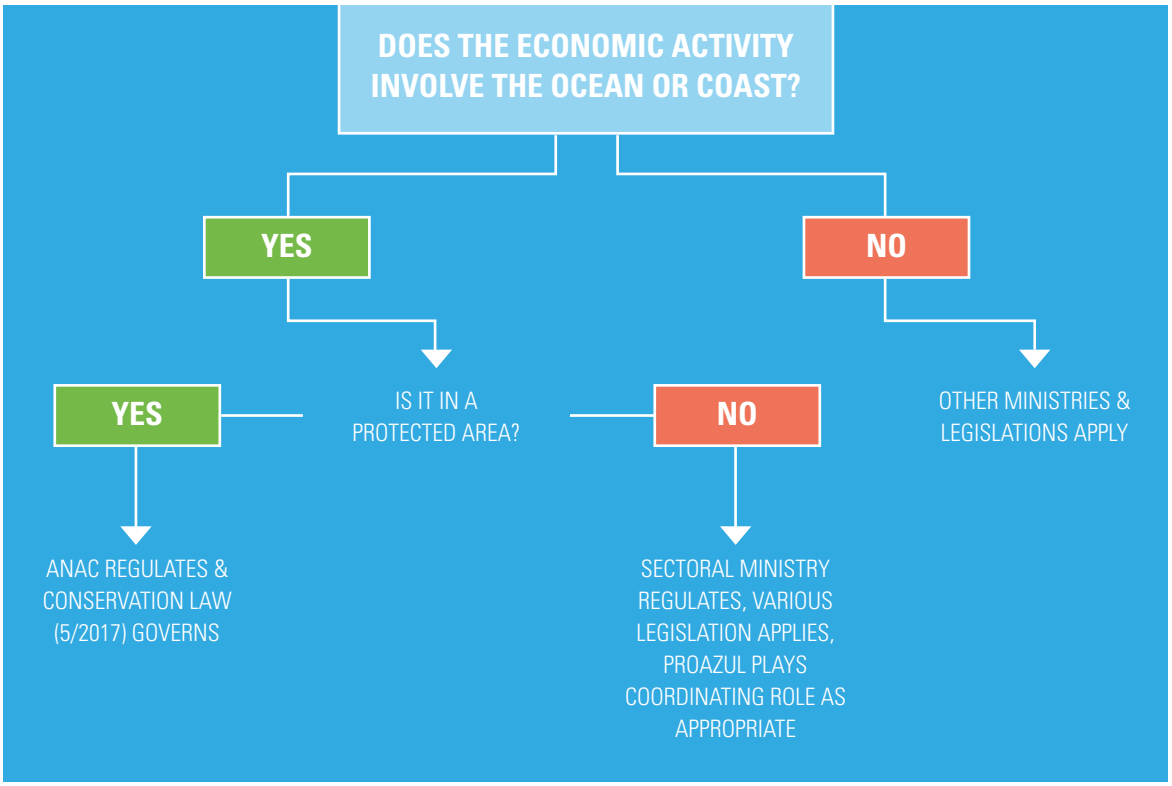


FIGURE 2. Marine Sector Governance



3.1 Governance Structure: Outside of MPAs

Mozambique's ocean resources are impacted by a multitude of regulations and Ministries. The Ministry of the Seas, Inland Water and Fisheries (MIMAIP) regulates fishing and is the government delegated regulatory authority of overall economic activity in Mozambique's oceans and inland waters; the Ministry of Land and the Environment (MTA), which regulates land use and conservation-related activities; the Ministry of Tourism and Culture (MICULTUR) regulates tourism-related activities; the Ministry of Transport and Communications (MTC) regulates shipping; the Ministry of Energy and Mineral Resources (MIREME) regulates oil and gas, mining, including seabed mining; the Ministry of Industry and Trade (MIC) regulates commercial activities along the coast; the Ministry of Public Works, Housing and Water Resources (MOPHRH) regulates wastewater and sewage; the Ministry of Agriculture and Rural Development (MADER) regulates agriculture, which has pesticides and fertilizers that may run off into the ocean. These are a few examples, and there are other Ministries that have some oversight on the economic activities that may have an impact on Mozambique's coastal and marine assets.



The complex set of rules and a wide variety of institutions that regulate economic activities in Mozambique's ocean and along the coast is too vast to include in this current desk study. We will instead provide a brief overview of a few of the primary ministries that regulate the blue economy and activities that might impact coastal and marine ecosystems.

MIMAIP recognized the critical need for Ministries to coordinate on design and implementation of marine-oriented laws and

regulations. Because of the wide array of legislation and Ministries involved with blue economy governance, and because of the lack of proper coordination on blue economy governance, the government recently created an entity under MIMAIP, called *ProAzul*, to help with coordination of blue economy governance and oversight.[153] We do think a comprehensive mapping of legislation and regulatory oversight of Mozambique's ocean resources would be a useful exercise. Annexes 1 and 2 provide an overview of some of the main legislation and international agreements, both within and outside of the protected area framework.

The following is a list of key actors, frameworks, and laws for reference:

Ministry of the Seas, Inland Water and Fisheries (MIMAIP)

MIMAIP was created by Presidential Decree no. 17/2015, of March 25 and is the government delegated regulatory authority of overall economic activity in Mozambique's oceans and inland waters, with broad powers for coordinating any activity along the coast and in Mozambican waters as per the Public Administration Inter-Ministerial Commission's Resolution 12/2015. MIMAIP directs, coordinates, plans and ensures the implementation of policies, strategies and activity plans concerning sea, inland waters and fisheries. The resolution provides details of all of MIMAIP's competencies and we will only summarize a few here. It is Mozambique's focal point and authority for all matters of the sea, and as such, MIMAIP regulates fishing and authorizes concessions and research in maritime waters. It issues opinions and recommendations on building of any infrastructure (e.g., oil rigs, ports, etc.) in the sea and other activities that require the use of the sea and may impact marine ecosystems. It also coordinates regulation around marine pollution and sustainable use of marine resources. It researches the impact of marine-based activities and monitors impacts of such activities on Mozambique's marine resources. And MIMAIP is responsible for applying and ensuring compliance with national legislation and international conventions related to maritime affairs that the country has ratified.

The Fisheries Research Institute (IIP) undertakes scientific research of fisheries in Mozambican waters to ensure sustainable fish stocks, which is used to inform policy and issuance of fishing licenses. IIP, with support from WCS, is currently finalizing a National Strategy and Plan of Action for Coral Reefs (NSPOA-CR). The National Fisheries Administration (ADNAP) handles the fisheries licensing systems and the National Development Institute of Fisheries and Aquaculture (IDEPA) supports the development of infrastructure for small-scale fisheries and aquaculture.

The Blue Economy Development Fund (ProAzul)

At the end of November 2019, the government issued Decree 91/2019 of 27 November which created *ProAzul*. The Fund for the Development of the Blue Economy, or *ProAzul,* has the mandate to coordinate activities and increase financing for sectors that make up the blue economy.[154] *ProAzul* replaced the Fisheries Promotion Fund (FFP), which was thought to have too narrow of a focus on just fishing. *ProAzul* is overseen by MIMAIP and was created to more broadly cover all blue economy sectors and implement the Government's Sea Policy and Strategy (POLMAR), coordinate government, the private sector and civil society and ensure sustainable blue economy and use of Mozambique's marine and coastal resources.

[153] ProAzul is the Fund for the Development of the Blue Economy (Fundo de Desenvolvimento da Economia Azul).

[154] Decree 91/2019 of 27 November for the creation of ProAzul.

Growth Program in the southwestern Indian Ocean "SWIOFish1" also runs through September 2021 and is funded by the World Bank (US$ 37 million) to support sustainable development of the region's fisheries sector by improving efficiency in the management of selected priority fisheries; and (3) MaisPeixe Sustentável is a matching grant program for artisanal fishermen, SMEs and other fisheries value chain actors in Nampula, Zambezia and Sofala to improve sustainable fisheries practices. The International Fund for Agricultural Development's (IFAD) new US$49 million Small-scale Aquaculture Development Project (PRODAPE) was launched in February 2020 and aims to move the aquaculture sector from a subsistence basis to a commercial level. PRODAPE will be technically managed by IDEPA and the financing component will likely be managed by *ProAzul*. The establishment of *ProAzul* seems well worth it given the breadth of blue economy sectors and a lack of coordination among those sectors. As *ProAzul* is a new institution, evaluation of its ability to fulfil its mandate remains to be seen, but we think it presents a good partnership opportunity for donors.

Marine Spatial Planning (MSP) under MIMAIP

In June 2019, development of the Mozambican Marine Spatial Plan (POEMN) for the Ministry of the Sea, Inland Waters and Fisheries began. The POEMN is financed by the Fisheries Development Fund, with a contract of more than USD 3.5 million, under the World Bank's Project on Governance and Shared Fisheries Growth (SWIOFish), which supports the sustainable development of the fishing sector. The work is being led by TPF and is expected to be complete by June 2021.[155] Marine spatial planning is a tool to assist in a multi-stakeholder planning process. It provides for operationalizing an ecosystem approach through a planning process involving all stakeholders. Through MSP, stakeholders can put forward a vision for a marine area; identify where human activities (including offshore energy, shipping, fishing, aquaculture, tourism, and mining) currently occur and where it might be desirable for them to occur in the future; and identify actual or potential conflicts between different ocean-related uses and human activities and desired conservation outcomes. The resulting spatial plan can provide for sustainable use, while also conserving specific areas through MPAs and

[155] TPF Consultants website: https://www.tpf.pt/en/mozambican-marine-spatial-plan-c-1892-2--45-110-3.html

other appropriate measures in a manner that avoids potential conflicts. MSP stakeholders include all ocean users and those who depend on a healthy ocean environment. Broad stakeholder involvement is important for the long-term success of MSP. The POEMN will fit into the National Territorial Development Plan (PNDT) which is the overall territorial planning system, and which is currently being developed by the Ministry of Land and Environment (MTA).

Key Marine Legislation

While Annex 1 provides an overview of some of the main legislation, both within and outside of the protected area framework, a few key pieces of legislation are worth highlighting here:

Law of the Seas

The Law of the Sea, Law 20/2019 (replaces the Sea Act 4/1996) governs all sea matters, includes Mozambican coastline, and provides the authorization for expansion of blue economy activities, subject to specific regulations that govern each blue economy activity. The Law of the Seas also adopts the Ocean Policy and Strategy (POLMAR) and creates the National Fisheries Council (CNM).

Ocean Policy and Strategy (POLMAR)

The ability to regulate the variety of blue economy sectors (e.g., fisheries, shipping, tourism, oil and gas, research, etc.) requires the coordination of various parts of government and an integrated approach. The POLMAR is the guiding strategy and policy for developing Mozambique's blue economy in a sustainable fashion. It provides a strategy for the promotion, growth and competitiveness of a sustainable blue economy. The POLMAR outlines the national agenda for the sustainable multi-sector management of coastal and marine areas, access and use of coastal and marine renewable and non-renewable resources, and guides the development and implementation of sector-specific policies.

National Ocean Council (CNM)

Article 81 of the 2019 Fisheries Law created the National Oceans Council (CNM - Conselho Nacional do Mar), which is charged with implementing the POLMAR and keeping the government informed on ocean related activities, including marine conservation. While the CNM has not officially been operationalized, it is expected to start functioning in the near future.

Fisheries Law

Mozambique updated it's old Fisheries Law, Law 22/2013 in October 2020 and passed the new General Regulation of Maritime Fisheries (REPMAR) Decree 89/2020.[156] The new REPMAR establishes the rules to be followed while fishing in marine waters of Mozambique. It sets the fishing gear and the type of requirements of vessels allowed in maritime waters, as well as surveillance actions of the

[156] Decree 89/2020 Maritime Fisheries Law.

activity. It addresses the creation of areas for the preservation of fishery resources (marine parks, marine reserves and marine protected areas). It sets the obligatory use of devices to protect endangered species (e.g., Turtle Exclusion Devices) and focuses on efforts to reduce by-catch. Addresses the possibility to create artificial reefs. The new fisheries law also provides protection to manta rays and whale sharks and other species. And the law focuses on community marine conservation areas.

Marine Scientific Research (RECIM)

A new decree (Decree 30/2019 of 19 April) was passed in 2019 that allows for marine scientific research and gives MIMAIP the authority for regulating the sector.

Marine Spatial Planning

The legal regime for use of maritime space (RJUEM), Decree 21/2017 - outlines the role of marine spatial planning to guide development in blue economy activities. A Marine Spatial Plan (POEMN) is currently being developed and is expected to be completed in 2021, which will flow into the National Territorial Development Plan (PNDT) - the overall territorial planning system that is currently being developed by MTA.[157]

National Strategy and Plan of Action for Coral Reefs (NSPOA-CR)

IIP is working with WCS to develop the NSPOA-CR to help address issues around coral reefs throughout Mozambique, such as degradation of coral reefs and related ecosystems. The NSPOA-CR aims to address a general lack of knowledge, data and monitoring as well as capacity to implement research undertaking. It also makes recommendations on the legal framework that needs to be updated to further coral reef protection. Allen Coral Atlas have developed high resolution maps of coral reefs (up to a maximum depth of 10 meters) to assist with the effort, and the NSPOA-CR also aligns with the work CORDIO is doing with funding from Norad on IUCN Red-listing of Ecosystems, which includes coral reefs, in East Africa.[158]

Other marine related legislation

There is a multitude of other legislation related to blue economy activities, such as shipping, tourism, coastal development, marine research, oil and gas, etc. There also exists legislation that potentially affects marine ecosystems, such as agriculture, mining, sewage and waste treatment, etc. And a host of sectors include environment impact assessments, which can take into account effects on marine ecosystems. An overview is provided in Annex 1.

Key International Marine Conventions

Mozambique is also a signatory to a variety of critical international agreements and treaties that relate to the blue economy. Mozambique ratified the United Nations Convention on Biological Diversity (CBD) in 1995 and the United Nations Convention on the Law of the Sea (UNCLOS) in 1997. Mozambique has also adhered to various United Nations Environment Program (UNEP), Food and Agriculture (FAO), Southern African Development Community (SADC), Indian Ocean Tuna Commission (IOTC) and New Partnership for African Development (NEPAD). Annex 2 lists the main international marine agreements Mozambique has joined.

---

157 Ministry of Land and Environment (MTA), he National Plan for Territorial Development (PNDT) - Plano Nacional de Desenvolvimento Territorial | República de Moçambique.

158 IUCNs Red List of Ecosystems is a framework for assessing the conservation status of ecosystems. It is a tool used to identify ecosystems most at risk of biodiversity loss using a standard similar to that for the Red List of species. It uses a classification system such as Not Evaluated (NE), Least Concern (LC), Endangered (EN) through to Collapse (CO).

Ministry of Land and the Environment (MTA)

The other key pillar for marine governance, and especially on the marine conservation side, is the Ministry of Land and Environment (MTA). MTA oversees environmental licensing, establishing biodiversity policy and setting land policy and managing all issues related to land. On the environmental side, the National Directorate of Environment (DINAB) handles issues related to the environment and biodiversity, including managing the environmental impact assessment (EIA) process, carbon offsets and awareness raising nationally on environmental issues. On the land side, the National Directorate of Land (DINAT) handles the national land cadastral record system and approves applications for land over 1,000 hectares, as land administration falls to provincial administrations and decentralized municipalities. However, DINAT provides technical guidance to the District Planning and Infrastructure Service (SDPI) and cadastral services in municipalities. The National Directorate of Resettlement and Territorial Planning (DINOTER) has the environmental inspection responsibilities for large-scale land projects, and a coordinating/technical support role in the context of land use planning activities carried out by decentralized authorities. The National Agency of Environmental Quality Control (AQUA) helps develop and monitor environmental quality standards and undertakes research on air, soil and water quality standards. The National Fund for Sustainable Development (FNDS) also reports to MTA. FNDS promotes and finances a range of projects that contribute to the sustainable development of Mozambique and recently moved from MTA to MADER.

The National Agency for Conservation Areas (ANAC)

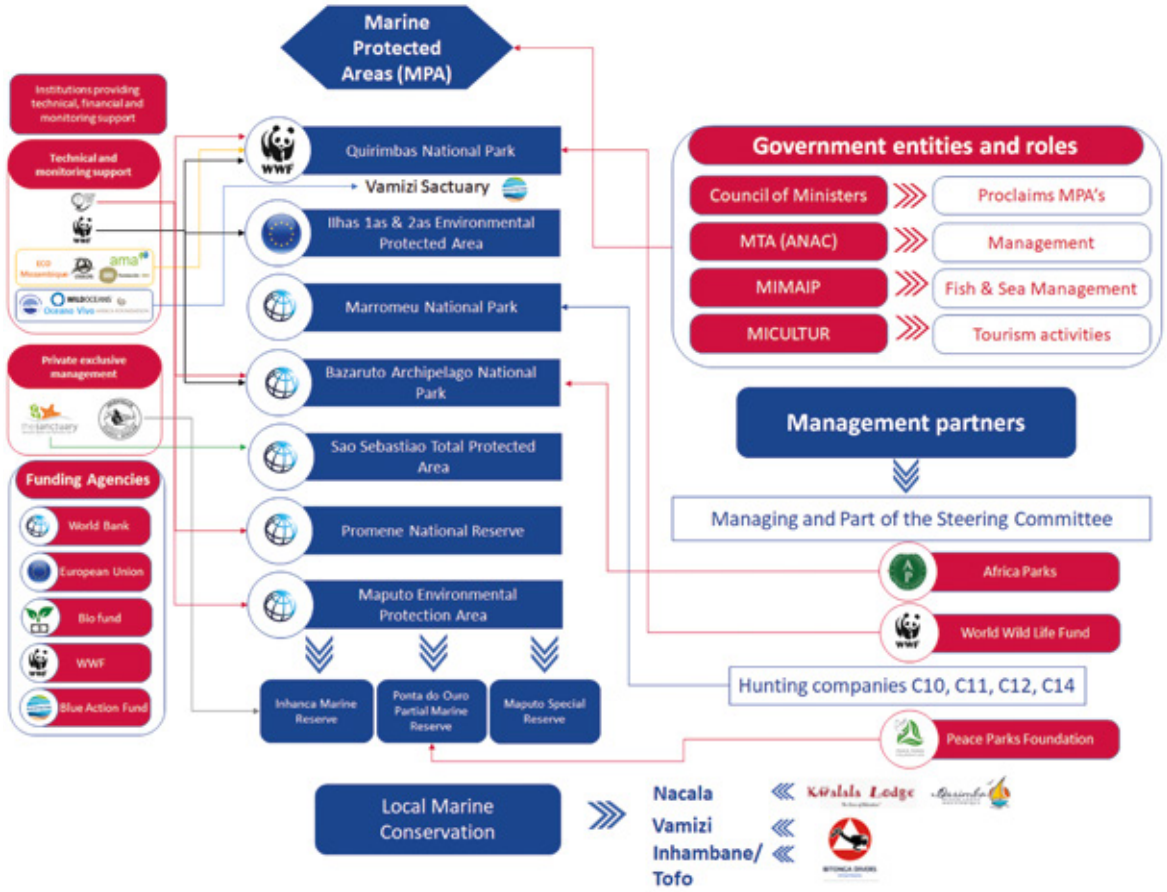
ANAC administers all conservation areas in Mozambique and is responsible for approving new conservation areas, including all marine protected areas, as well as approving and promoting investment into conservation area management. A recently established Business Partnerships Office (BPO) was created and is supported by Space for Giants with funding from the World Bank. The BPO office has a specific mandate for promoting investment into MPAs.

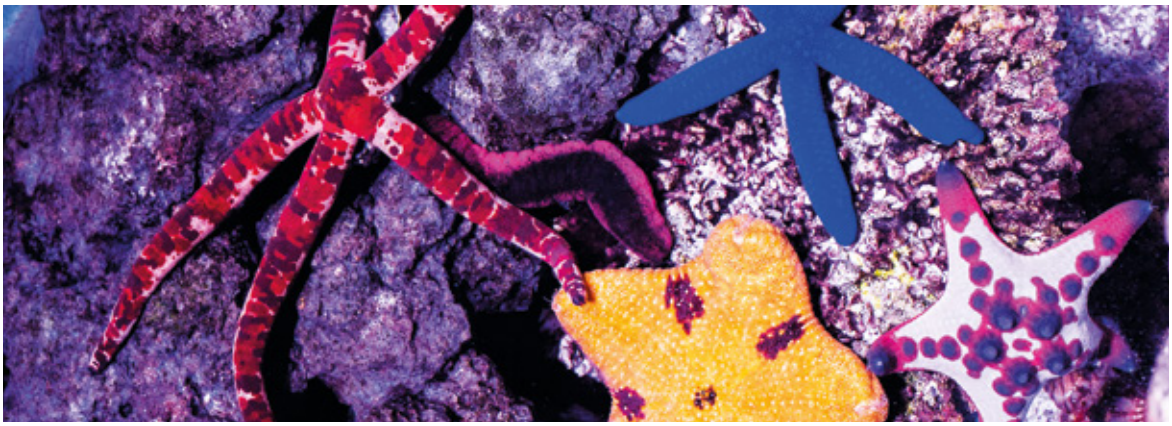
3.2 Governance Structure: Inside the Country's MPAs

The gold standard for the regulation of blue economy activities, marine conservation, and establishing marine tenure, provided there are sufficient resources so as not to create "paper parks", is designation of a marine protected area (MPA). Once an area is designated as a protected area, coastal and marine conservation activities and management of economic activities in protected areas falls to the Ministry of Land and Environment (MTA), and specifically to the National Administration for Conservation Areas (ANAC). But currently only a very small amount of Mozambique marine and coastal areas has protected status - 2%. Strategic Objective #188 of Mozambique's new 5-year Plan 2020-2024 has a goal of increasing the marine reserves under protection from 2% to 10%. But even then, 90-98% of Mozambique's ocean resources are not under any sustainable conservation or management.

The primary piece of legislation governing marine conservation and economic activities in designated seascapes is the Law on the Protection, Conservation and Sustainable Use of Biological Diversity (Law Nr. 5/2017 of 11 May), which applies to natural assets and resources on land and in the ocean.[159] It sets out a series of designations for protected areas, which comprises marine protected areas, and which we outline in Table 2. Figure 3 below illustrates how the current 7 MPA's in Mozambique are governed.

FIGURE 3. Mozambique's Marine Governance Map





[159] Law on the Protection, Conservation and Sustainable Use of Biological Diversity (Law Nr. 5/2017 of 11 May).

TABLE 2. Types & Characteristics of Marine Protected Areas in Mozambique

Legal Designation	Natural Reserve	National Park	Special Reserve	Environmental Protection Area	Sanctuary / Total Protection Zone	Community Conservation Areas
Marine Protected Area		Bazaruto, Quirimbas	Maputo, Marromeu, Pomene, Ponta do Ouro	Primeiras and Segundas, Maputo	Cabo Sao Sebastiao, Vamizi	Inhambane (Marragane, Ponto Cais, etc.) recognized by MIMAIP. Nacala, Vamizi, informal CCAs
Other designations	n/a	n/a	Partial Reserve	n/a	Total protection area	Locally managed areas
Classification of protection zones	Total conservation areas	Total conservation areas	Conservation area of sustainable use	Conservation area for sustainable use	Conservation area for sustainable use	Conservation area for sustainable use
Criterias for establishment (assets)	Preservation of nature, maintain functioning of ecosystems and endangered or rare species	Propagation, conservation, preservation and management of wildlife & protection of places, landscapes	Protection of a specific species of rare fauna or flora, endemic or in danger of extinction.	Protection of species and habitat	Reproduction, shelter, feeding and research of certain species of fauna and flora	Varies depending on 2017 Conservation Law and local government
Ownership	State	State	State or Private Sector	State or Private Sector	State or Private Sector	State or community
Management system	Co-Management	Co-Management	Co-Management	Co-Management	Co-Management	Community or private sector
Responsible for enforcement	Government	Government & partner	Government & partner	Government & partner	Government & partner	Government & partner
Economic Activities	Limited eco-tourism	People allowed under controlled conditions; Lodge and other recreational establishments permitted	Activities allowed and-exploitation of resources permitted as per the approved Management Plan.	Activities allowed and-exploitation of resources permitted as per the approved Management Plan.	Activities allowed and natural resources (other than the protected) can be exploited;	Not defined by the Law. The use and management of natural resources is done in accordance with the customary rules and practices
Fishing	Not allowed	Subsistence only	Subsistence only	Subsistence only	Yes	TBD Through the Management Plan
Boating	No	Yes	Yes	Yes	Yes	TBD Through the Management Plan
Diving	No	Yes	Yes	Yes (only for ecotourism purposes)	Yes	TBD Through the Management Plan
Sport Hunting	No	No	Yes	No	No	TBD Through the Management Plan

Legal Designation	Natural Reserve	National Park	Special Reserve	Environmental Protection Area	Sanctuary / Total Protection Zone	Community Conservation Areas
Tourism/ Ecotourism	Only eco-tourism is permitted	Yes	Yes	Yes (both consumptive and non-consumptive tourism)	Yes	TBD Through the Management Plan
Installation of tourist facilities	No	Yes	Yes	Yes	Yes	TBD Through the Management Plan
Aquaculture (small and medium scale)	No	TBD	TBD	Yes	TBD	TBD Through the Management Plan
Other recreational activities	No	TBD	TBD	TBD	TBD	TBD Through the Management Plan

3.3 Community-Based Coastal Resource Management (CBCRM)

Involving local communities in establishing marine tenure, managing marine resources and empowering communities to make decisions and benefit from conservation initiatives is international best practice and allowed under Mozambique's 2017 Conservation Law. The International Union for Conservation of Nature (IUCN) has recognized community conserved areas as one of the official categories of protected area. In line with this approach by IUCN, the Mozambican Conservation Law 5/2017 provides new opportunities for community based coastal resources management (CBCRM) through the establishment of Community Conservation Areas (CCAs) as a category of Protected Area.[160] The 2018 SPEED+ study on co-management in Mozambique recommended the use of delegated management models to allow communities to take on a more prominent role in the sustainable use of natural resources.[161] Co-management involves vesting delegation of management responsibility and authority between the local level and the state level. Co-management can serve as a mechanism for both management of a coastal resource and for community and economic development by promoting participation of users of coastal resources and the community in actively solving problems and addressing needs.[162]

The new General Regulation of Maritime Fisheries (REPMAR) Decree 89/2020 as well as the Conservation Law 5/2017 allow communities to form community conservation areas (CCAs) for sustainable use whereby one or more local communities are vested with the right to use and benefit from the area for the conservation of fauna and flora and sustainable use of natural resources. According to the laws, the community can enter into agreements and contracts with the private sector for the commercial use of natural resources and charge use fees which accrue directly to the community. The process for establishing a CCA is a lengthy one requiring technical expertise to support communities in making their application to ANAC. A considerable amount of information

MARINE COMMUNITY CONSERVATION AREAS (MCCA'S)

27

number locally managed marine protected areas we've counted. Each face challenges because they are not nationally recognized.

160 Jones, Brian, et. al. Co-Management Governance and Legal Frameworks for Community Conservation Areas in Mozambique, USAID SPEED+, 2020.

161 Lindsey, Peter an Baghai, Mujon, Co-Management Models for Conservation Areas in Mozambique Report, USAID SPEED+, 2018.

162 Pomeroy, Robert S., Community-based and co-management institutions for sustainable coastal fisheries management in Southeast Asia, Ocean & Coastal Management, Vol. 27 Issue 3, pp. 143–162, 1995.

is required for supporting documents and a process of consultation in the community will be required to gain community consent for the CCA to be formed. The regulations indicate that partnerships with the private sector be concluded before the CCA is approved. Annex 3 provides a process map that outlines the process under the law for how CCAs can be formed.

While it is a lengthy, complicated and cumbersome process to receive national protected status as a CCA under the 2017 Conservation Law, there are examples of locally managed Marine CCAs (MCCAs) that have been formed, and even recognized, at the national and district levels. Community Fishing Councils (CCPs), in collaboration with the private sector (either lodges, dive centers or NGOs), and sanctioned by either/or the Provincial Directorate for MIMAIP, municipal governments or village chiefs.[163] In the forthcoming Western Indian Ocean Marine Protected Areas Outlook report, Marcos Pereira notes a few of these "non-formal protected" CCAs, and also notes that information regarding management and governance, funding, mapping and other details, is poorly documented in these areas.[164]

An overarching challenge with all non-formal MCCAs is the lack of national protection, park wardens and other resources required to adequately protect and manage the resource. In numerous instances, this lack of a national and formal protection can lead to damage of the resource if and when a community deems appropriate - for instance, during economic hardships such as COVID-19. We outline a few of these challenges below.

Nacala

The area from Nuarro down to Nacala is extremely rich for marine biodiversity. It has frequently been cited as a possibility for marine protected areas, with Kenneth Tinley proposing the area around Nacala for MPA status as early as 71. The authors visited Nacala in 2019 and saw some of the sanctuaries in operation. However, more research is necessary to document these additional non-formal MCCAs. In addition to better understanding the non-formal MCCAs in Nacala, efforts from NGOs like WWF or RARE in building the capacity of local fishing associations might be useful as a first step to advancing these micro MCCAs in Nacala:

- ***Nuarro Marine Sanctuary*** - The authors spoke with the manager of Nuarro, Tibea Hammann, who confirmed that a small MCCA was set up with the help of marine biologist Yara Tibirica in 2017. Nuarro worked with Lurio university in Pemba to establish relationships with the local fisheries and marine authorities to set up the Nuarro marine protected area. There are 5 dive sites that are inside the protected area.

- ***Bonita Marine Sanctuary*** - is a small (450m in length by 150m depth) non-formal marine protected area advanced by Kwalala Lodge. Kwalala has worked to get the sanctuary acknowledged locally by the provincial maritime department and the Nacala Fishing Association (ASSOPENA). Users that visit the sanctuary pay a fee to Kwala Lodge, which in turn pays ASSOPENA who works to manage and police the sanctuary.

---

163 Note there are multiple terms we've encountered that are used for essentially the same idea: locally managed marine areas (LMMAs), non-formal protected areas (NFPAs), Community Based Coastal Resources management (CBCRM), etc. We've elected to use Marine Community Conservation Areas (MCCAs) to help promote greater recognition of formal community marine protected area status, which we believe can be achieved under the 2017 Conservation Law.

164 Pereria, Marcos. Western Indian Ocean Marine Protected Areas Outlook. Mozambique Chapter. Forthcoming, 2020.

165 https://kwalala-lodges.com/

ASSOPENA can fine fishermen if they find nets around the reserve. Kwalala Lodge is working on awareness and capacity building of ASSOPENA and local fishermen, as well as working on coral gardening around the reef. Their work has led to improvements: Kwalala lodge reported to the authors they have seen coral growth, more shoals, more species, and better health of the marine ecosystem, which in turn is helping local fishermen to catch fish. Kwalala lodges would like to extend the reef to 1km in length. The authors were amazed by the health of the reefs and the variety of marine life in the sanctuary.

- *Ossimba Marine Sanctuary* - follows the same model as the Bonita Sanctuary and is spearheaded by Ossimba Lodge, 13kms from Kwalala Lodge.[166] The Mulula Sanctuary is more remote and has less population pressure. Ossimba Lodge is working with a different fishing association to build capacity and monitor the reef.

- *Other Nacala Marine Sanctuaries* - The owner of Kwalala Lodge confirmed the existence of 6 other micro MCCAs in Nacala: Libélula, Melala, Naharenque, Muzuane, Massingirini and Nachiropa. As with virtually all of these small, non-formal MCCAs, there have been challenges in managing the sanctuaries, particularly in monitoring fishing in the sanctuaries. The authors saw multiple fish traps and nets while diving in the sanctuary. We also heard that in early 2020, a guard at the Melala sanctuaries chased away a fisherman that was encroaching the boundaries of a sanctuary, which upset the local fisherman, who retaliated by destroying part of the sanctuary.

Inhambane & Vilanculos

The authors know of two non-formal MCCAs in Inhambane Bay and in Zavora and one in San Sebastian.

- *Inhambane Bay* - There is a group of nine small community sanctuaries in Inhambane Bay: Marragane, Guindziwe, Ponte Cais, Guilalene, Guidzivane, Marambone, Mahigo Mbate, Mandzenika, Nha Dzi Sector). According to Pereira, these sanctuaries are In the process of being gazetted under the Fisheries Law (Law 22/2013 of 1 November) and Conservation Biodiversity Law (Law 5/2017 of 11 May). Bitonga Divers and Ocean Revolution are leading the efforts, together with the support of the Community Council for Fisheries Management and the Community Fisheries Council.

- *Zavora* - The authors were told in an interview with Yara Tibirica and Nakia Cullain from the Marine Lab in Zavora that a non-formal marine CCA was formed to protect one of the famous rock pools for mussels.[167] The village chief of the area controls access to the mussels, and only on certain dates are people allowed to go to harvest. Women mainly harvest the mussels and people come from far away. The small fee that is charged to harvesters is used to help purchase equipment and labor necessary to protect and maintain the mussel reefs. While we have not been there to see first-hand this example, we do think it is worthwhile investigating more.

- San Sebastian - Dr. Andrea Marshall of Marine Megafauna Foundation told us about an MCCA in San Sebastian where

166 http://ossimbabeachlodge.com/

167 http://marineactionresearch.com/

a contract was signed with provincial representatives of MIMAIP, the CCP and private sector operators in San Sebastian. The MCCA was working well for years, protecting a small rock pool, and species thrived in the protected area. But because of the economic challenges brought about by COVID-19, we were told the community got frustrated and decimated the species in the protected area through the use of nets, and the communities are now complaining they cannot find fish anymore.

Northern Quirimbas Islands

Non-formal marine CCAs also exist north of the Quirimbas National Park, in the northernmost set of islands in the archipelago.

- ***Vamizi*** - Established in 2002, the &Beyond resort on the island of Vamizi has spearheaded marine conservation efforts on and around the island through its Friends of Vamizi and the island's Research Center. The Friends of Vamizi, together with the local Fisheries Council (CCP), established a marine sanctuary that surrounds much of the eastern side of the island and extends three kilometers out to sea and represents a "no-take" fishing zone. It is policed by the CCP. Vamizi has hosted numerous NGO and research activities through the years that have chronicled the positive effect the non-formal marine protected area has on increasing the health and abundance and distribution of reef fish and corals in the sanctuary.[168]

- ***Northern Quirimbas*** - According to Pereira (2020) there exists six small community sanctuaries in the northern Quirimbas: Nsangue, Quifuque, Lalane, Malinde, Quiwia. These non-formal marine CCAs are not formally recognized by a national authority and are managed by local fishing community councils supported by AMA (a national NGO) and CORDIO.

3.4 Other Key Ministries & Institutions

As outlined in Figure 2, Marine Sector Governance Organigram, there are many institutions involved in the marine sector and marine conservation governance in Mozambique. We provide a brief overview of some of the main government and non-governmental institutions. This is not meant to be an exhaustive list, but rather a general overview. All have a tangential or direct link to blue economy governance, and as such, should start to develop some minimal capacity at understanding marine sector governance.

Ministry of Agriculture and Rural Development (MADER)

The Ministry of Agriculture and Rural Development (MADER) regulates agriculture, an industry which uses pesticides and fertilizers that may run off into the ocean. The Directorate of Agricultural Services (DNSA) has the responsibility to ensure adequate infrastructure is in place and rules are adhered to with regard to fertilizer and pesticide use. The National Cartography and Remote Sensing Centre (CENACARTA) provides mapping and GIS data through the purchase of

168 http://www.vamizi.com/

satellite data, as well as provides topographic and thematic maps. It is specialized in the treatment of geographic information and responsible for directing, coordinating and executing geo-cartographic and remote sensing activities at national level, disseminating remote sensing techniques in the country, acquiring, processing, and distributing geo-cartographic images and data obtained via satellite.

Ministry of Culture and Tourism (MICULTUR)

The Ministry of Culture and Tourism (MICULTUR) regulates tourism activities, including hotels and lodges, restaurants, including within Mozambique's conservation areas. The Minister also has a board seat on BIOFUND, a conservation trust fund in Mozambique (more on BIOFUND is provided towards the end of this section). The National Directorate of Tourism (DNATUR), is responsible for analysis and assessment of tourism investment initiatives including defining tourism investment zones. The National Institute of Tourism (INATUR), which reports to MICULTUR, promotes tourism, and has an Office for Coordination of Trans-Boundary Conservation Areas (ACTF), which promotes environmentally sustainable tourism.

Ministry of Transport and Communications (MTC)

The Ministry of Transport and Communications (MTC) has a broad mandate and sets policy and regulations for shipping and ports as well as for rail, air, postal and telecommunications. The two key departments related to the blue economy regulation are (1) the National Directorate of Surface Transport, which sets government policy on road, maritime, river, lake and port transport; and (2) the Directorate of Infrastructure, which sets government policy on infrastructure development for ports, maritime, rivers and lakes. MTC also oversees the National Naval Institute (INAMAR), the regulatory body for maritime safety, port facilities and vessels, maritime transport. INAMAR also regulates pollution from ships and oil/gas platforms in the ocean and has a mandate for rules and standards related to pollution at sea. INAMAR is also responsible for authorizing and monitoring dredging activities at both ports and inland waters. The National Institute of Hydrography (INAHINA) also reports to MTC, and oversees oceanography, hydrography and maritime navigation. INAHINA also provides technical recommendations to projects involving new dredging techniques, hydraulic maritime works and other works that could affect the hydrographic patterns of ports and coastlines. State Owned Enterprises (SOEs) are also overseen by the MTC and those that have a blue economy focus include: the Mozambique Dredging Company (Emodraga); Transmaritima, a Mozambican shipping company; and the Mozambique Railways Company (CFM), which handles rail, but is involved with port management. Recently, the Spatial Development Program (PDE) was created by MTC and hosts the National Geographic Information System Network.

Marine Maps

For maps, MTCs National Institute of Hydrography (INHAIA) and its recently created Spatial Development Program (PDE) are tasked with mapping data. The National Cartography and Remote Sensing Centre (CENACARTA), linked to the Ministry of Agriculture and Rural Development, handles satellite data and is reportedly developing a geographic information system (GIS) database. WCS is working on creating a series of Coral Maps to map corals along Mozambique's coast up to a maximum depth of 10 meters (32 feet) and has created a series of marine-related maps as part of the Key Biodiversity Areas (KBA) work WCS did with the USAID SPEED+ project in 2020. And as mentioned previously, development of a Mozambican Marine Spatial Plan (POEMN) for the Ministry of the Sea, Inland Waters and

Fisheries began in 2019 and is expected to be completed in June 2021. Once completed, the POEMN can inform the overall National Plan for Territorial Development (PNDT). EIAs also typically have detailed maps.

Ministry of Energy and Mineral Resources (MIREME)

The Ministry of Mineral Resources and Energy develops and implements policies relating to the exploration and production of mineral resources including minerals and metals. It also oversees the National Directorate of Geology and Mines which was established to manage and oversee the mining sector and is responsible for developing policy and regulating mining projects. The National Petroleum Institute (INP) manages upstream oil and gas exploration and production activities in Mozambique, both onshore and offshore. The INP regulates oil and gas operations and sets guidelines for public and private sector participation in the sector.

Ministry of Industry and Trade (MIC)

The Ministry of Industry and Trade (MIC) sets trade and industrial policy. With regard to blue economy sectors, the National Directorate for Industry (DNI) formulates and implements industrial policy on downstream agricultural industries, garment manufacturing, metals and metallurgy producers, wood product manufacturers, and supplying industries, industries that may be created in coastal regions.

Ministry of Public Works, Housing and Water Resources (MOPHRH)

The Ministry of Public Works, Housing and Water Resources (MOPHRH) sets policy and regulations for public works, buildings, roads and bridges, urbanization, housing, water resources, water supply and sanitation - all of which can have a potential impact on marine and coastal ecosystems throughout Mozambique. For instance, roads may have an impact on coastal development and access to coastal habitats, and lead to driving on beaches, which may impact turtle nesting sites. As such, the National Roads Administration (ANE), which reports to MOPHRH and which guides the development, maintenance and expansion of Mozambique's road networks, should understand the possible impacts of road development on marine ecosystems.[169] The Regional Water Boards (ARA) as well as the Water and Sanitation Infrastructure Administration (AIAS) and the Water Supply Investment and Heritage Fund (FIPAG) also report to MOPHRH and their activities may also impact marine ecosystems.

The Attorney General's Office (PGR)

The Attorney General's Office (PGR) has an Environmental Office. The USAID SPEED+ project has been working regularly with the office on prosecuting wildlife crimes through the development of a Rapid Reference Manual on Wildlife crimes. The PGRs office is a critical part of enforcing Mozambique environmental legislation. Most of the work with PGR to date has been on prosecution of terrestrial-related crimes, we think more work could be done on marine and coastal-related crimes.

The Prime Minister's Office

The National Council for Sustainable Development (CONDES) was established by Decree 40/2000 and the 1997 Environment Law to promote and coordinate all sectoral efforts towards sustainable use of natural resources. Its mandate is to promote dialogue on environment issues during the preparation of sector policies pertaining natural resources use and management and monitoring the implementation of all policies of relevance to environmental management. CONDES is an

[169] James Davis Reimer et al. Effects of causeway construction on environment and biota of subtropical tidal flats in Okinawa, Japan, Marine Pollution Bulletin, Volume 94, Issues 1–2, 2015, Pages 153-167.

advisory body of the Council of Ministers and is consulted for public hearings on environmental issues in order to ensure effective and proper coordination and integration of the principles and activities of environmental management in the development of the country. Originally, the Prime Minister as well as Ministers and Vice-ministers from 13 relevant sectors (agriculture, tourism, energy, mineral resources, planning and development, health, etc.) were members of CONDES, which is chaired by the Minister of Land and Environment. Three representatives each from academia, civil society and the private sector also participate in CONDES.[170]

In 2016, through Decree 19/2016 or 17 May, the composition of CONDES was adjusted by removing the Prime Minister's office and adjusted representatives of CONDES from Ministers to "representatives" of the same original ministries and sectors, eliminated the CONDES Secretariat and attached CONDES to MITADER.[171] CONDES has not met since 2010 when its Executive Secretary was transferred to be an adviser to MITADER, now MTA. The COMBO project recommended in 2018 that CONDES could serve an important role for inter-ministerial coordination on environmental issues, particularly reviewing EIAs.[172] The same report notes that more narrowly focused inter-ministerial coordination occurs around the environmental impact assessment process through Technical Assessment Committees (CTAs) that are formed and meet to review EIAs for specific projects.

In August 2020, the new Minister of Land and Environment (MTA), through Resolution 10/2020 of 6 May, re-established CONDES and held the first meeting of CONDES on August 7, 2020. The same resolution outlines the functions of CONDES, which are:

A. To guarantee coordination and integration of environmental management principles and activities in the country's sustainable development process;

B. To issue opinions on sectoral policies related to the management of natural resources;

C. Issue an opinion on proposals for legislation complementary to Law No. 20/97, of 1 October, including proposals to create or revise sectoral legislation related to the management of natural resources in the country;

D. To give its opinion on the proposals for ratification of international conventions, treaties and agreements relating to the environment;

E. To elaborate proposals for the creation of financial or other incentives to encourage economic agents to adopt environmentally sound procedures in the daily use of the country's natural resources;

F. To propose mechanisms for simplifying and streamlining the licensing process for activities related to the use of natural resources;

G. To issue opinions on conflicts of interest in the area of the environment.

---

170 Ecolex. information service on environmental law, operated jointly by FAO, IUCN and UNEP.

171 Ministries of: Economy and Finance; Agriculture and Rural Development; Transport and communications; Public Works and Housing; Industry and Trade; Sea, Interior Waters and Fisheries; Mineral Resources and Energy; Education and Human Development; State Administration. Also 3 representatives from the Ministry of Land and Environment; 3 representatives from University; and 3 from civil society and private sector.

172 COMBO Project (2018) Gap Analysis on Policy, Law, Capacity and Experience of the Government of Mozambique´s institutions to Deliver No Net Loss (or Net Gain) of Biodiversity. Project COMBO: Conservation, Impact Mitigation and Biodiversity Offsets in Africa. WCS/Biotope/Forest Trends, supported by AFD, FFEM and MAVA.

As CONDES begins to meet and reassert its role for coordinating sustainable use of natural resources, ensuring marine and blue economy activities, and capacity for addressing impacts on marine ecosystems by CONDES and its members, will be critical.

3.5 Local Governments

Local governments—10 provinces, 43 municipalities, and 128 districts—all have some level of responsibility and oversight in the marine governance process. Virtually all ministries involved in blue economy regulation have provincial directorates. In addition, municipalities have clear mandates for local traffic, water, drainage, markets, cemeteries, parks and green spaces licensing and regulation of private transport and licensing and regulation of buildings. Districts are responsible for services of local interest such as water, sanitation and garbage disposal, but these are provided at very basic levels or are almost nonexistent, because districts are mostly in rural areas and due to a lack of resources. Mozambique's new decentralization law instills a new Secretary of State in each province who is responsible for overseeing the ministerial provincial representatives and budgets.

3.6 Donors and Non-Governmental Organizations (NGOs)

There are a variety of donors and NGOs providing technical and financial support to the marine landscape in Mozambique. In our review, we came across a multitude of donors and NGOs, typically only providing small and targeted assistance to Mozambique, for example on marine monitoring (e.g. turtles), or on undertaking specialized reports, such as the Global Environment Facility (GEF), UN Environment or the IUCN for development the NBSAP or other specific reports and participation in global forums. A multitude of bilateral donors also have provided or are providing targeted assistance in the sector, such as AFD for biodiversity offsets through the COMBO project. And a variety of regional programs for the Indian Ocean include assistance to Mozambique. There are too many of these donors and NGOs to represent in this report, but we do think it would be useful to comprehensively map the actors and projects in the marine landscape at some point. In this section, we provide a brief overview of some of the major players providing sustained support in the coastal and marine sectors in Mozambique.

USAID

USAID is currently financing the Supporting the Policy Environment for Economic Development (SPEED+) Project, which includes over $10 million in assistance on biodiversity and conservation initiatives in Mozambique,

[173] World Bank. Mozambique Public Expenditure Review Addressing the Challenges of Today, Seizing the Opportunities of Tomorrow. Report No. 91153-MZ, World Bank 2014.

including this current report. Previously, USAID financed the $20 million Coastal City Adaptation Project (2015-2018) that worked with five cities — Pemba, Quelimane, Nacala, Mocimboa da Praia, and Ilha de Moçambique — to promote municipal-led climate adaptation activities, including a mangrove reforestation cost-benefit analysis. Since 2008, USAID has invested over $17 million into the conservation and community development of Gorongosa National Park, which is matched 1:1 by the Greg Carr Foundation; the newly awarded $20 million Resilient Gorongosa GDA will expand this approach into the western Zambezi River delta and coastal region. USAID has also invested $15 million in the Niassa Special Reserve, which is co-managed by the Wildlife Conservation Society (WCS) and a follow-on $10 million ECOSMART-2 project is planned. USAID funded the Northern Arc Tourism Project, which ended in 2010, focused in and around Pemba.

World Bank

The World Bank funds the Conservation Areas for Biodiversity and Development (MozBio Phase 2) project, which builds on the first phase of the project in providing support to Mozambique's network of national parks and reserves through strengthening management capacity and promoting nature-based tourism. The World Bank also funds the regional Fisheries Governance and Shared Growth Program in the southwestern Indian Ocean "SWIOFish1", which runs through 2021 and which supports the sustainable development of the region's fisheries sector by improving efficiency in the management of selected priority fisheries.

The World Bank is also currently developing two new projects related to the blue economy and fisheries: (1) the Sustainable Rural Economy Program, a US $150 million activity that will be divided into Phases. Phase 1 is expected to be approved in March 2021 and provide $25 million to fisheries and blue economy activities in the center and northern part of the country;
(2) the second is a Northern Rural Resilience Project, a $100 million project focused on Nampula, Cabo Delgado and Niassa and which is expected to dedicate some of the funding to fisheries and blue economy activities, and which is expected to be approved in July 2021.

Sweden

The Coastal Resilience to Climate Change project (CRCC) runs through 2021 and has a budget of USD $7 million from Sweden to improve the capacity of local people and authorities in coastal areas to work together in the sustainable management of natural resources. The program will prioritize intervention in the districts of Inhassoro, Dondo and Memba in the provinces of Inhambane, Sofala and Nampula. Sweden also supports RARE on small-scale fisheries projects throughout Mozambique.

Norway

Norway provides $300 million in annual support around oil and gas through its Oil for Development program, which includes Mozambique as one of fourteen beneficiary countries. Through its assistance, marine-related support is addressed.

The European Union (EU)

The European Union is gearing up to provide support to management of Ilhas Primeiras and Segundas MPA; details of the program design are not yet available.

The Foundation for the Conservation of Biodiversity (BIOFUND)

The Foundation for the Conservation of Biodiversity (BIOFUND) is a conservation trust fund that was created in 2011. BIOFUND supports and finances the conservation and activities geared towards the sustainable use of natural resources, including the national system of Conservation Areas. BIOFUNDs mandate also includes marine conservation. BIOFUND had

an endowment of $37 million as of December 2019 and has been able to raise another $30 million as BIOFUND has gradually become an attractive option to channel financial resources to the protected areas by donors. Part of BIOFUNDS current strategic plan includes advancing marine conservation.

World Wildlife Fund (WWF)

The World Wildlife Fund (WWF) is a non-profit dedicated to supporting conservation efforts. Its office in Mozambique was established in 2001. The WWF Program in Mozambique supports a number of initiatives in conservation of the marine environment, forests, water, environmental education and training, environmental journalism, community involvement and endangered species. On the marine side, WWF supports conservation efforts for sea turtles (green, hawksbill, olive Ridley, loggerhead, leatherback), dugong, whale shark, whales (humpback and mink), dolphins (humpback, spinner, common, bottlenose), and corals. WWF have activities in the Primeiras and Segundas on fisheries management in Lake Niassa, in the Zambezi Delta, in the Bazaruto Archipelago National Park and the Quirimbas National Park (though, given the recent violent extremism, WWF is shifting operations out of the Quirimbas), and in the Sofala Bank (dealing with shrimp fishing).

Wildlife Conservation Society (WCS)

The Wildlife Conservation Society (WCS) is another large non-profit that supports conservation and marine conservation efforts in Mozambique. WCS established a country program in Mozambique in 2012 and focuses on co-management of the Niassa National Reserve and strengthening national-level protected area management by helping to improve policies and reinforcing the government's ability to implement wildlife crime legislation through strategic engagement with government agencies in Maputo. WCS has supported efforts on utilizing carbon offsets through its COMBO project, and recently helped advance establishing Key Biodiversity Areas (KBAs) and an IUCN Red List for Mozambique through the USAID SPEED+ project. WCS has become more active on the marine conservation side in Mozambique, assisting the government with the research and support necessary to expand marine protected areas throughout Mozambique.

RARE

Rare runs its Fish Forever program in Mozambique and works with village groups, community fisheries councils and district governments to build and strengthen community-based fisheries management of Mozambique's coastal waters. Rare is helping establish marine tenure through managed access areas that provide fishing communities clear rights to fish in certain areas. They are working to create marine CCAs and community-led no-take marine reserves in order to replenish and sustain fish populations and protect critical habitats. Rare is also helping coastal fishing communities' access financial and market opportunities and mobilize public and private investments in marine areas in Mozambique.[174]

---

174 Rare website: https://rare.org/program/fish-forever-in-mozambique/

175 Marine Megafauna Foundation: https://marinemegafaunafoundation.org/

Conservation International (CI)

CI signed an MoU with ANAC in September 2020 that focused on the following work:

1. Facilitate a workshop with ANAC to bring together stakeholders and institutions to plan the early planning stages of the Save river - Zavora MPA, with the intent of supporting the development of the MPAs Integrated Management Plan, and application of fisheries improvement projects in the future.

2. Undertake a rapid fisheries assessment from the Save River to Pomene, with the intent to use this data to inform a Fisheries Management Plan for the MPA.

3. Perform, in partnership with NOAA, a marine management capacity assessment within ANAC and MIMAIP, with the intent to develop a fit for purpose, multi-year Marine Management Capacity Development Program for Mozambique.

As a trusted and neutral partner with global experience in Seascape design and implementation, CI is uniquely and strategically positioned to build a coalition of partners to establish and effectively manage the MPA.

Marine Megafauna Foundation (MMF)

The Marine Megafauna Foundation (MMF) has been working in Mozambique for 20 years and has offices in Bazaruto, Vilanculos, San Sebastian, Tofo and Zavora and soon to be in Pomene as a main office. MMF has about US $1 million in funding for the next few years to conduct work on manta rays, whale sharks, bull sharks, leopard sharks, devil rays, smalleye stingrays, wedgefish, as well as minor programs for potato grouper, other rays, and marlin. MMF educates the public and government to influence long-lasting conservation strategies. MMF. MMF also supports the scientific research, identification and knowledge necessary to create MPAs, and to help design the management plans for MPAs. MMF has a number of youth marine awareness and appreciation programs in Mozambique.

Other Marine-focused NGOs

As we mentioned previously, we've encountered numerous donors and NGOs working to provide assistance in the marine space in Mozambique - either through regional programs, or through dedicated in-country teams and programs, such as Dolphin Encounters in Ponta, Friends of Vamizi, etc. NGOs may work directly through MPA co-managers, such as African Parks, or Peace Parks, and include the Waitt Foundation, Foundation Ensemble and a variety of others.

167 Rare website: https://rare.org/program/fish-forever-in-mozambique/

168 Marine Megafauna Foundation: https://marinemegafaunafoundation.org/

3.7 Financing Marine Conversation

Financing is a critical component of marine conservation governance efforts. Wealthy nations are able to finance efforts through their national budgets. But less developed countries, such as Mozambique, require financial support. Typically, this has been done by donors and NGOs, but there are some new tools that can help finance marine conservation efforts, such as carbon offsets for "blue carbon", and blue bonds. And, as we mentioned previously, coastal and marine tourism can also support marine conservation efforts, as can overall business environment reforms that allow tourism, research and investment to flow into Mozambique. Blended finance, or combining donor finance with commercial finance, is another potential avenue for financing marine conservation. Donors could play a role in Mozambique by evaluating the potential of the blue bond market for Mozambique, and providing direct financing for marine conservation activities to unlock blended finance opportunities.

BLENDED FINANCE

$10
MILLION

amount of USAID's GDA to Gorongosa. USAID has been blending finance for years through GDA and credit guarantees

Donor Finance

Donors, whether development agencies, private foundations or NGOs, have traditionally provided assistance to Mozambique for these efforts. The World Bank has a large $84.15 million regional program that includes Mozambique - the Second South West Indian Ocean Fisheries Governance and Shared Growth Project (SWIOFish2) that provides support around fisheries resource management.[176] Norway provides support around Oil and Gas, which includes support for activities around marine conservation. The European Union is gearing up to provide support around Ilhas Primeiras and Segundas. And there are NGOs, such as WWF (Ilhas Primeiras and Segundas), Peace Parks (Ponto do Ouro), and African Parks (Bazaruto) providing large scale support on marine conservation. Wildlife Conservation Society is beginning to provide support on MPAs. And a handful of smaller private donors and foundations finance various smaller marine conservation efforts throughout the country, such as on Fire Island in the Primeiras and Segundas and Vamizi in the Quirimbas. We have not undertaken a comprehensive mapping of donor activity around marine conservation, but think such an activity, and efforts to coordinate donors on the marine conservation front, would be useful.

[176] https://projects.worldbank.org/en/projects-operations/project-detail/p153370

Blended Finance

Blended finance is the use of development capital to mobilize additional private finance. This blending of development capital and private capital allows entities with different objectives to invest alongside each other while achieving their own objectives (whether financial return, social impact, or a blend of both). The blended financial arrangement mitigates various financial risks that often prevent private capital from supporting a project. A development agency may provide guarantees, insurance, technical assistance grants and first loss capital from development agencies to get projects in motion. Blended finance holds potential for the marine conservation area.

For instance, in Section 1 on the Nacala seascape overview, we mentioned development of an artificial reef. Financial and in-kind contributions by Vale and Kwalala Lodge could be blended with assistance from a donor to make the artificial reef project a reality. The donor might provide technical assistance to move the project through the approval stage or support the environmental impact assessment. Vale is interested in contributing its tug boat and costs of preparing the boat for sinking, and Kwalala Lodge is prepared to provide technical assistance, but some of the other critical pieces to the project's success are missing, and a donor could provide these missing pieces that would provide numerous benefits if completed. The Ocean Investment Platform helps investors source deals, assess risks and returns, assess impacts, evaluate projects/ solution providers, and develop "blended" sources of finance for ocean sustainable development investment opportunities.[177]

PAYMENT FOR ECOSYSTEM SERVICES (PES)

$15

MILLION

amount Seychelles received in blue bonds, which helped pay for a marine spatial plan

Payments for Ecosystem Services (PES)

Payments for Ecosystem Services (PES) is an umbrella term used in which payments are made by one entity to another entity to reward that entity for conservation of ecosystem services. PES can be in the form of direct public payments by a government directly to the owners of an ecosystem to keep that ecosystem unharmed and operational in order to generate benefits, such as protecting wildlife, keeping flood plains open and other ecosystem benefits. PES also can refer to payments made by private organizations, such as NGOs or companies, to another entity to conserve an ecosystem. Certification programs, such as sustainably caught seafood, whereby consumers pay a premium for certified sustainable caught seafood, which is helping to protect ecosystems. And blue carbon offsets

[177] Ocean Investment Platform

is a voluntary trade of money to purchase offset credits, which are then used as a payment to protect valuable ecosystem services.[178]

Blue Carbon and Carbon Offsets

Carbon captured in oceans and coastal ecosystems is known as "blue carbon". Several key coastal habitats, such as sea grasses and mangroves, take carbon out of the atmosphere by absorbing it and "sinking" carbon into the soil, which is critical to mitigate the effects of global warming. Mangroves also provide at least US $1.6 billion each year in ecosystem services, which include: supporting fisheries by providing important spawning grounds for commercial fish species; filtering pollutants and contaminants from coastal waters and contributing to healthy coastal marine water quality; and protecting coastal development and communities against storms, floods and erosion and they present an important opportunity for ecosystem-based climate mitigation, which also preserves the essential ecosystem services of these habitats. Despite these benefits and services, coastal blue carbon ecosystems are some of the most threatened ecosystems on Earth, with an estimated 340,000 to 980,000 hectares being destroyed each year.[179]

Enter carbon offsets. A carbon offset is a fee one party pays to another party to "offset" their generation of carbon. That fee is then used to invest in and preserve ecosystems that sequester and sink carbon, such as mangroves and seagrass beds. If the value of the stored blue carbon could be quantified, payments could be paid to communities involved in managing and conserving these habitats through a "carbon market approach." Blue carbon credits could then be traded and handled much like green carbon currently is (such as forest carbon under the UN collaborative initiative on Reducing Emissions from Deforestation and Forest Degradation) and entered into emission and climate mitigation protocols along with other carbon-binding ecosystems.

In practice, however, blue carbon has not yet been fully included in emissions accounting and that standards for blue carbon markets are still in their infancy. Some blue carbon pilot projects are currently underway, and research on carbon storage capacity of coastal ecosystems is being undertaken. For instance, a project to restore 1,000 acres of tidal wetland using the Verified Carbon Standard VM0033 Methodology for Tidal Wetland and Seagrass Restoration to finance the restoration through carbon offset credits is underway in the US state of Massachussettes.[180] The COMBO project, funded by the French Development Agency (AFD), The French Fund for World Environment (FFEM) and the Mava Foundation, was run by WCS-Mozambique nded in 2019 the project's focus was to advance carbon offsets in the country. The project produced a report entitled "A National Biodiversity Offset System: A Road Map for Mozambique".[181] There are a few good case studies on how to materialize blue carbon offsets, for instance in Kenya, where a woman's organization was able to secure $12,500 in blue carbon credits for protecting and caring for mangrove forests.[182]

Nevertheless, carbon absorption is clearly one of the critical ecosystem services that must be quantified and valued (along with other services such as shelter, resilience to erosion, source of food, and so on), with the potential for a whole blue

178 Smith, S., Rowcroft, P., Everard, M., Couldrick, L., Reed, M., Rogers, H., Quick, T., Eves, C. and White, C. (2013). Payments for Ecosystem Services: A Best Practice Guide. Defra, London.

179 Blue Carbon Initiative https://www.thebluecarboninitiative.org/

180 Herring River Restoration Project

181 Wildlife Conservation Society (WCS) - A National Biodiversity Offset System: A Road Map for Mozambique

182 Wylie, Lindsay et. al., Keys to successful blue carbon projects: Lessons learned from global case studies, Marine Policy, Volume 65, 2016, Pages 76-84.

carbon sector to emerge eventually, particularly as carbon prices on the voluntary or compliance markets increase. Donors can play a role in beginning the necessary work to quantify marine ecosystem services and evaluate the potential of carbon offsets and assist in structuring blue carbon offsets for the marine sector in Mozambique.

Blue Bonds

Investors are committing capital to help solve environmental challenges and blue bonds have emerged as a financing instrument to help protect the world's oceans and the economies that rely on their health. The blue bond is a debt instrument issued by governments, development banks or others to raise capital to finance marine and ocean-based projects that have positive environmental, economic and climate benefits. Bond sales are facilitated by multilateral institutions including the World Bank and the African Development Bank, and in 2019, for the first time, underwritten by a private financial firm, Morgan Stanley.[183] Seychelles was the first country to issue $15 million in blue bonds with support of the World Bank, which was used partly for development of a marine spatial plan.[184] The Nordic Investment Bank, The Nature Conservancy (TNC) and others are all now offering or planning on offering blue bonds for marine and ocean-based projects. Given Mozambique's history with the "tuna bonds", issuance of blue bonds may be far on the horizon, but with Mozambique's enormous coastline and marine assets, blue bonds should be on the financing menu in Mozambique.

Debt for Marine and Coastal Nature Swaps

Debt for coastal/marine nature swaps allow a country to redirect a portion of its current debt payments to fund nature-based solutions to climate change, including marine spatial planning and networks of marine protected areas. For example, the Seychelles completed a $30 million debt for conservation swap in exchange for the government's commitment to enhance marine conservation and climate adaptation, including protecting important tuna feeding grounds. The initiative will also establish a permanent endowment generating sustainable financing for marine conservation and climate adaptation activities in the Seychelles.

Insurance for Protecting Marine Ecosystem Assets

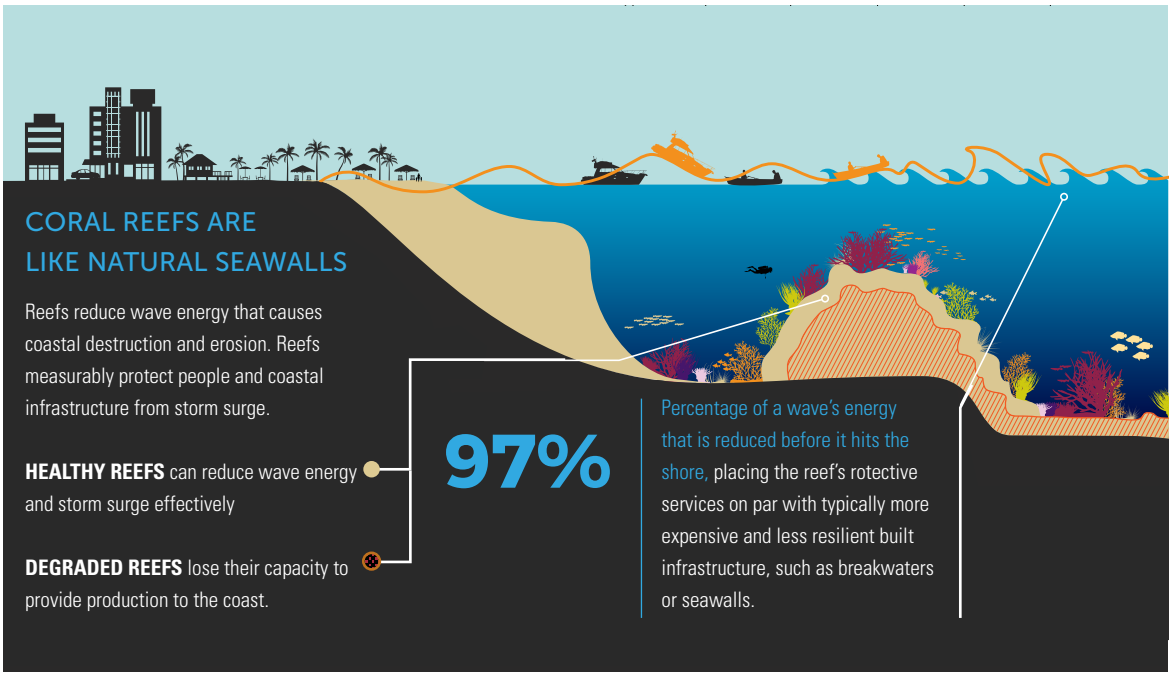
Insurance products can help to provide the necessary financial resources to help individuals, communities or governments rebuild, clean, repair and stabilize assets that have suffered a loss due to a particular event, thus minimizing risk of investing in those assets. Increasingly, insurance products are starting to be developed to help minimize risk and support repair of key marine habitats and associated livelihoods in case of disaster. Insuring marine ecosystems is important as there are (1) greater risks to coastal and marine environments due to climate change and more severe and frequent storms; (2) a need for the valuable ecosystem services that these covered assets provide and that need to be repaired in case of damage, such as coral reefs, in helping to dampen wave energy during storms and minimizing damage to coastal areas; and (3) a need to repair the marine ecosystem assets to harness the economic value of marine ecosystems, such as coral reefs, in driving tourism revenues to assist with economic growth (see Figure 4 below). The authors feel that developing and deploying insurance for key marine ecosystems in Mozambique should be considered, including support by donor partners to understand the marketplace. Below we outline how the concept is being applied in the Caribbean.

---

183 See Morgan Stanley Blue Bonds

184 World Bank Press Release on Blue Bonds for Seychelles

FIGURE 4. Insuring Coral Reefs[185]



Two specific examples of insuring marine assets are worth noting:

1. ***Mexico and the Coral Reef Insurance Policy.*** The Mexican state of Quintana Roo, through their Coastal Zone Management Trust, purchased the first ever coral reef insurance policy to minimize risk and ensure the coral reefs are repaired after extreme storms. This innovative funding system will help protect the region's US$10 billion tourism industry, encourage the conservation of a valuable natural asset, and create a scalable new market for the insurance industry. The cost of immediate response ranges from US$ 100,000 to 150,000, for an area 20 km long and requires 20 to 30 days of work, based on estimations from the Puerto Morelos National Park.[186]

2. ***The Caribbean Ocean and Aquaculture Sustainability Facility (COAST).*** COAST is a climate risk insurance mechanism that was developed with the financial support of the US State Department and led by the World Bank and the Caribbean Catastrophe Risk Insurance Facility. The insurance helps to rapidly put money into the hands of those impacted by extreme weather, providing them with immediate economic relief and promoting a culture of building back better to enhance coastal community resilience after an extreme weather event.[187]

185 From https://www.nature.org/content/dam/tnc/nature/en/documents/TNC-CoastalManagementTrust_Infographic_04.pdf
186 https://www.nature.org/en-us/what-we-do/our-insights/perspectives/insuring-nature-to-ensure-a-resilient-future/
187 https://www.ccrif.org/sites/default/files/publications/CCRIFSPC_COAST_Brochure_July2019.pdf

Annexes

Annex 1.
Marine-related Legislation, Policy and Strategy

Legislation	Reference	Year
Constitution	Constitution of Mozambique - references territory covering all land, sea and airspace…It further states that the extension, limit and regime of territorial waters, the exclusive economic zone, the contiguous zone and the remaining seabed of Mozambique are established by law.	2004
The Ministry of the Seas, Inland Water and Fisheries (MIMAIP)	Created by Presidential Decree no. 17/2015	2015
	MIMAIP Competencies - Public Administration Inter-Ministerial Commission's Resolution 12/2015	2015
Blue Economy Fund - ProAzul	Decree 91/2019 of 27 November - Creation of ProAzul	2019
Law of the Sea	Law of the Sea, Law 20/2019 (replaces the Sea Act 4/1996)	2019
Fisheries Law	The Fisheries Law, Law 22/2013	2013
Fisheries Research Institute (IIP)	Decree 63/98 - Creates the Fisheries Research Institute (IIP)	1998
Sports Fishing	Decree 51/99	1999
General Regulation of Maritime Fisheries (REPMAR)	Decree 43/03 - establishes the rules to be followed while fishing in marine waters of Mozambique. Sets the fishing gear and the type of requirements of vessels allowed in maritime waters, as well as surveillance actions of the activity. Addresses the creation of areas for the preservation of fishery resources (marine parks, marine reserves and marine protected areas). Sets the obligatory use of devices to protect endangered species (Turtle Exclusion Devices) and to reduce the by-catch. Addresses the possibility to create artificial reefs.	
National Institute of Fish Inspection (INIP)	Decree 18/2005 - Creates the National Institute of Fish Inspection (INIP)	2005
Marine Scientific Research	Decree 30/2019 - regulates research in Mozambican waters	2019
Marine Spatial Planning (RJUEM)	Decree 21/2017 of 24 May (Regime Jurídico de Utilização do Espaço Marítimo)	2017
Conservation Law	Biodiversity and Conservation Law, Law No. 5/2017 - Legislation on Marine Protected Areas (MPAs)	2017
Shipping Law	Decree 35/2016 of 31 August 2016	2016
	Nationality Condition for Shipping Companies - Decreto-Lei n 47/148 of 15 October 1966.	1966
	Cabotage Strategy, Resolution 37/2009, 30 June	2009
	Commercial Maritime Transport,Decree 35/2007, 14 August	2007
Ports Law	Draft Ports Law	2019
Mining Law	Mining Law No.20	2014

Legislation	Reference	Year
Oil and Gas Laws	Petroleum Law, No 21.	2014
	Law for Offshore Areas Decree Law No.2	2014
	Oil and Gas Upstream Operations Law No.21	2014
Law on Hydro Resources	Water Law No. 16 - Interior hydro resources law	1991
Regulations on Water Pollution	Water Quality Regulation	2004
	Regulation for the Prevention of Pollution and Marine and Coastal Environmental Protection Decree No.45	2006
Disaster Management Law	Disaster Management Law No.15	2014
Land Laws (applies to Coastal Areas)	Land Law No.19	1997
	Territorial Planning Law No.19	2007
	Technical Annex to the Land Law	2000
	Rural Land law	1998
Cultural Heritage Law	Cultural Heritage Law No.10	1988
Forestry and Wildlife Law	Forests and Wildlife Law No.10	1999
Environmental Impact Assessment	Addressed under Petroleum Law	2014
	Environmental Regulations for Petroleum Operations Decree No.56	2010
	EIA Evaluation Process Regulations Decree No.54	2015
	Petroleum Operations Regulations ("New POR") Decree No.34	2015
	Regulation for Environmental Inspection Decree No.11	2006
	Regulation on the Resettlement Process Resulting from Economic Activities Decree No.31	2012
	Technical Directive on the Resettlement Plans Preparation and Implementation Process, Ministerial Resolution No. 156	2014
	Mining Law Regulations Decree No.31	2015
	Environmental Regulations for Mining Activities Decree No.26	2004
	Regulation on the Environmental Audit Process, Decree No. 25	2011
Regulations on Waste Management	Regulation on the Management of Hazardous Waste Decree No. 83	2014
	Regulation of Environmental Inspection Decree No. 11	2006
	Regulation for the Management of Urban Solid Waste Management, Decree No. 94	2014
Regulations on Petroleum Management	Petroleum Operations Regulations Decree No.34	2015
	Environmental Regulation for Petroleum Operations Decree No.56	2010
	Regulation on the Importation and Marketing of Petroleum Products Decree No.45	2012
Regulations on Chemicals Management	Regulation on the Management of Hazardous Waste Decree No. 83	2014

Legislation	Reference	Year
Regulations on Soil Management/Pollution	No specific regulation in Mozambique but addressed under Regulation for Waste Management Regulation on Environmental Quality and Effluents' Emissions Decree No. 18: Decree No. 67	2004 (Amended 2010)
Regulations on Noise Pollution	No specific regulation in Mozambique but addressed under Regulation on Environmental Quality and Effluents' Emissions Decree No.18: Decree No. 67	2004 (Amended 2010)
Regulations on Oil Spill Management	Regulation for the Prevention of Pollution and Marine and Coastal Environmental Protection Decree No.45	2006
Regulations on Decommissioning of Oil and Gas infrastructure	No specific regulation in Mozambique	
Rules on Produced Water Disposal	Addressed under the Regulations on Waste Management Decree No.13	2006
	Addressed under the Regulations of Environmental Quality Standards and Effluents' Emission Decree No.18; Decree No.67	2004 (Amended 2010)
	Regulation for the Prevention of Pollution and Marine and Coastal Environmental Protection Decree No.45	2006
Rules on Drill Cuttings Disposal	Addressed under the Petroleum Operations Regulations (2015) and Petroleum Law (2014), and under the Licensing Regulations for Petroleum Installations and Activities Decree No.272	2009
Rules on Use of Radioactive Sources in oil industry	Addressed under the Mining Safety Regulation (for Technical Safety and Health for Geological and Mining Activities)	2006
	Regulation regarding the Management of Substance that Destroy the Ozone Layer No.78	2009
Rules on Community Consultations	Addressed under the Petroleum Operations Regulations	2015
	Procedures for Community Consultations (Ministerial Diploma)	2011
Rules on Use of Dispersants	No guidelines on use of dispersants in Mozambique; it is governed by Maritime Law and Environmental Law	
Rules on Disposal of Disaster Wastes/Debris Management	Addressed under the Regulation on Waste Management Decree No.13	2006
Environmental Quality Standards for Water	Addressed under the Regulations of Environmental Quality Standards and Effluents' Emission Decree No.18: Decree No.67	2004 (Amended 2010)
Environmental Quality Standards for Air	Addressed under the Regulations of Environmental Quality Standards and Effluents' Emission Decree No.18: Decree No.67	2004 (Amended 2010)
Environmental Quality Standards for Soil	Addressed under the Regulations of Environmental Quality Standards and Effluents' Emission Decree No.18: Decree No.67	2004 (Amended 2010)
	Land Law Regulation Decree No.68	1998
	Regulation of the Land Law Decree No.66	1998

Legislation	Reference	Year
Policy & Strategy		
Blue Economy	Policy and Strategy of the Sea (POLMAR)	2017
Coral Reef Strategy and Action Plan	National Strategy and Plan of Action for Coral Reefs (NSPOA-CR)	2020 (under development)
National Action Plan on IUU	National Action Plan to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fisheries - Decree 58/2009	2009
Oil Governance	National Policy and Strategy for Biofuels, approved by the Council of Ministers under Resolution No.22	2009
	National Energy Policy	1998
	Mineral Resources Policy	2013
Environment	National Environmental Policy	1995
	Policy for Territorial Planning Resolution 18	1997
	National Water Policy I	1995
	National Water Policy II	2007
	Conservation and strategy for implementation Policy	2009
	National Forestry and Wildlife Development Policy	1997
Others	Resettlement Policy	2006
	Policy of Corporate Social Responsibility for the Extractive Industry of Mineral Resources Res. No.21	2014
	National Land Policy	2020
	Agricultural Policy and Implementation Strategy (PAEI)	1996
	National Tourism Policy and Implementation Strategy	2003
	Cultural Policy	1997
	National Policy and Strategy for Decentralization	2012
	The National Health Policy Declaration	2007
Disaster Management	National Policy on Disaster Management	1999

Sources: UNEP. (2018). Institutional Capacity Needs Assessment for Strengthening Environmental Management in the Oil and Gas Sector in Mozambique; Pereira, M. A. M., C. Litulo, R. Santos, M. Leal, R. S. Fernandes, Y. Tibirica, J. Williams, B. Atanassov, F. Carreira, A. Massingue & I. Marques da Silva (2014). Mozambique marine ecosystems review. Final report submitted to Fondation Ensemble. 139 pp. Maputo, Biodinamica/CTV; Author's analysis.

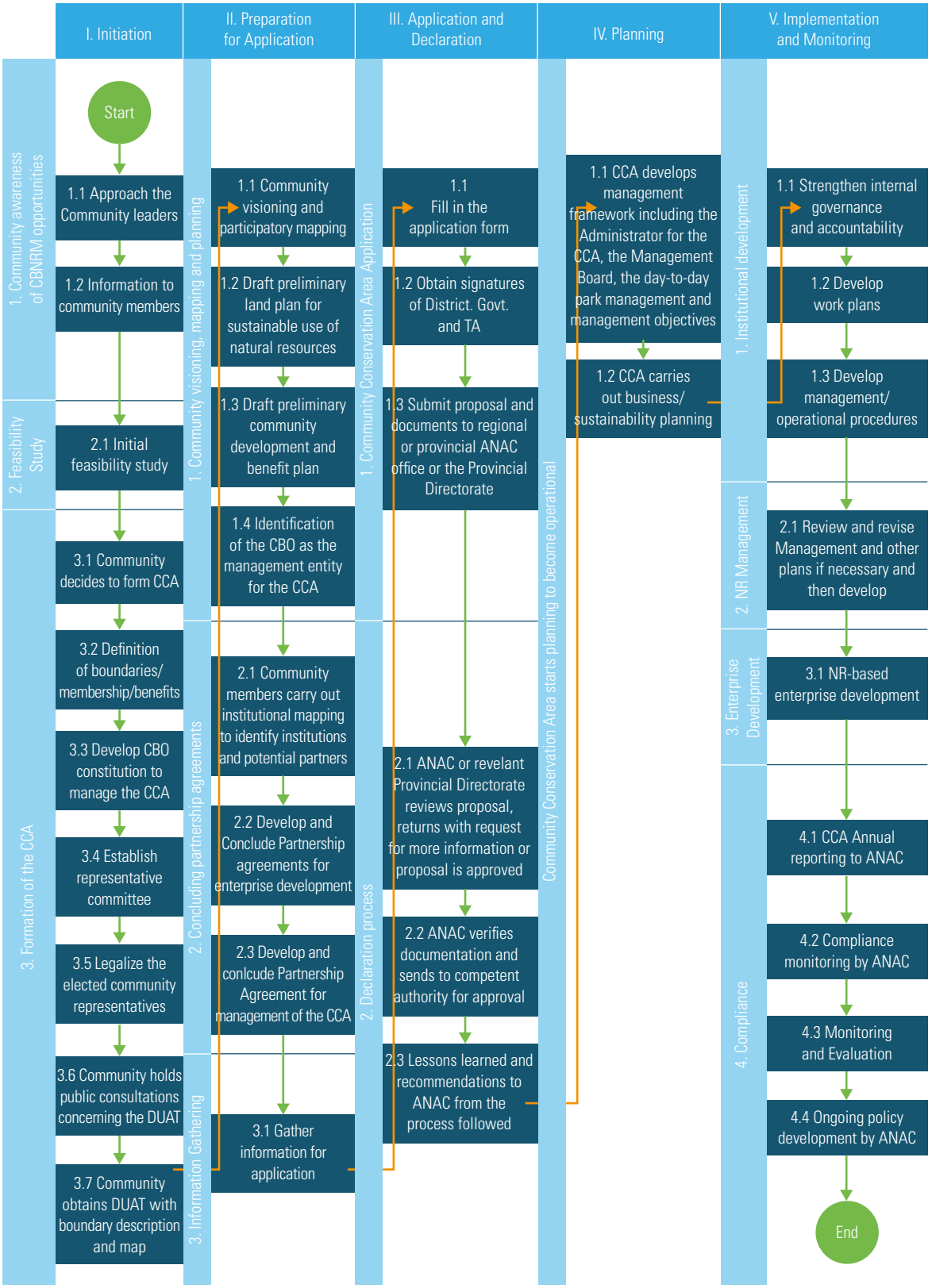
Annex 2.

International & Regional Agreements Ratified by Mozambique

Institution and year of implementation	Institution and year of implementation
UN, 1995 (ratified in 1995)	Convention on Biological Diversity (CBD)
UN, 1982 (ratified in 1997)	United Nations Convention on the Law of the Sea (UNCLOS)
UNEP, 1985 (ratified in 1996)	United Nations Environmental Programme Convention For the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African.
FAO, 1993 (ratified in 2009)	Food and Agriculture Organization of United Nations Agreement to promote the compliance with International Conservation and Management Measures by fishing vessels on the high seas
UN, 1995 (ratified in 2008)	United Nations Fish Stocks Agreement
FAO, 1995	Food and Agriculture Organization of United Nations Code of Conduct for Responsible Fisheries
UN, Nairobi Convention, 1996	Convention on the Protection, Management and Development Marine and Coastal East Africa Region
FAO, 1999	International Plans of Action (IPOA) for Reducing Incidental Catch of Seabirds in Longline Fisheries; International Plans of Action (IPOA) for the Conservation and Management of Sharks; International Plans of Action (IPOA) for the Management of Fishing Capacity
FAO, 2001	International Plans of Action (IPOA) to Prevent, Deter and Eliminate Illegal, Unreported and Unregulated Fishing
SADC, 2002	Southern African Development Community Treaty Protocol on Fisheries
RASMAR, 2003	Convention on the Protection of Wetlands (RAMSAR)
NEPAD, 2005	Abuja Declaration: The New Partnership for Africa's Development Action Plan for Sustainable Development of Fisheries and Aquaculture in Africa
FAO, 2006	South Indian Ocean Fisheries Agreement (SIOFA)
UN 2001, ratified in 2008	The United Nations Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UNFSA)
SADC, 2008	Declaration of Commitment of the Ministers of Fisheries of Southern African Development Community in the fight against IUU Fishing
UN Bonn Convention, 2009	Bonn Convention on Migratory Species (CMS). Recognizes the importance of conservation of special habitats of migratory species.
NEPAD, 2009	International Partnership for African Fisheries Governance and Trade (PAF)
IOTC, 2011	The Indian Ocean Tuna Commission Resolution 10/11 on Port State Measures to Prevent, Deter and Eliminate IUU Fishing
IOTC, 2013	The Indian Ocean Tuna Commission (IOTC) Resolutions: Resolution 13/04 on the conservation of cetaceans Resolution 13/05 on the conservation of whale sharks Resolution 13/06 on a scientific and management framework on the conservation of shark species caught in association with IOTC managed Fisheries
FAO, 2014	Food and Agriculture Organization of United Nations Agreement on Port State Measures to Prevent, Deter and Eliminate IUU Fishing

Annex 3.

Community Conservation Area Process Map



References

Allport, Gary. Notable recent records of terns, gulls and skuas in southern Mozambique including the first country records of Black Tern Chlidonias niger. Bioone, Vol. 138, Issue 2, 2018. andBeyond Vamizi Island | Northern Vamizi

ASCLME 2012. National Marine Ecosystem Diagnostic Analysis. Mozambique. Contribution to the Agulhas and Somali Current Large Marine Ecosystems Project (supported by UNDP with GEF grant financing).

AvW Lambrechts, Biodiversity Management Plan, Vilanculos Coastal Wildlife Sanctuary, 2003.

Back to Basics Scuba blog article from Back to Basics Scuba.

Backscatter Underwater Phot & Video Store website: https://www.backscatter.com/reviews/post/Macro-Underwater-Photography-Workshop-Lembeh-Resort-Indonesia

Balidy, HJ; HH Pacule; AJ Matavel; JC Horril; M Mechisso; GM Mulhovo; AR Zunguze, SS Mbié (2008). Reserva Especial do Bilene. Situação Biofísica e Socioeconómica Actual. Volume 1. CDS Zonas Costeiras e DPCA - Gaza/MICOA.

Bandeira, S. et al. 2008. Seagrass beds. In: A Natural History of the Bazaruto Archipelago, Mozambique: 65-69. Everett, B.I., van der Elst, R.P. and Schleyer, M.H. (Eds.). Special publication No. 8. Oceanographic Research Institute, South African Association for Marine Biological Research, Durban, South Africa.

Barbosa, F.M.A. et al. 2001. Status and distribution of mangroves in Mozambique. South African Journal of Botany 67(3): 393-398.

Beilfuss, Richard D. et. al. Status and distribution of large herbivores in the Marromeu Complex of the Zambezi Delta, Mozambique. 2010

Beúla, Emídio. Porto de Techobanine avança no meio de controvérsia, July 25, 2010. Blog Article on Techobanine in Macuahub.

Biofund Website: www.biofund.org.mz.

Birdlife International Website: http://datazone.birdlife.org/country/mozambique/marine

Blue Action Fund: Safeguarding Primeras and

Segundas Environmental Protected Area Blue Action Fund

Blue Carbon Initiative https://www.thebluecarboninitiative.org/

Brito, A. 2012. An interview-based assessment of the incidental capture and mortality of sea turtles in Mozambique's Sofala Bank commercial shrimp fishery. Revista Moçambicana.

Brito, A. and Pena, A. 2007. Population structure and recruitment of penaeid shrimps from the Pungué River estuary to the Sofala Bank fishery, Mozambique. Western Indian Ocean Journal of Marine Science 6(2): 147-158.

Club of Mozambique Online News: https://clubofmozambique.com/news/sa-resorts-under-threat-as-jihadists-occupy-mozambique-islands-171456/ and https://clubofmozambique.com/

news/chinas-chec-involved-in-us1bln-port-in-ponta-techobanine-maputo/ and Article on Plastic Bags and https://clubofmozambique.com/news/beijing-projected-construction-of-techobanine-port-and-railway-report/

COMBO Project (2018) Gap Analysis on Policy, Law, Capacity and Experience of the Government of Mozambique´s institutions to Deliver No Net Loss (or Net Gain) of Biodiversity. Project COMBO: Conservation, Impact Mitigation and Biodiversity Offsets in Africa. WCS/Biotope/Forest Trends, supported by AFD, FFEM and MAVA.

Community Partners (ParCO) website: Seahorse Protection

Convention on Biological Diversity. Zero draft of the post-2020 global biodiversity framework. February 2020

Cordio, Marine Spatial Atlas for the Western Indian Ocean: MASPAWIO interactive depth map

Data provided to the team by the Ministry of Sea, Inland Waters and Fisheries in the Statistics Bulletin for Fish and Aquaculture 2006-2017. Also see Indian Ocean Tuna Commission 2018 Report.

Decree 91/2019 of 27 November for the creation of ProAzul.

DugongLodge:https://www.mozambiqueislands.com/resort/dugong-lodge/

Ecolex. information service on environmental law, operated jointly by FAO, IUCN and UNEP.

Edson Aparecido Vieira, Leonardo Rodrigues de Souza, Guilherme Ortigara Longo, Diving into science and conservation: recreational divers can monitor reef assemblages, Perspectives in Ecology and Conservation, Volume 18, Issue 1, 2020, Pages 51-59.

Environmental Impact Assessment Report Deepwater Exploration Drilling Operations in the Rovuma Offshore Area 1, Mozambique, Impacto, 2008 and 2014 EIA Update by ERM South Africa and Impacto.

Environmental Impact Assessment Report Deepwater Exploration Drilling Operations in the Rovuma Offshore Area 1, Mozambique, Impacto, 2008 and 2014 EIA Update by ERM South Africa and Impacto.

Everett, B.I. and Schleyer (editors). A Natural History of the Bazaruto Archipelago, Mozambique, Oceanographic Research Institute, Special Publication No. 8., South African Association for Marine Biological Research, Durban, South Africa. 2008.

Findlay, K. et al. 2011. Distribution and abundance of humpback whales, Megaptera novaeangliae, off the coast of Mozambique, 2003. Journal of Cetacean Research and Management (Special Issue) 3: 163-174.

Fire Island Conservation website: www.fireislandconservation.com

Friends of Vamizi - Conservation & Community

Garnier, J. & Marques da Silva, Isabel & Davidson, Johnston & Hill, Nicholas & Muaves, Lara & Mucaves, Santos & Guissamulo, Almeida & Shaw, Alison. (2008). Co-Management of the Reef at Vamizi Island, Northern Mozambique. Obura, D.O., Tamelander, J., & Linden, O. (Eds) (2008). Ten years after bleaching - facing the consequences of climate change in the Indian Ocean. CORDIO Status Report 2008. Coastal Oceans Research and Development in the Indian Ocean/Sida-SAREC. Mombasa.

Garnier, J. et al. 2012. Status and community-based conservation of marine turtles in the northern Quirimbas Islands (Mozambique). Oryx 48(3): 359-367.

Giri, C. et al. 2011. Status and distribution of mangrove forests of the world using Earth observation satellite data. Global Ecology and Biogeography 20(1):154-159.

Government of Western Australia. Department of Primary Industries and Regional Development, website article: Artificial reefs.

Graham, Nicholas & Wilson, Shaun & Carr, Peter & Hoey, Andrew & Jennings, Simon & Macneil, Aaron. (2018). Seabirds enhance coral reef productivity and functioning in the absence of invasive rats. Nature. 559.

Grech, A., K. Chartrand-Miller, P. Erftemeijer, M. Fonseca, L. McKenzie, M. Rasheed, H. Taylor and R. Coles (2012). A comparison of threats, vulnerabilities and management approaches in global seagrass bioregions. Environmental Research Letters.

Gullström, Martin and Dahlberg, Mattis. Fish community structure of seagrass meadows around Inhaca Island, southern Mozambique. Uppsala University, Sweden, June 2004.

Hansen, V. AND K. Reiss. Threats to Marsh Resources and Mitigation. Chapter 16, J. Ellis and D. Sherman (ed.), Coastal and Marine Hazards, Risks and Disasters. ELSEVIER, AMSTERDAM, Holland, , 467-494, (2015).

Haysom, S. Where crime compounds conflict: Understanding Northern Mozambique's vulnerabilities. The global initiative against transnational organized crime. 2018

Herring River Restoration Project

Hill, Nicholas & Davidson, J & Marques da Silva, Isabel & Mucave, S & Muaves, Lara & Guissamulo, Almeida & Debney, A & Garnier, J. (2010). Coral and reef fish in the Northern Quirimbas Archipelago, Mozambique – a first assessment. Western Indian Ocean Journal of Marine Science.

https://vimeo.com/373704653

Hylton, Wil S. History's Largest Mining Operation Is About to Begin, The Atlantic, Jan/Feb 2020.

Impacto and ERM, Offshore Hydrocarbon Exploration Drilling Operations In The Sofala Concession Area, Sofala And Inhambane Provinces, Mozambique. Environmental Impact Assessment Report Final Report, Prepared for Sasol Petroleum Sengala Limitada. 2011.

Impacto, preparação for MICOA and the Province of Gaza. Projecto de Avaliação Ambiental Estratégica da Zona Costeira – Moçambique. June 2012.

International Trade Center TradeMap

James Davis Reimer et al. Effects of causeway construction on environment and biota of subtropical tidal flats in Okinawa, Japan, Marine Pollution Bulletin, Volume 94, Issues 1–2, 2015, Pages 153-167.

Johnsen, E., J. Krakstad, M. Ostrowski, Bjørn Serigstad, T. Strømme, O. Alvheim, M. Olsen, Diana Zaera, E. R. André, N. Dias, L. Sousa, B. B. Sousa, B. Malauene and S. Abdula. 2007 Surveys of the living marine resources of Mozambique. Ecosystem survey and special studies. 27 September - 21 December 2007. 2007.

Jones, Brian, et. al. Co-Management Governance and Legal Frameworks for Community Conservation Areas in Mozambique, USAID SPEED+, 2020 (forthcoming).

Kathy Broughton, Office of National Marine Sanctuaries Science Review of Artificial Reefs, NOAA Office of National Marine Sanctuaries, 2012.

Kwalala-Lodges – An Oasis of Relaxation

Law on the Protection, Conservation and Sustainable Use of Biological Diversity (Law Nr. 5/2017 of 11 May)

Lindsey, Peter an Baghai, Mujon, Co-Management Models for Conservation Areas in Mozambique Report, USAID SPEED+, 2018.

Long, Stephen, et al.. Identification of a Soft Coral Garden Candidate Vulnerable Marine Ecosystem (VME) Using Video Imagery, Davis Strait, West Greenland, Frontiers in Marine Science, Vol 7, 2020.

Louro, C.M.M. et al. Report On the Conservation Status of Marine Turtles in Mozambique. Centro de Desenvolvimento Sustentável para as Zonas Costeiras, Ministério para a Coordenação da Acção Ambiental, Maputo. 2006.

Macuahub article on Techobanine Economic and Feasibility Study. July 2012.

Management Plan for Pomene (2026): http://www.anac.gov.mz/wp-content/uploads/2017/07/Plano-Maneio-Pomene.pdf

Marine Megafauna Foundation: https://marinemegafaunafoundation.org/

Marzoli, A. Inventário florestal nacional. DNTF, Maputo, Moçambique. 2007.

Menon, Ashok and Crudeli, Luca. Mozambique Under the Water, a Virtual Exhibition, done for the Mozambique Ministry of Seas, Inland Water and Fisheries for World Oceans Day, June 8, 2020.

Menon, Ashok. A high resolution image of the map on the previous page can be downloaded here: https://drive.google.com/file/d/1WFdXhn8q4zfnIoGJ0cnK0JGFOSxsKhFx/view?usp=sharing

Milton Group: https://themiltonpartnership.com/projects/pomene-marine-reserve-mozambique/ and

Morgan Stanley Blue Bonds

Mozambique 5-Year Plan 2020-2024. This is a translated copy done by USAID SPEED+.

Mozambique Boletin de Republica, Series 3, No. 14 of 21 January 2019 and detailed in CFMs Audited Financial Report produced by PwC on page 446 of the Boletin.

Mozambique Sanctuary: https://mozsanctuary.com/

MSC Cruises: https://www.msccruises.co.uk/cruises/destinations/south-africa/mozambique/pomene

Muthiga, N. et al. 2007. Status of coral reefs in East Africa: Kenya, Tanzania, Mozambique and South Africa. In: Status of Coral Reefs of the World: 2008: 91-104. Wilkinson, C. (Ed.). Global Coral Reef Monitoring Network and Reef and Rainforest Research Centre, Townsville, Australia.

National Geographic article on Whale Sharks and Mantas

National Oceanic and Atmospheric Administration (NOAA), The Importance of Coral Reefs, NOAA website.

Navonics online maps: www.navonics.com

New York Times: Jordan Creates Artificial Reef From Decommissioned Military Vehicle, New York Times, July 2019

Nuarro Lodge: Diving Mozambique at the Eco Dive Resort

Obura, D.O., Church, J.E. and Gabrié, C. 2012. Assessing Marine World Heritage from an Ecosystem Perspective: The Western Indian Ocean. World Heritage Centre, United Nations Education, Science and Cultural Organization (UNESCO). 124pp.

Obura, D.O., Church, J.E. and Gabrié, C. 2012. Assessing Marine World Heritage from an Ecosystem Perspective: The Western Indian Ocean. World Heritage Centre, United Nations Education, Science and Cultural Organization (UNESCO). 124pp.

Ocean Investment Platform https://www.oceancouncil.org/global-issues-platforms/cross-cutting-issues/ocean-investment-platform/

Ossimba Beach Lodge

Peddemors, V.M., P.B. Best, K.P. Findlay, D. Gove, B. Rakotonirina, A. Rossouw, and K. Sekiguchi. 1997. Small cetaceans of the

south-west Indian Ocean. Paper SC/49/SM33 presented to the International Whaling Commission Scientific Committee, October 1997.

Pereira, M. A. M. (2008). Report on the Status and Trends of Rare Marine Fisheries Species in Mozambique: Reef Associated Aquarium Fish, Seahorse and the Hump head Wrasse. CDS Zonas Costeiras/MICOA.

Pereira, M. A. M., C. Litulo, R. Santos, M. Leal, R. S. Fernandes, Y. Tibirica, J. Williams, B. Atanassov, F. Carreira, A. Massingue & I. Marques da Silva. Mozambique marine ecosystems review. Final report submitted to Fondation Ensemble. 139 pp. Maputo, Biodinamica/CTV. 2014.

Pereria, Marcos. Western Indian Ocean Marine Protected Areas Outlook. Mozambique Chapter. Forthcoming, 2020.

Pomene Hideaway Lodge: https://pomenehideaway.com/

Pomeroy, Robert S., Community-based and co-management institutions for sustainable coastal fisheries management in Southeast Asia, Ocean & Coastal Management, Vol. 27 Issue 3, pp. 143–162, 1995.

Popular Mechanics Magazine. The Great Barrier Reef's Seagrass Is an Amazing Carbon Sink, Popular Mechanics, December 18, 2018.

Pritchard, David, et. al. Ramsar Advisory Missions - No. 62: Marromeu Complex Ramsar Site, Mozambique. Rasmar, 2009

Rare website: https://rare.org/program/fish-forever-in-mozambique/

Savage, Candida. (2019). Seabird nutrients are assimilated by corals and enhance coral growth rates. Scientific Reports. 9.

Seahorse Trust.

Secretariat of the Convention on Biological Diversity (2016), Ecologically or Biologically Significant Marine Areas (EBSAs). Special places in the world's oceans. Volume 3: Southern Indian Ocean. 128 pages.

See Ministry of Land and Environment (MTA), he National Plan for Territorial Development (PNDT) - Plano Nacional de Desenvolvimento Territorial | República de Moçambique.

Shipwreck Lodge: http://www.shipwrecklodge.co.za/

Smith, Margaret M., Heemstra, Phillip C. (Eds.), Smith's Sea Fishes, 1986

Smith, S., Rowcroft, P., Everard, M., Couldrick, L., Reed, M., Rogers, H., Quick, T., Eves, C. and White, C. (2013). Payments for Ecosystem Services: A Best Practice Guide. Defra, London.

Stringer, Christina et al., The Zambezi River Delta Mangrove Carbon Project: A Pilot Baseline Assessment for REDD+ Reporting and Monitoring. USAID, WWF, USFS, UEM, Mozambique Ministry of Agriculture, National Aeronautics and Space Administration. 2014.

Symons, Kate. The tangled politics of conservation and resource extraction in Mozambique's green economy. 2018

The Commonwealth Blue Charter: Webinar explores ways to raise money for ocean protection, July 2020.

The Nature Conservancy, Mapping the Ocean's Wealth website: www.oceanwealth.org

The Ocean Conservancy, Fact Sheet on Sea Horses.

Tibirica, Yara. Caracteristicas Ecologicas e Turisticas da Zona da Bahía de Závora, Compreendida entre a Lagoa tsene até metade da Lagoa Dongane. 2012.

TPF Consultants website: https://www.tpf.pt/en/mozambican-marine-spatial-plan-c-1892-2--45-110-3.html

UN Environment Website

UN Environment, Strengthening Environmental Management in the Oil and Gas Sector in Mozambique, 2018

UNEP. (2018). Institutional Capacity Needs Assessment for Strengthening Environmental Management in the Oil and Gas Sector in Mozambique; Pereira, M. A. M., C. Litulo, R. Santos, M. Leal, R. S. Fernandes, Y. Tibirica, J. Williams, B. Atanassov, F. Carreira, A. Massingue & I. Marques da Silva (2014). Mozambique marine ecosystems review. Final report submitted to Fondation Ensemble. 139 pp. Maputo, Biodinamica/ CTV; Author's analysis.

United Nations Education, Scientific and Cultural Organization (UNESCO), Tentative Lists, properties which they consider to be cultural and/or natural heritage of outstanding universal value and therefore suitable for inscription on the World Heritage List. https://whc.unesco.org/en/tentativelists/5380/

US Environmental Protection Agency (EPA) on coral reefs threats.

USAID SPEED+ Project, Report by WCS, KBAs Identified for Mozambique, 2020.

Vamizi: Cradle of Coral film trailer: https://youtu.be/B6Se3XEOPPg

Wikipedia. https://en.wikipedia.org/wiki/List_of_birds_of_Mozambique

Wildlife Conservation Society (WCS) - A National Biodiversity Offset System: A Road Map for Mozambique

World Bank Open Data: https://data.worldbank.org/

World Bank Press Release on Blue Bonds for Seychelles

World Bank, Blue Economy: Increasing Long-term Benefits of the Sustainable Use of Marine Resources for Small Island Developing States and Coastal Least Developed Countries, 2017.

World Bank. Mozambique Public Expenditure Review Addressing the Challenges of Today, Seizing the Opportunities of Tomorrow. Report No. 91153-MZ, World Bank 2014.

World Wildlife Fund (WWF) website: https://www.worldwildlife.org/species/sea-turtle and mangroves and https://www.worldwildlife.org/photos/women-gleaning-sand-oysters-in-mozambique

Wylie, Lindsay et. al., Keys to successful blue carbon projects: Lessons learned from global case studies, Marine Policy, Volume 65, 2016, Pages 76-84.

Zavora Marine Lab / Marine Action Research. http://marineactionresearch.com/