

UNITED REPUBLIC OF TANZANIA
MINISTRY OF LIVESTOCK AND FISHERIES DEVELOPMENT

MNAZI BAY-RUVUMA ESTUARY MARINE PARK

GENERAL MANAGEMENT PLAN



BOARD OF TRUSTEES
MARINE PARKS AND RESERVES UNIT

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PREAMBLE

This revised General Management Plan (GMP) for Mnazi Bay – Ruvuma Estuary Marine Park (MBREMP) is the park's road map for the next 10 years (2011 – 2021). As part of adaptive management strategy which the park adopted for managing its resources, the plan has considered experience from the five years of implementation of the first GMP and developed methodologies for actions that will counterfeit past uncertainty.

This document is the result of genuine stakeholders' participation, in which a wide range of stakeholders including villagers, investors, key decision makers and NGO's got an opportunity to air their views through consultative meetings and workshops as required by the Marine Parks and Reserves Act No. 29 of 1994.

The Plan intends to share with MBREMP's stakeholders' useful information about the park; and laying down management strategies and activities that will enhance communication and cooperation which is so vital in protecting our valuable marine resources. In this GMP, Vision and Mission statements of Marine Parks and Reserves Unit (MPRU) have been included.

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APPROVAL PAGE

Implementation of this plan has been endorsed by the Advisory Committee of the Mnazi Bay Ruvuma Estuary Marine Park (MBREMP), pursuant to sections 5 & 15 of the Marine Parks & Reserves Act No. 29 of 1994, at its meeting of 18th May 2011.

Hon. Mohamed Mkiwa (Councillor)

Mr. Redfred G. Ngowo

Chairman

Warden-in-Charge, MBREMP

MBREMP Advisory Committee

Secretary, MBREMP Advisory Committee

Implementation of this plan has been approved by the Board of Trustees for Marine Parks and Reserves, pursuant to sections 4 & 15 of the Marine Parks & Reserves Act No. 29 of 1994, at its thirtieth (30) Ordinary Board Meeting on 5th July 2011.

Dr. Blandina Lugendo

Dr. Abdillahi I. Chande

Chairperson

Unit Manager, MPRU

Board of Trustees

Secretary, Board of Trustees

This General Management Plan has been adopted by the Minister of Livestock and Fisheries Development pursuant to section 14 of the Marine Parks & Reserves Act No. 29 of 1994.

Hon. Dr. David Mathayo David (MP)

Minister of Livestock and Fisheries Development

The United Republic of Tanzania

VISION

“Marine Protected Areas in Tanzania become the joy and pride for all”.

MISSION

“To establish and manage Tanzania’s marine protected areas for sustainable use”

MOTTO

“Let us share the gift of nature together”

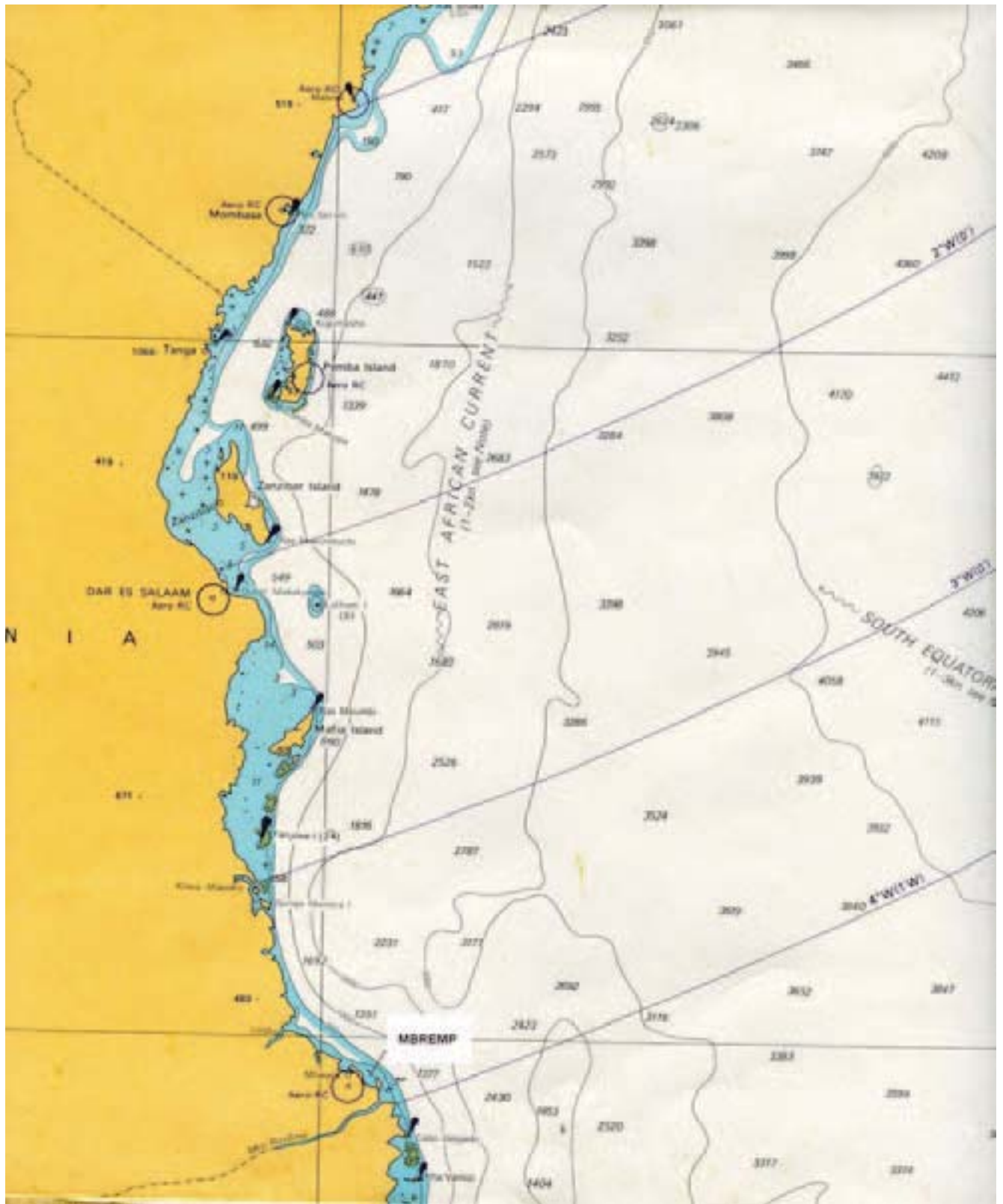


Fig. 1. A map of coastal areas of Tanzania showing the location of MBREMP

FOREWORD

Tanzania's coastal strip has historically been a centre of wealth creation, through trade, extraction of natural resources and most recently gas extraction, tourism and mariculture. Through the centuries, this wealth has attracted people to Tanzania's coastal areas, both from within the country to beyond the and therefore creating a rich and varied cultural heritage. Alongside this human realm, Tanzania's marine and coastal areas are also rich in biodiversity, harbouring a wealth of species of fish, marine invertebrates, marine mammals, reptile, birds and plant life. As such, they have increasingly come to the attention of those concerned with conservation of our country's natural heritage, in terms of wildlife, biodiversity and scenic splendour.

The present population along Tanzania's 1,400 km coastline is approaching 10 million people. Outside of the trading hubs of Dar es Salaam, Zanzibar, Tanga and Mtwara, the livelihood of many coastal people has increasingly come to depend upon small scale fisheries, mangrove and non-living resources including, minerals to provide all essentials to life. Increasingly, these marine and coastal resources, and associated biodiversity, have come under severe threat from overuse, unplanned commercial development and destructive practices.

In this context, the Government of Tanzania has dual obligations to safe guard the livelihoods of coastal people and future generations; and also to ensure the continued survival of rich variety of living organisms bestowed by nature.

To respond to this challenge the Tanzanian government established the Board of Trustees of Marine Parks and Reserves in 1996, to oversee a system of marine protected areas wherein special management can be focused. Whereas marine reserves can provide total protection from extractive use to small areas, the marine parks aim to achieve sustainable accommodation of livelihood, environmental and commercial interests. The key success to this ambitious undertaking will be an active and equal partnership between the government, communities and investors. As such we must be confident constantly to evaluate our performance, take on board constructive suggestions and welcome contributions from outside.

Mnazi Bay Ruvuma Estuary Marine Park being the second marine park to be established in Tanzania, launched its first General Management Plan five years ago. The five years (2005 – 2010) plan intended to lay down strategies on how best the park in collaboration with its stakeholders could jointly manage valuable resources available in the park. Evaluation of the first management plan showed satisfactory level of implementation for the past five years, and this review is intending to continue implementing unaccomplished tasks and accommodate new issues raised by stakeholders during the review process.

Currently, the number of park villages has increased from 11 with 30,000 residents when the first plan was launched in 2005 to 17 villages with over 44,000 residents. Among others, this is a major challenge to the park as it has an impact on resource use pattern, livelihood and sustainability of resources. Therefore, this plan provides a framework for resources management by re-designating "user zones" within the park, which range from Core zone, specified use, and general use to buffer zone. Furthermore, regulations have been underlined in collaboration with key stakeholders to ensure that sustainability of coastal and marine resources is not compromised by their exploitation. Hence, I call upon all key stakeholders to give us a hand in conservation of valuable resources that God has gifted us because the benefit will be not only for our nation but also for the present and future generations.

Hon. Dr. David Mathayo David (MP)

*Minister of Livestock and Fisheries Development
The United Republic of Tanzania*

ACRONYMS

AIG	Alternative Income Generating Activities
CBD	Convention on Biological Diversity
CITES	Convention on International Trade on Endangered Species
CORDIO	Coral Reef Degradation in the Indian Ocean
EACC	East Africa Coastal Current
ECC	Equatorial Counter Current
EIA	Environmental Impact Assessment
FFEM	Fonds Français pour l'Environnement Mondial
GBRMPA	Great Barrier Reef Marine Protected Area
GEF	Global Environmental Facility
GIS	Geographical Information System
GMP	General Management Plan
IUCN	International Union for the Conservation of Nature
WWF	Worldwide Fund for Nature
UNDP	United Nation Development Programme
MBREMP	Mnazi Bay – Ruvuma Estuary Marine Park
MC	Mozambique Current
MIMP	Mafia Island Marine Park
MNRT	Ministry of Natural Resources and Tourism
MPA	Marine Protected Area
MPRU	Marine Parks and Reserves Unit
MtDC	Mtwara Development Corridor
PDF	Project Development Funds
SADC	Southern African Development Community
SCUBA	Self Contained Underwater Breathing Apparatus
SEC	South Equatorial Current
TIF	Tourism Investment Framework
UNEP	United Nations Environmental Programme
VEMPs	Village Environmental Management Plans
VLCs	Village Liaison Committees

EXECUTIVE SUMMARY

This General Management Plan (GMP) for the Mnazi Bay – Ruvuma Estuary Marine Park (MBREMP) is to fulfil the legal obligation of every marine park or reserve to have a formal plan guiding its management. This GMP is the second one for MBREMP since its establishment in 2000, and it will be implemented for the period of ten years (2011 – 2021). The first GMP was implemented between 2005 and 2010.

MBREMP is located south of Mtwara town in southern Tanzania. The Park covers a total area of 650 km², it includes the northern portion of the Ruvuma Estuary, Mnazi Bay and the three islands of Namponda, Membelwa (or Mongo), and Kisiwa Kidogo. The Park includes 45 kilometres of coastline, from the headlands at Ras Msangamkuu to the Ruvuma River on the border with Mozambique.

The Mnazi Bay Ruvuma Estuary Marine Park is unique in that the ratio of the terrestrial part to the marine part is the highest in East Africa. The rationale behind incorporating such a wide area of land into the Park was to constitute a buffer zone and control human activities that impact the protected marine environment.

The GMP is intended to serve as a long-term roadmap for conservation of marine and coastal biodiversity and the sustainable management of the Park's natural resources. The Plan also provides the basis for partnership among stakeholders in the management of the Park.

Various studies undertaken to assess the resources in the park have confirmed that the waters of the Park are home to a great diversity of marine life, with features unique to Tanzania and the region. The Park's marine, coastal and terrestrial habitats include large tracts of mangrove forests around the Ruvuma River delta, highly productive and relatively undisturbed coral reefs and seagrass beds along the coastline, and sand banks that are rare to East Africa.

The inclusion within the Park of 17 villages with approximately 44,000 residents who are highly dependent upon marine resources for their livelihood demands a detailed management plan that will reconcile with the interests of the residents without undermining conservation. The GMP also must account for the Park's proximity to the border with Mozambique, and the transboundary character of local natural resource use. The Plan recognizes the continued development of the natural gas deposits in the Mnazi Bay.

The main challenges for the Park management addressed in this GMP include:

1. Fishing pressure and unregulated fishing
2. Shell and sea cucumber collection
3. Overfishing
4. Destructive fishing practices, notably the use of dynamite and beach seine nets
5. Endangered species, notably sea turtles and marine mammals
6. Coral mining in buffer zone
7. Mangrove harvesting
8. Coastal erosion
9. Population growth

In light of these challenges MBREMP developed the following management objectives:

1. To protect, conserve, and restore the health and genetic diversity of marine resources within the park, as well as the ecosystem processes that sustain marine and coastal areas;
2. To ensure that villagers and other park residents are involved in all phases of planning, development and management of the marine park and have priority in the resource use and economic opportunities ;
3. To promote the rational development and sustainable use of under-utilised natural resources;
4. To promote community-oriented education on the conservation and sustainable use of aquatic resources within the Park; and
5. To facilitate and conduct research and monitoring of resource conditions and uses within the Park.
6. To manage the marine and coastal area so as to promote sustainable resource use, the recovery of over exploited and degraded areas and resources, and the rehabilitation of damaged ecosystems;

7. To ensure that any exploitation of non-living resources does not affect the Park's aesthetic and natural values;
8. To protect the cultural heritage of the Park residents;
9. To ensure that tourism in the Park is sustainable.

In order to ensure that people living within the Park fully participate in the protection and conservation of the Park's natural resources, the GMP would:

1. Facilitate mechanisms to ensure that the benefits from gas exploitation and eco-tourism are dedicated to compensating Park residents whose activities have been curbed by the implementation of the GMP.
2. Strengthen the capacity of Village Liaison Committees (VLCs) to participate in Park management.
3. Prioritise outreach efforts and an environmental education programme for local communities on the GMP and associated management activities of the Park.
4. Design a turtle education programme, including regular workshops on the ecology and importance of marine turtles to marine biodiversity.

The GMP divides the area of the Park into user zones to protect critical and species-rich habitats, including sub-tidal areas, mangroves, coastal forests, bird nesting, fish spawning and turtle-breeding grounds. Under this zoning scheme, core zones provide the highest level of protection and are closed to all forms of extractive resource use. Specified-use zones constitute an intermediate level of protection, for areas that warrant primary conservation status but are also important to local resource-users. For both core and specified-use zones activities likely to cause significant alterations to the park environment are prohibited. There are also general-use zones where Park residents will be accorded top priority to access resources in the zone. The Buffer zone covers all the area adjacent to the Park borders. The area serves as a cushion to activities outside the Park. Although the Park has no jurisdiction over activities in the buffer zone, it nevertheless has vested interest, thus the need for consultation, cooperation and compliance with all stakeholders.

To reduce reliance on marine resources for the residents, the Park will promote supplementary source of income to the residents, encourage eco-tourism and utilisation of under utilised resources such as bee-keeping and other small-scale ventures.



CHAPTER 1

INTRODUCTION

1.1 National Marine Parks and Reserves Initiative

Tanzania's Marine Reserves were first gazetted as Marine Protected Areas (MPAs) in June 1975 under the Fisheries Act No. 6 of 1970. At that time there were eight marine reserves: Chole Bay, Kitutia, Mbudya, Bongoyo, Pangavini, FunguYasini, Maziwe, and Tanga Coral Gardens. Since there were no effective management plans to ensure conservation and sustainable use of the marine resources, in reality, the protected status of these areas existed on paper alone. They were characterized by unregulated fishing including widespread use of small mesh nets, dynamite fishing, spear fishing, and use of poison.

These shortcomings prompted the Government to look into ways of ensuring conservation and sustainable use of the marine resources in affected areas. As a result, the reserves were transferred to the Marine Parks and Reserves Unit (MPRU) of the Ministry of Natural Resources and Tourism (MNRT) in 1999, with the aim of protecting these areas' aesthetic, recreational, and scientific values and facilitating the sustainable use of the natural resources located within (UNEP 2004). To this effect, MPRs Act No. 29 of 1994 was formulated to provide management framework that has given MPRU the mandate for management of all MPAs in mainland Tanzania.

1.2 Historical Development of Mnazi Bay-Ruvuma Estuary Marine Park

Mnazi Bay and Ruvuma Estuary were identified as priority areas for the conservation of global marine biodiversity in 1995 (GBRMPA/World Bank/IUCN 1995). Soon thereafter, the Government of Tanzania followed the recommendations of that report by considering the area as a priority for marine park designation. The preliminary social and environmental assessments carried out prior to gazetting (with a World Bank/GEF supported Block B PDF grant) showed that the area supports a complex and diverse system of coral reefs, mangroves and seagrass beds (Muhando *et al.* 1999). The assessments also showed that the communities living in the area, numbering almost 30,000, are economically poor and rely primarily on marine resources and subsistence agriculture for their livelihoods (Mwaipopo and Ngazy 1998).

A series of consultations were organised with the communities, which showed that there was general support for an initiative that would improve the management of the park's natural resources. These consultations led to the adoption of the "Mtwara Resolution on Mnazi Bay-Ruvuma Estuary Marine Park" in April 1999, in which local communities (from 10 villages and seven sub-villages) in the proposed park area, along with representatives from District, Regional and National level, government, the private sector and non-governmental organisations, agreed on the designation of the area as a marine park. In 2000, MBREMP was gazetted as Tanzania's second marine park (Fig.1), after Mafia Island Marine Park (MIMP) (Government Notice No. 285, published on 4/8/2000).

The Government of Tanzania received assistance for the development of Mnazi Bay-Ruvuma Estuary Marine Park (MBREMP) which came from a UNDP/GEF and Fonds Français pour l'Environnement Mondial (FFEM) funded project, which was initiated in 2002. The project was intended to support the Government of Tanzania in "conserving a representative example of internationally significant and threatened marine biodiversity." The development objective of that project was to "enable local and government stakeholders to protect effectively and utilise sustainably marine biodiversity and resources of the MBREMP" (UNDP/GEF 2000).

A series of biodiversity assessments of different habitats were carried out between 2003 and 2005 to establish baseline knowledge on the status of the Park's mangrove forests, coral reefs, intertidal areas, seagrass beds, and other marine resources. A socio-economic assessment was also carried out to establish an understanding of the social and economic context in which Park residents use and/or impact these marine resources. These assessments contributed to the development of this and the previous General Management Plan (GMP), particularly a zoning plan and other conservation strategies. An on-going and more practical objective of the Park is to find ways to ensure that these resources will continue to benefit all citizens and future generations.

1.3 Target Audience of the General Management Plan

The GMP is intended as a broadly accessible document that will inform all interested parties of the concepts and strategies behind the management of the Park.

Successful implementation of the GMP will be ensured through involvement of all parties, including, but not limited, to:

- Local communities within and adjacent to the Marine Park;
- MBREMP staff;
- Other MPRU staff;
- Local and central government staff and public Institutional representatives involved in the broader field of natural resources management, including, but not limited to, staff from the Fisheries and Forestry departments;
- Investors interested in economic activities in MBREMP and the buffer zone adjacent to the Park (including fisheries operators and tourism developers)
- Researchers, scientists, and other technical experts working in related fields (e.g. from NGOs);
- Managers of other marine protected areas in East Africa and around the world, including IUCN's and WWF
- Government staff and key stakeholders in Mozambique who manage activities that may have a direct impact on MBREMP.
- Police, Navy and other enforcement and surveillance entities.
- Judiciary institutions at District and National level.

1.4 MNAZI BAY-RUVUMA ESTUARY MARINE PARK GENERAL MANAGEMENT PLAN (GMP) AND THE REVIEW PROCESS

The Marine Parks and Reserves Act No. 29 of 1994 requires each park to develop a GMP within six months of its establishment and to update the plan periodically. In 2005, MBREMP developed the first five years General Management Plan (GMP) which ended in 2010 that called for the development of this revised GMP. Its development has been a participatory process as required by the Act. Views and comments of stakeholders that were incorporated into the new GMP were obtained through the following activities:

- Review of the Park's previous GMP and identification of strategies that could need to be revised in the light of the prevailing issues;
- Assessment of implementation of the previous GMP and the major factors that constrained implementation, as identified by MPRU staff in their evaluation matrix;
- Meetings held in each village in the Park to review Village Environmental Management Plans (VEMPs);
- A stakeholder meeting held in Mtwara on 8th January, 2011 and attended by 106 participants including village leaders, village environmental planning committee members, village liaison committee members, the Park's Advisory Committee members, MBREMP staff, representatives of key resource user groups (tourism and fisheries private sectors in Mtwara), regional and district government officials, and other stakeholders and partners (e.g. WWF);
- Discussions with MBREMP senior management team;
- A meeting involving members of the Park's Advisory Committee; and
- A meeting with the Board of Trustees of the MPRU.

ACHIEVEMENTS MADE AS A RESULT OF THE 2005/2010 GMP IMPLEMENTATION

Objective 1: Biodiversity and Ecosystem Conservation

- Training needs assessment for MBREMP staff developed, in which a total of twelve staff attended various long and short term courses.
- An average of 52 land and sea based patrols per year launched jointly with other law enforcement institutions to curb illegal resource extraction .
- Monitoring programs for coral reefs, fisheries, mangroves, whales and turtle conducted to check the status and trends.

- MBREMP conducted awareness raising to community members and other park stakeholders that have contributed into increased understanding on importance of sustainable use of coastal and marine resources, and reduced conflicts that existed in the past between some community members and park management.

Objective 2: Sustainable Resource Use and Rehabilitation

- MBREMP in collaboration with its stakeholders prepared regulations, which were part of the General Management Plan. The GMP and regulations provided foundation for collaborative and sustainable use of park resources.
- MBREMP made baseline assessments for fish and fisheries, mangroves, coral reefs, seagrass bed, social economic and terrestrial plants. Those studies and development of two working documents, Integrated Development Plan (IDP) and Tourism Investment Framework (TIF) aimed at getting baseline information and laying down principles for sustainable use of resources for the benefit of present and future generations.
- MBREMP conducted gear exchange in three phases in which 556 fishers were given a total number of 819 fishing nets and their accessories. Villages involved in the gear exchange programme included Tangazo, Litembe, Mitambo, Msimbati, Mngoji, Mkubiru, Madimba and Kilambo.
- MBREMP supported several community groups on deep-sea fishing, mariculture, chicken rearing, vegetable gardening, beekeeping, fish processing and pearl farming as means for the alternative income generation and reducing pressure on park resources.

Objective 3: Community Participation and Management

- MBREMP facilitated democratic election of 8 community members from each village to establish a Village Liaison Committee (VLC), and established the Advisory Committee (AC) for the park.
- The park appointed 14 Honorary Rangers (HRs) and trained them on game scout at the Community Based Natural Resources Management Collage (CBNRM) at Likuyu Sekamaganga, in Ruvuma region.
- Ten village leaders from the park villages attended a two weeks course on management of natural resources at Likuyu Sekamaganga.
- Five Community Turtle Officers (CTOs) selected and trained on how to identify turtle species, searching for their nests, marking the nests, re-allocation of nests and filling of data forms.
- MBREMP facilitated development of Village Environmental Management plans (VEMP's) in 10 out of the 12 villages that were in the park by then.
- As part of implementation of VEMPs, MBREMP supported construction of a total of four classrooms (three in secondary schools and one in a primary school) and construction of VLC's office at Litembe.

Objective 4: Environmental Education and Information Sharing

- MBREMP conducted meetings, workshops, seminars, study visits, and produced awareness materials such as newsletters, calendars, T-shirts etc.
- Inter- schools, villages and groups environmental competitions were organized in which winners were awarded during the World Environmental Day (WED).
- MBREMP participated in trade fairs like Mtwara Small Scale Entrepreneurs Development Association (MSEDA), SABASABA and Karibu Arusha.
- Environmental curricular for primary schools in the park were developed in collaboration with teachers and district education officials, and environmental clubs were established in each primary school in the park.
- MBREMP facilitated local community and key stakeholders at regional and district levels to visit other protected areas such as Tanga Coastal Zone Conservation and Development Project (TCZDP) and Mafia Island Marine Park (MIMP) so that they could learn and share with their fellows issues related to MPAs management.

- MBREMP staff attended international occasions such as World Parks Congress (WPC), International Tropical Marine Ecosystem Management Symposium (**ITMEMS**), Western Indian Ocean Marine Scientists Association (WIOMSA) symposiums and WIO – COMPAS Certification programs for learning and sharing experience with their fellow MPA managers.

Objective 5: Research and Monitoring of Resource Conditions and Use

- Eight baseline surveys on coral reefs, reef fish, fish and fisheries, mangrove, terrestrial forests, intertidal community/ seagrass beds and soft substratum, also surveys on turtles, dugong, cetaceans, and household income were conducted.
- Park staff and some local communities were trained and involved in the participatory marine resources monitoring program in which coral reefs, mangroves, turtles, whales, and fisheries were regularly monitored.
- MBREMP's GIS unit was established in which equipment (computer, external drives, GPS, printer, Arc GIS 9.3 software and ARC GIS license from ESRI) and eight staff got training on how to run it.

Objective 6: Under-utilized Resources Development

- MBREMP facilitated fish culture, pearl farming, bee-keeping and crab fattening as alternative livelihood activities.

Objective 7: Aesthetic and natural values of the park

- Implementation of Tourism Investment Framework (TIF), and mandatory for each development project to follow the EIA procedures and investment guidelines developed by MPRU HQ has helped the park to maintain its aesthetic and natural value.

Objective 8: Cultural Resources Protection and Conservation

- Historical and sacred sites in all park villages identified and documented in their Village Environmental Management Plans (VEMPs).

Objective 9: Sustainable Eco-tourism

- MBREMP hired consultants to conduct studies that lead to development of two documents, the Integrated Development Plan (IDP) and Tourism Investment Framework (TIF).

CHAPTER 2

RESOURCE DESCRIPTION AND RESOURCE USE

2.1 AREA AND LOCATION

The Mnazi Bay-Ruvuma Estuary Marine Park (MBREMP) is located in the Mtwara Rural District of the Mtwara Region, between 100 34' 46"S 400 16' 13" E and 100 34' 25"S 100 16' 02" and 100 07' 29"S 400 28' 10"E and 100 09' 28"S 400 13' 56"E (Fig.1). Mtwara is the southern most coastal District in Tanzania. The Park covers approximately 650 km² (162,500 acres or 65,000 hectares) of which 220 km² is terrestrial and 430 km² is marine area. Beginning in the north, the Park extends south from the head lands at Ras Msangamkuu along 45 km coastline to the Ruvuma River, which serves as the border with Mozambique, and then inland along the river to Mahurunga Village.

MBREMP comprises marine, coastal and terrestrial habitats. Main features within the Park include Msimbati Channel, Mnazi Bay, Ruvula Peninsula and Ruvuma Estuary. Within Mnazi Bay, the Park includes the three small Islands of Namponda, Mmongo and Kisiwa Kidogo, two of which (Namponda and Mmongo) are surrounded by healthy stands of mangrove forests. Large tracts of mangrove forests also surround the Ruvuma Delta, Mnazi Bay, Msimbati Channel, and the marine waters of Ruvula Peninsula which contain productive coral reefs and seagrass beds. The sand banks north of the estuary represent a rare ecosystem to the entire East African seaboard, with plant species not found elsewhere in Africa.

The varied ecosystems of the Park support a great diversity of marine life. The mangrove forests along the Ruvuma Estuary serve as reproductive and nursery grounds for many fish and crustacean species. Seagrass beds likewise constitute an important feeding ground for a number of marine species. Biological surveys have found over 250 species of hard coral, 400 species of fish, and 100 species of echinoderms within the Park's reefs. The marine and coastal plants and animals found within the Park are there because of the climate, the physical features, the influences of the Indian Ocean, and the overall integrity of the combination of habitats.

A recent survey and analysis of the entire East African region conducted by WWF and other stakeholders concluded that MBREMP and the coastal environment of the Quirimbas archipelago in northern Mozambique constitute an area of global importance for marine biodiversity. This conclusion has prompted stakeholders to propose the development of a trans-boundary network of marine protected areas (MPAs). The concept entails the development of an international .

reserve system that can maintain ecological function of the area and sustainable marine resource use.

2.2 Physical Features

2.2.1 Geology and Topography

The geology of the Park is primarily sedimentary deposits from the Jurassic and Lower Cretaceous periods (approximately 150 million years ago). Within one hundred kilometres of the coast rise the slopes of the Makonde Plateau, over 500 metres above sea level. The Makonde Plateau extends into Mozambique but is bisected by the Ruvuma River, draining Lake Nyasa, as well as a large part of northwest Mozambique through the river's largest tributary, the Lugenda River.



MBREMP development has included extensive biological surveys to assess the status of the Park's marine resources.

Evidence of previous sedimentation can be seen in the western part of Mnazi Bay, where the cliffs near Mnete show eroded sedimentary layers. The southern portion of the Park, around the headland of Msimbati provides a rare example of sand banks in Tanzania, probably accumulated over hundreds of thousands of years. The vegetation associated with these 10-15 metres high banks includes plants that may not occur elsewhere in the East African region.

The edge of a rocky limestone platform extends, in two sections, for about 25 kilometres along the outer perimeter of the Park from Ras Msangamkuu in the north to the Ruvuma Estuary at the Mozambique border, bisected by Msimbati Channel. This feature was produced by past coral reef growth, mainly during the Pleistocene epoch (within the last million years), which has since been uplifted. The shorter, southern portion of the ledge runs from east of Msimbati Village, through Lijombe lagoon, to Ras Ruvula. The northern platform extends 20 kilometres, from Namponda Island on the northern side of Msimbati Channel to Ras Msangamkuu, including Membelwa Island.



Msimbati Channel and Namponda Island, viewed from Ruvula Beach.

The geophysical configuration of Msimbati Channel and southeast Mnazi Bay is unique in Tanzania. A deep channel runs from open ocean into a large, sheltered bay, with coral patch reefs found along the channel up to 30 metres deep. The southern side of the channel extends for almost five kilometres of patchy coral growth backing onto the sandy beaches of Ruvula.

No other sites are known to house such a combination of geological and biological features. In northern Mozambique, perhaps in the Quirimbas, there may be other deep channels of comparable scale. For Tanzania, the Msimbati Channel is a special site and a vital link to the hydrology and ecology of Mnazi Bay.



Patch reefs in Msimbati Channel

2.2.2 Bathymetry

Mnazi Bay encompasses about 70 square kilometres. The depth, or bathymetry, of the bay averages less than 25 metres deep, with the northern portion generally shallower, where the substrate is predominantly sand (Fig.2). Towards the southern end, a distinctive line of three coralline patch reefs of between 400-1,000 metres in width extend for six kilometres from the south eastern portion of the bay towards Namponda Island.



Fig. 2. A map of Mnazi Bay Ruvuma Estuary Marine Park showing bathymetry and habitat types

The patch reef closest to Namponda is called Chamba cha Lusale, and is irregularly shaped, about a thousand metres wide, with reef slopes extending 25 metres to the sandy bottom. The other two patch reefs, Chamba cha Chumbo and Ilili, have rocky coral outcrops exposed during extreme low tides, and run to a depth of nine to sixteen metres. Numerous small coral patch reefs are scattered in the shallower waters (five to nine metres deep) amongst these larger reefs. One of the most distinctive and probably the largest of these smaller patch reefs is Matenga, near the existing gas well off Ruvula Peninsula. The water in the shallow southern part of Mnazi Bay is generally more turbid than other parts of the Bay, due to inputs from three small mangrove creeks (Mnazi, Kilindi and Mlamba) and the muddy surrounding intertidal area.

2.2.3 Oceanography

2.2.3.1 Currents

Three ocean currents – the South Equatorial Current (SEC), East Africa Coastal Current (EACC), and Equatorial Counter Current (ECC) – influence the coastal waters of the MBREMP. Starting in Australia and flowing across the Indian Ocean, the SEC meets the coastline of Africa approximately at the border of Mozambique and Tanzania, at the heart of MBREMP. When the SEC meets the shores of southern Tanzania and northern Mozambique the current divides, with the large portion turning northwards to become the East Africa Coastal Current, and the smaller southern flow forming the Mozambique Current (MC). The north-flowing EACC is a steady current, strongest during the Southern Monsoon when windy conditions can form surface currents that exceed three metres per second. Depending on the strength of the Northeast Monsoon, the EACC can reverse direction, flowing south and offshore as ECC.

These ocean currents are important to the Park, particularly, the SEC, because they enrich the waters of the Park. Within the waters of the SEC are the eggs and juvenile stages of thousands of marine animals and plants that are produced in the mangroves, seagrass beds, rocky shores and coral reefs of Indonesia and Australia. Southern Tanzania and northern Mozambique are the first arrival points in Africa for these drifting species and MBREMP is therefore strategically located and very important for the settlement and subsequent dispersal of marine organisms both north and south along the East African coast. MBREMP's location at this arrival point of the SEC is likely the source of the Park's rich marine biodiversity.

2.2.3.2 Tides

In most areas of Tanzania, including the Park, the maximum tidal range is about 4.5 metres, occurring during spring tides (around the new and full moon). During the low water of spring tides, over 70 km² of sand and seagrass beds in Mnazi Bay are exposed. Seawater visibility becomes exceptionally clear at these times.

During spring high tides, seawater enters Mnazi, Mtwara, and Mikindani bays and covers about 80 km² of intertidal areas. The 50-metre deep Msimbati Channel is the most prominent of these three channels. The tide flows eastwards, and when the tide is over half way up seawater floods over the eastern reef platform of Mnazi Bay, along Membelwa and Namponda Islands. At its highest speed, seawater flows through the Msimbati Channel at four metres per second.

2.2.4 Climate

2.2.4.1 Weather

The southern coast of Tanzania has a tropical climate influenced by the seasonally changing monsoon winds of the Indian Ocean. Two distinct monsoon periods occur, the Northeast Monsoon (Kasikazi), which prevails between November and March, and the Southeast Monsoon, which blows from April to August (Kusi). In between the changing monsoons, an intermediate easterly wind prevails (Matlai). The Northeast Monsoon usually brings calm weather, while the Southeast Monsoon is usually windy with cool temperatures and rough seas.

2.2.4.2 Temperature and Cyclones

The Northeast Monsoon is normally associated with high air temperatures (28-32°C), high surface water temperatures (up to 31°C), and few rain showers. Winds are moderate to strong. Beginning in June, in the midst of the Southeast Monsoon, the climate is cooler and drier and the wind blows consistently stronger than any other part of the year. Cyclones in this part of the Indian Ocean occur between January and March, mainly in Madagascar and the Comoros Islands. Fortunately, during the cyclone season the people of Mtwara Region rarely experience any impact other than occasional days of strong winds.

2.2.4.3 Rainfall and Sediments

Rainfall is generally low, usually between 500 and 1,000 millimetres per year, with most precipitation falling over a short period from April to May. The Ruvuma River is the largest source of freshwater in the Park. During the wet season, the river floods across the narrow causeway linking Msimbati Peninsula to the mainland. For the rest of the year, there is only one small river near Mnazi village and some seasonal streams draining upland areas to the west.

Prolonged rainfall during the wet season increases the volume and strength of the Ruvuma River and its tributaries, increasing erosion and washing sediment into the river and then into the sea. When the Ruvuma River meets seawater, the sediment-laden outflow spreads northwards, along Msimbati Peninsula. The smaller Mnazi River also carries heavy sediment loads during the wet season into the southeast portion of Mnazi Bay. While the sediment increases the productivity of the Park's mangrove forests, seagrass beds, and plankton communities, excess sedimentation can damage reef habitat by hindering coral photosynthesis. Natural erosion rates are magnified by poor agricultural practices in the Ruvuma River basin.

2.3 Natural Environment

2.3.1 Coastal Forests and Shrubs

Coastal forests constitute an important fresh water catchment for the Park environment. These forests occur as small patches ranging from two to six hundred hectares. These coastal forests are remnants of the once continuous East African coastal forest that extended throughout the region. Scientific assessments have documented 254 species of plants in the Park area, representing 248 taxa, including 119 various taxa of trees.

About 35 species of plants, including coconut and casuarinas, have been classified as exotic, although none of these foreign species are considered "virulent." Most of the exotics are either crop plants or exotic ornamentals, like the sweet smelling tree near Latham's house, *Millingtonia hortensis*.

Scientific studies during Park development identified some plants that were new to the region, including *Vepris lanceolata*, *Cassipourea mossambicensis*, *Pentarrhopalopilium umbellulata*, *Aloe massawana*, *Psydrax curvifolia*, *Phellocalyx vollesenii*, *Psilanthus* ssp., *Tarenna littoralis*, and one potential discovery of a tree, *Diospyros squiloensis* (named after the port of Kilwa), which has not been collected in Tanzania for over 100 years (White, 1996). Other potential new discoveries included the climbing orchid *Vanilla roscheri* and a sedge that could be a rare species *Remirea maritime* (Haines & Lye, 1983). Other records of interest included the white flowered twiner, *Derris trifoliata* (former source of the insecticide "Derris powder"), the yellow flowered shrub *Hugonia busseana*, and the tree *Strychnos cocculoides* (Luke, 2004).

Trees formerly endemic to Tanzania, including *Baphia acrocalyx*, *Berlinia orientalis*, *Commiphora madagascariensis* and the extremely rare endemic shrub, *Premnahans joachimii*, were also recorded, representing perhaps the last stands of such trees in Tanzania (Luke, 2004).

2.3.2 Sand Banks and Beaches

The impressive sand banks extending about 3 kilometres along the coast of Msimbati Peninsula are over fifteen meters high in some places. Sand banks are rare features along the Tanzanian and East African coastline. The specialised plant community associated with these banks is unique to the country, adding to the special status of the Park. The banks and associated vegetation also attract specific communities of birds and insects that are unique to the park.

Sand beaches are common within the Park and occur in two main areas. A twelve-kilometre section of beach runs along the eastern shores of the Msimbati Peninsula and around Ruvula. Strong currents between Lijombe and Ras Mivinjeni lagoons are creating visible beach erosion problems, including parts of local coconut plantations. A more sheltered, fifteen-kilometre section of beach runs continuous along part of Sinda and Mnazi Bays. Vast expanses of open sand are also exposed during low tides in central parts of Sinda Bay to Mnazi Village and between Namponda and Membelwa Islands. These intertidal areas greatly contribute to the diversity of habitats in the Park.



Figure 4: Sand banks which are very attractive and are also turtle nesting sites

Beaches are especially important for nesting turtles, with green and hawksbill turtles annually nesting in the Park (Figure 4). Ghost crabs, sand crabs, sand hoppers, and butterfly shells (*Donax* spp.) also inhabit these sandy areas, along with other molluscs and polychaete worms below the surface. These invertebrates are an important food source for shorebirds, such as crab plovers, whimbrel, and yellow-billed storks.

2.3.3 Mangrove Forests

Of the nine mangrove species found in Tanzania, seven species have been reported in MBREMP: *Avicennia marina*, *Xylocarpus granatum*, *Rhizophora mucronata*, *Ceriops tagal*, *Sonneratia alba*, *Bruguiera gymnorrhiza*, and *Heritiera littoralis*. There are approximately 70 km² (or 7,000 hectares) of mangrove forest in the Park, accounting for nearly a tenth of all the mangrove forests of Tanzania (Wagner et al., 2004).

Ecologically, mangrove forests form an integral part of coastal and marine ecosystems. Mangroves are highly productive, producing large quantities of organic matter that serves as food for many resident and non-resident organisms. Mangroves also serve as breeding and nursery grounds for a great variety of invertebrates and fishes on which Park residents depend on. Moreover, mangroves trap river sediments that can otherwise smother seagrass beds and coral reefs. Similarly, mangroves play an important role in stabilizing the coastline, by preventing shoreline erosion from wave action and changing sea levels.

Mangrove forests also have significant socio-economic value. Park residents use mangroves as a source of firewood, charcoal, home and boat building materials. These forests and the animal life they support can also be a great tourist attraction.

The largest continuous mangrove forest in MBREMP is located in the northern portion of the Ruvuma Estuary. Within this area, the densest stands are adjacent to the Ruvuma River, between the river's confluences with the Litokoto and Lidengo rivers. In this area, the forest is comprised of mixed stands of healthy, mature trees, including *Heritiera littoralis* – a species that has suffered greatly in the Rufiji Delta forests. In terms of density and tree size, measured by basal area, the mangrove forest in this part of the Park is the second (with an average basal area of 1,015 square centimetres per square metre) to that of the Rufiji delta forest (average basal area 1,261 square centimetres per square metre) (Wagner et al., 2004).

When viewed from a map or the air, the Ruvuma Estuary gives the impression of having four main distributaries but in fact the northern three are tidally influenced and only the southern-most, Chikomolela, is regularly fed by freshwater. The discharge of river-borne nutrients through this channel contributes to the denser stands of mangroves in the southern part of the estuary.

Marine biodiversity in mangrove forests is limited to a few species tolerant to muddy conditions, desiccation, and seasonal freshwater flooding. Approximately fifteen species of crustacean and mollusc and twenty species of fish have been documented in MBREMP's mangrove forests. Notable species include mud crabs (*Scylla serrate*), penaeid prawns, fiddler crabs (*Uca* spp.), mud snails (*Terebralia palustris*), mullet (*Valamugil sahelii*), and seven-spot herring (*Hilsa kelee*). Unidentified monkeys have been spotted in the forest.



Dense mangrove forests of the Ruvumu Estuary at low tide

Mangrove forests are also present in a narrow band along many parts of the south and west shores of Mnazi Bay. The Islands of Namponda and Membelwa have well-developed mangrove forests closer to the ocean, with less mud substrate and freshwater input. This makes these islands unique because mangroves are present on the sheltered western shores and on the more exposed east coast, particularly on Membelwa. The proximity of mangrove forests, seagrass beds, and coral reefs to these islands is a feature of the Park that exists in few other parts of Tanzania.

The portions of the Park on the terrestrial edge of the mangrove forests are generally bare because of the amount of accumulated salt. These areas are flooded far less frequently and only a few specialist plants such as sedges and *Salicornia* spp. can be found here. These barren salt flats cover about 4 km² (400 hectares). Seaward of the mangroves, in most parts of the Park, a gently sloping mud flat extends to the sea, commonly covered by seagrass beds closer to the shore and extending into the subtidal area.

2.3.4 Seagrass Beds

Recent studies have confirmed that both the intertidal and subtidal seagrass beds are in good condition with healthy growth and high biodiversity. Ten species of seagrass have been reported in MBREMP: *Thalassia hemprichi*, *Halodule uninervis*, *H. wrightii*, *Halophila stipulacea*, *H. ovalis*, *Thalassodendron ciliatum*, *Cymodocea rotundata*, *Cymodocea serrulata*, *Syringodium isoetifolium*, and *Zostera capensis*.

Seagrasses need soft substrata for rooting and light. Seagrass beds are present inshore of the reef crest along much of the eastern shores of Msimbati Peninsula, but less along Ruvula. There is a thousand metre wide tidal expanse of thick, healthy seagrass beds along the northern end of the Msimbati Peninsula. In this area, the shaggy-leaved *Thalassia hemprichi* dominates the seabed. The tip of the beach, known as Mivinjeni, features a cluster of *Sonneratia alba* mangrove trees. Extending west parallel to Ruvula Channel, the seabed is steeply sloped with only small patches of *T. Ciliatum* and *S. isoetifolium*.

The seabed of the southern portion of Mnazi Bay is laden with mud and silt, resulting in thinner seagrass beds of *T. Hemprichi* and *C. rotundata*. The western shores of Mnazi and Sinde bays support well-developed seagrass beds along most of their length, beginning about 200 metres from the beach, and extending in places into the subtidal area. Larger, denser beds, about 500 to 1,000 metres wide, mostly of *T. hemprichi*, also exist inside the 20 kilometre rocky reef crest along the seaward side of Namponda and Membelwa islands. These beds are similar to those on Ras Ruvula.

Marine biotas found within the Park's seagrass environments include various echinoderms (e.g., sea cucumbers, starfish and sea urchins), mobile molluscs (e.g., cowries), burying bivalves, and crustaceans (e.g., crabs and shrimp). Many of these animals, as well as some fish species, lay their eggs on and within the seagrass.

2.3.5 Shallow Subtidal Habitats

The shallow, subtidal area of Mnazi and Sinde bays are predominantly characterized by bare sand. Seagrass beds are common in shallower areas, extending in patches to greater depths. Small coral patch reefs are common in the southern end of Mnazi Bay, with a larger section of patch reef (Chamba cha Lusale) bordering Msimbati Channel, extending from the low water line to over 30 metres deep.

2.3.6 Rocky Shores

Rocky shores are found within MBREMP in three different forms. The Pleistocene cliffs of the Membelwa, Namponda, and Kisiwa Kidogo islands support small clumps of red seaweed, snails of the genus *Nerita*, rock oysters (*Crassostrea cucullata*), and weak-shelled rock crabs (*Grapsustenui crustatus*).



*Seagrass beds serve as important feeding and spawning habitat for numerous fish species. Top photo: Great barracuda (*Sphyrna barracuda*) prowl the seagrass beds along Msimbati Channel. Bottom photo: A sky emperor (*Lethrinus mahsena*) guards her spawning red.*

On the western shores of the islands, these cliffs extend onto the second form of rocky substrate found in the Park, intertidal rocky flats punctuated by shallow tidal pools. Off Membelwa Island, these rocky flats run offshore for approximately half a kilometre. Smaller patches of rocky flats are found around Namponda and Kisiwa Kidogo. Common inhabitants of these rocky flats are cerith snails (*Cerithium* spp.) and red-eyed rock crabs (*Eriphia sebana*), with the red seaweed *Gracilaria salicornia* firmly fixed on rocky edges.

The third form of rocky substrate found in the Park is the reef crest, a one to two hundred metre wide band of mostly bare, near continuous rock running offshore from the southern part of Msimbati Peninsula to Ras Msangamkuu. During low tide, the reef crest provides an important refuge to various species of mobile invertebrates, including crabs, shrimps, snails, starfish, sea cucumbers, and brittle stars. Some marine species, including octopus and certain gastropods, lay their eggs in the boulders and crevices of the reef crest. Smaller examples of a reef crest are also found within Mnazi Bay, along the more sheltered reef out crops of Chamba cha Chumbo and Ilili.

2.3.7 Coral Reefs

The study conducted by Obura in 2004 confirmed that coral reefs within the Park are among the most diverse hard coral communities in East Africa. This high diversity is probably due to the influence of the South Equatorial Current and the Park's complex range of proximate habitats. In total, 258 species of hard coral in 59 genera from 15 families have been identified in the Park. In comparison, the Mafia Island Marine Park hosts about 270 species and locations in Kenya contain about 225 species. The coral fauna is dominated by species in the Acroporidae and Faviidae families (65 and 64 species, respectively). The abundance of coral genera that are vulnerable to bleaching, such as *Acropora*, *Stylophora* and *Seriatopora*, is notable, particularly in the wake of the bleaching that occurred in 1998 as a result of particularly strong El Niño conditions.

The study also identified four principle reef zones within MBREMP:

- The outer fore reef along the Park's offshore perimeter, extending more than 30 kilometres from Ras Msangamkuu to the southern part of Msimbati Peninsula. The southern portion of this zone includes the fragmented patch reefs bordering Kipwa Kidogo, Kipwa Kikubwa, and Lijombe Lagoon;
- The deep, sheltered reefs along the southern bank of Msimbati Channel, extending approximately five kilometres;
- The patch reefs within Mnazi Bay, including the larger patch reefs of Chamba cha Lusale, Chamba cha Chumbo, and Matenga, and the smaller coral patch reefs in the southern end of the bay; and
- The outer shelf reef northwest of Ras Msangamkuu.

Except where destructive fishing practices have damaged the benthic environment, these reefs have a high degree of topographic complexity and productivity. Hard coral species cover about 30 percent of these reefs, with soft corals and rubble each covering another 18 percent. High levels of algal growth or rubble are seen in some localities, indication of past habitat degradation.



The various types of reef and their physical conditions contribute to the diversity of coral communities in the Park. Within each environment, specific coral communities are able to survive and develop. For example, corals that are found in the clean waters offshore of Membelwa Island are different from the corals growing in the muddy waters of the southern portion of Mnazi Bay. The diversity of coral species and habitat suggest that the Park's marine ecosystem has a high productive capacity (Ngowo 2003).

The coral reefs of MBREMP demonstrate a high degree of variation in topography and benthic cover.

Studies to assess levels of coral bleaching and mortality following the El Niño event of 1998 indicated that coral cover in the reefs of Mnazi Bay had declined by 30 to 50 percent as a result of the rise in sea temperatures (Obura et al. 2000). Following that event, average hard coral cover was estimated at between 25 and 30 percent. These found that there was good potential for coral recruitment. Evidence of coral mortality from the El Niño event of 1998 is still apparent, though regrowth and re-colonization by hard and soft corals has been robust. Generally, the 1998 El Niño event demonstrated both the susceptibility and resiliency of Mnazi Bay’s reefs to seawater warming.

The variety of benthic environments and the biodiversity of coral communities in MBREMP likely contribute to the productivity and resiliency of local reefs. For example, the high density and diversity of corals in the deeper waters along Msimbati Channel, beyond the impacts of bleaching and dynamite fishing, may act as a reserve for the supply of larval recruits to damaged areas. These conditions suggest a high potential for recovery from bleaching and destructive fishing practices.

Since 1999, the reefs of Mnazi Bay have been included in the Tanzanian coral reef monitoring network, which is administered by scientists from the University of Dar es Salaam’s, Institute of Marine Science, Coastal Oceans Research and Development in the Indian Ocean (CORDIO), and volunteers from Frontier-Tanzania.

2.3.8 Crustaceans

Of the multitude of crustacean species found in the Park, the most economically important species for Park residents are lobsters (*Panulirus homorus*, *P. longipes*, *P. ornatus*, *P. penisllatus* and *P. versicolor*), penaeid prawns (*Penaeus monodon*, *P. monoceros*, *P. semisulcatus*, *P. Canaliculatus* and *Ferropenaeus indicus*) and crabs (*Scylla serrata* and *Portunus pelagicus*). Other targeted species of crustaceans include spanner crabs (*Ranina ranina*), freshwater prawns (*Macrobrachium* spp.) (harvested from Ruvuma River), and mantis shrimp (*Natosquilla investigatoris*). Despite the commercial importance of crustaceans to residents, the current status of crustaceans in the Park is unknown.

2.3.9 Molluscs

The most commercially important invertebrates for Park residents, are octopus (*Octopus cyanea* and *O. vulgaris*), squid (*Loligo forbesi* and *Sepia* spp.), bivalves (mainly cockles (*Anadara antiquata*) and giant clams (*Tridacna* spp.), and gastropods (such as tiger cowries, *Cypraea tigris*). As with crustaceans, the current biological status of mollusks in MBREMP is largely unknown.

2.3.10 Echinoderms

Echinoderms are commonly found in the seagrass beds and rocky and coral reef environments of MBREMP. In the western Indian Ocean, there are over 400 species of echinoderms, including various types of sea cucumbers, starfish, brittle stars, spiny sea urchins, and feather stars.

The status of echinoderms in MBREMP, particularly commercially important sea cucumbers, was extensively studied during the Park’s formation. There are about thirty species of sea cucumbers found within Mnazi Bay, with the most common species being *Holothuria atra*, *H. scabra*, *H. edulis*, *Actinopyga miliaris*, and *Stichopus horrens*.

Though not as commercially important as sea cucumbers, the status of other echinoderms is likewise relevant to the park’s marine biodiversity. Crown-of-thorn starfish (*Acanthaster planci*) feed on live coral polyps, and their over population is commonly seen as a cause of reef degradation. Sea urchins, on the other hand, generally help to maintain coral reef cover by grazing on the macroalgae that can potentially compete with corals for light and space. However, if sea urchin populations grow too large, they may further contribute to reef erosion through feeding and spine abrasion (McClanahan et al. 1996).



Crown-of-thorn Starfish
(*Acanthaster planci*)

2.3.11 Marine Fish

Approximately 400 species of fish, belonging to about 50 families and 150 genera, have been identified in MBREMP. The biodiversity of fish in MBREMP is comparable to Mafia Island Marine Park, where roughly the same number of species has also been reported. Greater biodiversity has been found in other marine parks in East Africa (e.g., Watamu Marine Park in Kenya, where about 1,300 fish species have been identified); however, these parks are generally more extensively studied and subject to stricter fishing regulations.

The productivity of MBREMP's waters are supported by the various marine habitats that comprise the Park. For example, the turbid, nutrient-rich waters of the Ruvuma Estuary support large stocks of mullet, trevally, snapper, milkfish, and breams. Likewise, the Park's reefs support stocks of groupers, emperors, snappers, goatfish, and parrotfish. Further offshore, sharks, tuna, swordfish, mackerel, and scad can be caught in deeper waters.

This productivity suggests that local fish stocks can support a viable local fishing industry, if fishing is carried out in a sustainable manner. However, biological surveys conducted in MBREMP suggest that local fish stocks are subject to heavy fishing pressure. In particular, the study by (Richmond and Mohamed, (2005) made three important findings in this respect: (1) carnivorous fish species, such as groupers, sharks, snappers, and barracuda, are generally found in low numbers; (2) herbivorous fish species such as parrotfish, surgeonfish and rabbitfish are generally found in smaller sizes; and (3) the majority of observed fish are smaller planktivorous dermasal. These observations are potential indicators of overfishing.

2.3.12 MarineTurtles

Of the world's eight species of sea turtles, five have been recorded in Tanzania including MBREMP. The most common species are green turtles (*Chelonia mydas*) and hawksbill turtles (*Eretmochelys imbricate*), both of which nest in the Park at various times of the year. There are occasional reports of olive ridley (*Lepidochelys olivacea*), leatherback (*Dermochelys coriacea*), and loggerhead (*Caretta caretta*) turtles in the Park, though these species are only migratory visitors and do not nest in Tanzania.

There are four main turtle nesting sites within the Park: Litokoto, Kingumi, Msimbati, and Msangamkuu beaches. Most nesting occurs between April and August, though green turtles have been reported to nest as early as February. Female turtles usually return to the same beach where they hatched to lay their eggs at night in a shallow pit. After about 60 days, the turtle hatchlings will emerge and immediately take to the sea, where they will feed and grow for up to 40 years before returning to repeat the cycle. Green turtles feed exclusively on seagrass, with the other species also consuming seaweed, sponges, and jellyfish.



Tracking of sea turtle hatchling.



Empty turtle egg shells after hatching

In a 2003 survey of Park villagers, more than half of all respondents reported a decline in turtle populations over the previous ten to twenty years (Muir 2003). This downward trend was attributed to targeted and incidental capture in nets, poaching of eggs and nesting females, dynamite fishing, and natural causes.

The IUCN has designated all the sea turtles of the western Indian Ocean as endangered, with hawksbill and leatherback turtles considered critically endangered. Sea turtles are protected internationally under the Convention on International Trade on Endangered Species (CITES), as well as Tanzanian law.

2.3.13 Marine Mammals

Several types of cetaceans can be found in MBREMP, including humpback whales, sperm whales, and four species of dolphin common bottlenose dolphins (*Tursiops truncatus*), Indo-Pacific bottlenose dolphins (*Tursiops aduncus*), Indo-Pacific humpback dolphins (*Sousa chinensis*), and spinner dolphins (*Stenella longirostris*). MBREMP was also once home to dugongs, with the last confirmed sighting in 1992, although there have been unconfirmed sightings since then. (Muir et al. 2003).

2.3.14 Shorebirds

The avian fauna of MBREMP is understudied. The Park is believed to be important habitat for shorebirds, particularly waders. Some evidence suggests that local bird populations may be declining. For example, in the 1960s, over 3,000 crab plover (*Dromas ardeola*) were recorded at a site that is now within MBREMP, but a similar count in 1995 recorded only 750 crab plovers and 1,823 greater sand plovers (*Charadrius leschenaultii*). The Park is also internationally recognised as Important Birds Area (IBA) No. 28. Other birds commonly cited in the Park include the herons, egrets and small wader birds. The mangrove forests of the Ruvuma estuary and Namponda and Membelwa islands provide important roosting sites for wading birds, as well as feeding and breeding areas for other birds.

In February 2004, during the Northeast Monsoon, about eighty yellow-billed storks were seen roosting along the north western shores of Namponda Island in a small mangrove stand, and on rocky islets on the southwestern side of Membelwa Island. Feeding was observed during low tide at numerous sites through the inner bays. These storks are common throughout Tanzania, but not normally seen in such numbers, and thus the Park populations may be unique.

MBREMP was the site of the first record in East Africa of the shy albatross (*Thalas sarchecausta*). Masked Boobies and peregrine falcon have also been recorded in the Park. On the mainland, in neighbouring shrub forests, farm land and plantations, red-eyed doves (*Streptopelia semitorquata*), white-bellied sunbirds (*Cinnyris talatala*), pied crows (*Corvus albus*) and black kites (*Milvus migrans*) are present, the latter commonly seen on beaches near fish landing sites. Beyond the biological significance, the diversity of birds in the Park is worth promoting for tourism purposes.

2.3.15 Freshwater Animals

There are a number of fresh water animals within the Ruvuma River, the most common being hippos (*Hippopotamus amphibious*) and crocodiles (*Crocodilus niloticus*). These species are tourist attractions in MBREMP, but also pose a threat to human life and property.

2.4 Human Population and Activities (Resource Use)



(A) Canoe fishers sell their catch at the end of the day, near Mnazi Village. (B) Dhow of Ruvula Beach. (C) Basket trap overgrown with corals in Mnazi Bay. (D) Residents gather shellfish and octopus during low tide, near Msimbati Village.

More than just a geographical entity, MBREMP is home to more than 44,000 Tanzanians, living in seventeen villages. Park residents are highly dependent on local marine resources for their livelihood, in terms of both food and income. Men and women widely engage in fishing, gathering shellfish, sea cucumbers, and octopus during low tide, and harvesting timber from the mangrove forests.

Some parts of the Park subject to tidal flooding are currently being used for salt production. Agriculture and livestock production by Park residents also relies upon local land and freshwater resources. The Park is also the site of extensive onshore and offshore natural gas deposits, and three wells have been drilled in the Park since 2006, as part of a gas-to-electric power project for the Mtwara Region.

MBREMP has also supported, directly or indirectly, a number of supplementary income generating activities (IGAs), which are intended to lessen residents' dependence upon fishing and other over-exploited marine resources. Such activities include aquaculture, seaweed farming, pearl cultivation, crab fattening, chicken and livestock rearing, and improved agricultural practices.

2.4.1 Fishing

As of 2004, an estimated 1,500 fishers were operating within MBREMP, with 25 percent of all households in the Park being dependant upon fishing for either their food or income. Of the sea bordering villages, residents of Msimbati, Mkubiru and Mngoji are especially dependent upon local marine resources. Similarly the residents of Tangazo are more dependent on marine resources than the other villages that border the Ruvuma Estuary and the associated mangrove forests (Malleret and Simbua, 2004).

Despite its prevalence, fishing is a small-scale, industry in MBREMP, with most fishers operating alone or in small groups of two to three people. Dugout canoes (some equipped with small sails and outriggers) are the most common means of fishing in the Park, though larger fishing parties of between five and ten men set sail in dhows from Msimbati and Ruvula villages daily. Only a handful of boats in the Park are equipped with an outboard engine.

Fishers in MBREMP use a variety of types of fishing gears. Handlines (mshipi), seine nets (nyavu) of assorted mesh sizes, and basket traps (madema) are the most commonly used types of fishing gear. Other types of gears include spears (mdeki), spear guns (bunduki), tidal weirs (wando), sharknets (jarife), ringnets (kavogo la kusini), castnets (kimia), scoop nets (lusenga) longlines (zulumati), and by hand or with short metal bar (nondo) while wading and free diving. Beach seine nets (juya) and fine-meshed mosquito nets (tandilo) are also frequently used for fishing, despite being illegal under Tanzanian law and prohibited by Park regulations.

Although Park residents constitute the majority of fishers operating in MBREMP, boats and fishing crews from Mikindani, Mtwara, and even Mozambique frequently fish within the Park.

The various fishing gears employed in the Park target different types and sizes of marine organisms (Table 1), and most fishers catch and sell a wide variety of species. Fishers also operate throughout the Park the reefs, deeper offshore waters, the estuary, and the mangrove forests. The catch includes demersal and pelagic fish, shellfish, octopus, sea cucumbers, prawns, squids, crabs, and lobsters.

To varying degrees, fishers use their catch for subsistence purposes and sell to, traders, agents and exporters. Fish, both fresh and dried, is sold in local villages and throughout south eastern Tanzania. Octopus, lobsters, prawns, crabs, and shark fins are commonly sold to traders for export outside the region and, in some cases, the country. Sea cucumbers were commonly collected and sold for export until 1996, when Tanzania imposed a national moratorium on the industry out of concern of overharvesting.

Fishing is generally carried out for four to eight hours during the day or night, for five to six days per week, with days off often spent repairing and maintaining fishing gears. Fishing occurs nearly year round in villages bordering the sea, and for about three-quarters of the year in villages adjacent to mangrove and estuary areas. Although women and children commonly fish from the shore with mosquito nets and by collecting shellfish, octopus, and sea cucumbers during low tide, vessel-based fishing is largely confined to men.

As in other parts of Tanzania, fishing in MBREMP is strongly influenced by tidal and climatic patterns. Catches generally drop during the Southeast Monsoon (Kusi), partly because of the windy conditions that can make it difficult for boats to reach common fishing grounds. Local fishing effort is also influenced by social and religious customs, as well as other labour demands, particularly farming during the planting and harvesting seasons.

There are three main fishing areas in the Park: (1) Mnazi Bay, including the islands of Namponda and Membelwa, and the associated reefs and mangrove forests; (2) Ruvuma Estuary and its associated mangrove forests; and (3) the outer fore reef and offshore deep water from southern Msimbati Peninsula to Ras Msangamkuu. Each of these areas is comprised of dozens of individually identified fishing grounds.

Table 1. Summary of common types of fishing gears, fishing practices, and targeted species in MBREMP (adopted from Malleret & Simbua 2004)

Gear Type	Daily Fishing Pattern	Seasonality	Targeted Species
Seine Nets (2.5-7" mesh) (Nyavu)	<ul style="list-style-type: none"> Day and Night Unconstrained by tides Marine and freshwater (Ruvumu River) 	<ul style="list-style-type: none"> Year round Peak season: Northeast and inter monsoons 	Emperor, snapper, jacks, sweetlips, mackerel, scad, bream, grunts, milkfish, mullet, halfbeak, needlefish, prawns, catfish
Handlines (Mshipi)	<ul style="list-style-type: none"> Day and night 	<ul style="list-style-type: none"> Year round Peak season: Northeast and inter Monsoons 	Emperor, snapper, jacks, grouper, wrasse, grunter, bream, shark, kingfish, barracuda

Gear Type	Daily Fishing Pattern	Seasonality	Targeted Species
Basket Traps (<i>Madema</i>)	<ul style="list-style-type: none"> Day Limited by rough weather 	<ul style="list-style-type: none"> Year round Peak season: Northeast and inter Monsoons 	Emperor, parrotfish, goatfish, rabbitfish, sweetlips, grunters, surgeonfish, triggerfish, lobster
Spears (<i>Mdeki</i>) & Spear Guns (<i>Bunduki</i>)	<ul style="list-style-type: none"> Day During low tide, wading or free diving (<i>kuzamia</i>) 	<ul style="list-style-type: none"> Year round Peak season: Northeast and inter Monsoons 	Jacks, parrotfish, surgeonfish, grouper; sweetlips, squirrelfish, grunters, octopus
By Hand or with Short, Metal Bar (<i>Nondo</i>)	<ul style="list-style-type: none"> Day Low tide, wading or free diving (<i>kuzamia</i>) 	<ul style="list-style-type: none"> Year round Peak season: Northeast and inter Monsoons 	Shellfish, octopus, crabs, sea cucumbers
Weir (<i>Wando</i>)	<ul style="list-style-type: none"> Day Checked at low tide, once or twice per day 	<ul style="list-style-type: none"> Year round Peak season: Southeast Monsoon, spring tides 	Prawns, snapper, emperor, jacks
Longlines (<i>Zulumati</i>)	<ul style="list-style-type: none"> Predominantly Night 	<ul style="list-style-type: none"> Year round Peak season: Northeast and inter Monsoons 	Emperor, snapper, grouper, jacks, sea catfish, shark, tuna, billfish, kingfish, dolphinfish
Shark Nets (>7" mesh) (<i>Jarife</i>)	<ul style="list-style-type: none"> Night Departing at low tide, returning at high tide 6 to 7 hours at sea 	<ul style="list-style-type: none"> Year round Peak season: Northeast and inter Monsoons 	Sharks, rays, skates, jacks, mullet, kingfish, tuna, snapper, grouper, emperors, barracuda, grunters, sea catfish, wrasse, flatfish, cobia
Cast Nets (<i>Kimia</i>) and Scoop Nets (<i>Lusenga</i>)	<ul style="list-style-type: none"> Day Shallow water during low tide, once or twice per day 	<ul style="list-style-type: none"> Year round Peak season: Northeast and inter Monsoons 	Mullet, anchovies, sardines, wolf-herring, silver-biddies, bonefish, sillago, lizardfish
Ring Nets (<i>KavogoyaKusini</i>)	<ul style="list-style-type: none"> Moonless Nights 	<ul style="list-style-type: none"> Year round Peak season: Northeast and inter Monsoons 	Mackerel, jacks, anchovies, sardines, kingfish
Seine Nets (<2.5" mesh) (illegal)	<ul style="list-style-type: none"> Day and night 	<ul style="list-style-type: none"> Year round Peak season: Northeast and inter Monsoon 	Mullet, silver biddies, anchovies, sardines, herring, ponyfish cardinalfish, sergeant fish
Mosquito Nets (<i>tandilo</i>) (Illegal)	<ul style="list-style-type: none"> Day 	<ul style="list-style-type: none"> Year round Peak season: Northeast and inter Monsoons 	Anchovies, sardines, herring, juvenile fish, spider prawns (<i>uduvi</i>)

Gear Type	Daily Fishing Pattern	Seasonality	Targeted Species
Beach Seine Nets (<i>Juya</i>) (illegal)	<ul style="list-style-type: none"> • Day 	<ul style="list-style-type: none"> • Year round • Peak season: Northeast and inter Monsoons 	Non-selective; catches all species and sizes

2.4.2 Agriculture and Livestock

Agriculture and livestock are also the sources of income for Park residents. Small-scale agriculture is practiced throughout the Park, both for subsistence and income. Common cash crops include cashewnuts, simsim, groundnuts, and coconuts. The predominant food crops are maize, sorghum, cassava, rice, and pigeon peas. Park residents raise goats, sheep, cattle, and chickens.

Livestock in MBREMP is fairly small-scale, primarily for economic reasons. Farming is seasonal and generally limited by poor soil conditions and insufficient rainfall. This situation increases local dependence on the Park's marine resources. However, there is potential for agricultural and livestock development if the areas associated with the wetland system of the Ruvuma River and Delta are properly utilised.



Figure 11. Cattle near Ruvula Village

2.4.3 Mangroves

The mangrove forests of MBREMP are an important part of the local economy and way of life for residents of the Park. Beyond their contribution to the local fishery, mangrove forests provide timber, firewood, charcoal, tannin, animal fodder, traditional medicines, and construction materials for houses, boats, and fishing gears. Mangroves also make a good site for beehives, represents potential tourist attraction, and offer valuable research and education opportunities.

Park residents use mangrove trees, particularly *Rizophora mucronata* and *Ceripogon stageri*, for building and roofing material due to their termite resistant property. Seeds of *Xylocarpus granatum* are commonly used for treating gastrointestinal illnesses. Other mangrove species are commonly used for charcoal and firewood production.

2.4.4 Coastal Forests and Shrubs

Coastal upland forests and shrub lands are important source of building materials (timber and poles), fuel (firewood and charcoal), and medicine. Makonde wood carvers, whose products are famous, sold throughout Tanzania, prefer certain types of local coastal trees, particularly the endangered *Dalbergia melanoxylon* (mpingo). Residents also use forests for honey production and livestock grazing. Coastal forests and shrub lands within MBREMP also include important sacred sites and grave yards for local communities.

2.4.5 Coral Mining

Live coral mining is known to occur in the Park's immediate vicinity, particularly at Msangamkuu and Mikindani Bay. It is estimated that 4,800 tons of live coral is annually being extracted from sea for lime production, requiring 3,000 tons of firewood (Guard, 2004). The massive boulder coral *Porites lutea* is principally used in this industry. *P. lutea* is among the most important reef framework builders in East Africa, constituting a keystone species for the regional marine environment (Hamilton and Brakel 1984). MBREMP in collaboration with the Mtwara Rural District Council is working to develop alternative building materials for this industry, including terrestrial sources of fossilized coral.

2.5 Tourism

The beaches along the coast of Msimbati Peninsula, from Msimbati to Ruvula villages, are some of the most scenic in all of Tanzania. The spectacular and fascinating Ruvuma Estuary offers a unique experience to explore dense mangrove forests. Unparalleled snorkelling and SCUBA diving opportunities await divers in the coral reefs off Msimbati, along the beach in Ruvula and Msangamkuu. Namponda and Membelwa islands offer spectacular intricate for snorkelling and SCUBA diving. Other attractions include banks covered with rare endemic plant species, crocodiles and hippos prowling the Ruvuma River, monkeys, wild pigs, bush babies, warthogs, birds, and bats. Humpback and sperm whales and dolphins are frequently observed in Mnazi Bay and off the Msimbati/ Ruvula channel. Whales typically visit the Park's waters from July to November, during their annual migration to and from the colder seawater of the southern Indian Ocean.

Tourism activities that are undertaken in the Park so far include; snorkelling, SCUBA diving, bird watching, camping, wind surfing, and sun bathing. The level of tourist visitation to the Park is low with a few visitors coming from the resident expatriates and missionaries based in Mtwara and Lindi regions. There are no typical tourist hotels within the Park, except the small campsite and thatch bungalows at Ruvula Sea Safari Lodge. Most visitors to the Park make it a day trip from hotels located in Mtwara and Mikindani. Transportation to and from the park is over a graded dirt track, which requires an off-road vehicle for much of the year.

Sites for potential tourist development have yet to be identified and publicized. The Park is legally required to ensure that this is a facilitative process, conducted in the best interests of all stakeholders. Investment will safeguard key sites and habitats, and be designed to prevent potential conflicts among users. Tourism also requires investment in visitor facilities, informative signs, and educational materials. Consideration of visitor safety and emergency preparedness is also of utmost concern.

2.6 Natural Gas

Natural gas was discovered in Mnazi Bay in 1982, and since 2006, a Canadian company, M/s. Artumas Group Inc., has completed three wells in the bay as part of Mtwara Energy Project, a gas-to-power project which has brought power to Mtwara and Lindi regions and, eventually is intended to bring power to other parts of Tanzania. Prior approval of this drilling was subject to a number of environmental requirements, including a rigorous environmental impact assessment (EIA). Gas from the wells is piped to a power plant in the Mtwara-Mikindani Municipal District.

The quantity of gas available in the Park is far greater than current demand, and the wells have now become the focus of plans to supply power to the national grid in an attempt to relieve national power supply problems.

More recently, international companies have begun deep-water hydrocarbon exploration offshore of Mtwara and MBREMP. If these exploration efforts lead to full-scale production, shipping activity at the Mtwara Port could increase significantly. MBREMP officials are currently working with the lease holders to mitigate any impacts from exploration and development activities, including in the preparation of an oil spill containment plan in case of emergency.

2.7 Makonde Culture

As MBREMP invites outsiders to visit the Park, this process can have the unintended effect of altering the local Makonde culture that makes the place so unique.

Makonde is the main tribe of Park residents. The Makonde people are famous for their traditional dance, sindimba, and their prized carvings. Key cultural traditions of the Makonde tribe include initiation ceremonies for adolescent boys and girls (Jando and Unyago respectively), and communal working and age groupings (Chikudi).

Promotion of local culture (dance, music, carvings, Jando and Unyago) could be one way of both preserving and honouring the local culture, while still helping to improve the livelihood and income of Park residents. Strategies will need to be devised to maintain the quality of local culture, while still promoting tourism.

CHAPTER 3

MANAGEMENT ISSUES AND OPPORTUNITIES

Biological and socio-economic studies, and Village Environmental Management Plans (VEMPs), have highlighted the importance of the Park's marine biodiversity on a national and regional scale, as well as its significance to local inhabitants. The productivity of the Park's marine waters is linked to the integrity of the various marine habitats, in particular the coral reefs, seagrass beds, sandy beaches, and mangrove forests of Mnazi Bay and the Ruvuma Estuary.

Studies have also described a number of threats to this unique environment from human activities through the following main operations: the collection of invertebrates (mostly from the lower intertidal zones), fishing (using a variety of gears and techniques), coral mining and mangrove harvesting, and the discharge of various pollutants. Past studies have also revealed a high dependence on marine resources and a low-income base for the residents of the Park. Other key issues raised through the stakeholders consultation process during the review of the previous 2005 GMP include the presence of cultural/ spiritual sites, coastal forests, shrubs, and other hard wood tree species for carving and medicinal plants, freshwater sites, wildlife (notably hippopotamus and crocodiles), tourism development, gas exploration, salt making, and the condition of beaches.

3.1 Natural Resource Issues

Various community consultations, research investigations, and stakeholder meetings have identified a number of issues that must be addressed if the Park is to function and succeed in its mission as planned. Main issues include overfishing and unregulated fishing, shell and sea cucumber collection, destructive fishing, endangered species, coral mining, and mangrove harvesting.

3.1.1 Overfishing and Unregulated Fishing

Fish surveys have indicated that many fish stocks of commercial importance (e.g., groupers, snappers, emperors) are only found in small, immature sizes, suggesting that these species are being heavily fished. In addition, herbivorous species (e.g., parrotfish, surgeonfish, and rabbitfish) occur in very low densities, indicating that fishers may be "fishing down the food chain," hence indicating overfishing.

Overfishing is perhaps the most serious threat to the integrity of the Park's marine environment. The results of overfishing invariably result in both damage to the environment and decline in fishers' living standards. If the pattern continues, the maximum sustainable yield will be exceeded and fish stocks will begin to decline.

Overfishing results from several factors, including increases in the numbers of fishers, new and "improved" gear types that result in higher catch rates (e.g., ringnets) and destructive fishing practices (e.g., dynamite fishing and using nets with tiny mesh sizes, like mosquito nets). These factors are interconnected. For example, as the number of fishers operating within the Park increase and the catch per fisher is reduced, fishers are more likely to adopt either improved gear types or destructive fishing practices in order to maintain their existing levels of income. The issue of fishing pressure is compounded by the fact that both Park residents and migratory fishers operate within the Park. Local fishers often fish on subsistence basis and generally are not as well equipped as migratory fishers, who fish for commercial purposes. Local opinion is that migratory fishers catch more fish than locals due to these advantages. Migratory fishers commonly acknowledge that they fish in MBREMP because their home fishing grounds are overfished.



Figure 12: Monitoring of fish catch per unit effort in the park

All evidence (scientific and anecdotal) suggests that local fish populations are under heavy pressure and that certain fish stocks could already be on the decline. Local communities have noted a decline in living standards directly related to reductions in the overall fish catch. The stocks of some species, including sea cucumbers and shellfish collected for their shells (for curio trade), have already dramatically fallen in the Park. Other species are following this pattern, notably octopus. Finfish stocks have shown signs of declines in individual fish size, with catches increasingly dominated by smaller, immature fish.

Data on fishing effort, catch landed, and stock estimates, which are all essential for sustainable fisheries management, are still lacking and/or inadequate in MBREMP. As a result, it is difficult at this stage to be too prescriptive given the lack of real depth of knowledge on fishing practices in the Park. The Park's Research and Monitoring Unit is currently developing a fish catch survey program that would yield valuable information on the level of local fishing pressure and the status of fish stocks, which is vital in proper management of the resource.

3.1.2 Shellfish and Sea Cucumber Collection

Park residents frequently search for shellfish and sea cucumbers in intertidal areas during low tide and by skin diving, mostly during spring tide. Bivalve molluscs, such as cockle and oysters, and a few types of gastropods are collected in large numbers, mainly for household consumption. Some larger bivalves, locally known as tondo, are collected for lime production. In recent years, the collection of holothurians (majongoo bahari) for export has intensified to the extent that larger specimens of sea cucumbers are becoming notably scarce. To combat this problem, in 2006 the Government of Tanzania imposed a moratorium on the fishing and export of sea cucumbers. The concern was that the level of sea cucumber harvesting was exceeding natural production rates.

3.1.3 Destructive Fishing

Dynamite fishing is perhaps the most destructive fishing practice historically carried out in the Park. Dynamite fishing can cause the long-term or permanent destruction of coral habitat on which fish rely for food, shelter, and spawning grounds. Although the practice is illegal, dynamite fishing is still reported to occur in many areas of coastal Tanzania. Lack of enforcement, continued access to materials, and persistent poverty are the primary reasons for the persistence of this practice.



Gears and crafts confiscated through MBREMP enforcement efforts against illegal fishing practices.

Dynamite fishing is still a problem in the Park. However, the practice has generally declined with regular enforcement patrols conducted by Park staff and other stakeholders.

The use of beach seine nets (juya) and other types of dragnets (kavogo) can also be very damaging to benthic marine life. When used in coral habitat, dragnets can quickly destroy large areas of coral that will require decades to recover. In areas with especially fragile branching corals, this form of fishing has a similar impact to that of dynamite fishing. Fishing with nets with small mesh sizes (less than 2.5 inches), including mosquito nets (tandilo), can also impair fish stocks by harvesting immature fish. Beach seine and dragnet fishing is illegal in Tanzania and these practice, along with the use of nets with a mesh size less than 2.5 inches, are against existing Park regulations. Enforcement and public education efforts by MBREMP, along with gear exchange programs, are believed to have reduced the use of prohibited fishing gears, though the practice undoubtedly still continues.

3.1.4 Endangered Species

MBREMP serves as a critical feeding, breeding, and nesting area for endangered green and critically endangered hawksbill turtles. The other three turtle species of the western Indian Ocean species make frequent visits to MBREMP waters, but do not nest in the Park and are much less common.

In a 2003 survey to Park villagers, the majority of respondents said that although turtle sightings were still common, populations had declined over the previous ten to twenty years due to targeted and incidental capture in nets, poaching of nesting females and eggs, trade in tortoise shells, and habitat destruction through fishing (Muir 2003). Almost ninety percent of all respondents said that they had previously consumed turtle eggs, and a quarter claimed to have personally caught turtles in their nets while fishing.

Turtles are hunted for meat, the trade of which is an important and lucrative local business. Dedicated turtle hunters operate on the four main nesting beaches in the Park and pose a major threat to local turtle populations. Turtles are also deliberately hunted off Msimbati, at Matanango and Nanano reefs. Turtle eggs are harvested for consumption, shells are used for decoration and occasionally sold to tourists, and turtle oil is used as a cure for ailments such as burns and rashes.

The regular capture and slaughter of turtles in sharknets was documented in the 2003 study and during subsequent coral reef surveys conducted in 2004. These activities pose a threat to the long-term survival of local turtle populations, although baseline population data is still lacking. However, MBREMP-facilitated community awareness and training programmes in turtle conservation and are believed to have reduced the incidence of turtle poaching.

All the species of sea turtles that can be found in MBREMP are currently on the IUCN's "Red List" of threatened species. Green, loggerhead and olive ridley turtles are classified as endangered, and hawksbill and leatherback turtles are considered critically endangered (IUCN 2004). These species are also listed on Appendix I of the Convention on

International Trade in Endangered Species of Wild Fauna and Flora (CITES), which prohibits the international trade of specimens of these animals.

In Tanzania, sea turtles are legally protected under the Fisheries Act of 2003 and the Marine Parks and Reserves Act No. 29 of 1994. These laws subject turtle poachers to fines and even imprisonment. Despite these laws, few if any, perpetrators are arrested and held accountable in Tanzania. The Park's on-going turtle nest protection program involving communities in the Park has proven successful, but must be maintained and enhanced. Future concerns include disturbance of nesting beaches from tourism development. Awareness of national legislation needs to extend to all levels of government so that appropriate penalties are given. National and regional turtle conservation strategies need to also be integrated into Park management scheme.

3.1.5 Coral Mining

In marine areas adjacent to the Park, especially around Ras-Msangamkuu, residents have been known to break off live corals from the seabed for use in lime production. The main types of coral used are the massive, slow growing corals of the *Porites* genus, which are ecologically important in reducing wave action and providing the base for reef growth. Continued extraction of these corals can destroy reefs, lead to increased erosion of the adjacent coastlines, and the eventual decline of local fish stocks. A related environmental impact of lime production is the deforestation caused by uncontrolled harvest of trees to feed the kilns that are used to burn the coral. Deforestation leads to increased soil erosion, which in turn affects the Park's marine environment through increased sedimentation in coral and seagrass habitats.



Releasing a Green turtle captured by poacher.

3.1.6 Mangrove Harvesting

For centuries, people inhabiting the Park have used local mangrove forests for fuel and building materials. Since local populations were low and migration was limited, it is likely that mangrove resources were harvested at a sustainable level. As human population in MBREMP and the influence of people from outside areas have increased over the past decade, the pressure on local mangrove forests has increased. Mangrove trees are now commonly harvested for firewood, charcoal, and housing and boat building materials.

Besides over-harvesting, there are several other factors that threaten the biodiversity of mangroves in MBREMP, including clear-cutting for salt production, unsustainable fishing methods, shellfish collection, and coastal erosion (Wagner et al. 2004). Hydrocarbon exploration has also been identified as the potential threat to local mangrove forests (Pring & Polunin 2010).

While there is evidence of mangrove harvesting in many sites within MBREMP, so far the resource appears to be exploited at a sustainable rate. This is due to the large number of seedlings seen in most sites, which far exceeded the density of cut stumps. Moreover, in most places the harvesting has not left open areas to the extent that forest conditions and soil properties appears to have changed significantly (Wagner et al 2004). However, there are some isolated areas in the Ruvuma Estuary where harvesting seems to have exceeded the natural regeneration rate. The harvesting of mangrove trees in Tanzania is controlled under the National Mangrove Management Plan and the Forest Act No. 14 of 2002, both of which are integrated into the current MBREMP GMP.

3.2. Socio-economic Issues

The Park is home to approximately 44,000 inhabitants many of whom depend largely on the marine resources for their livelihood. The high proportion of Park households dependent upon marine resources is an indicator of the potential threats to local marine resources. The more households are dependent on marine resources for their livelihood, the less likely they are to be receptive to Park regulations that control the use of these resources.

Occupational structure and household surveys have shown that there is a wide array of resource-use activities carried out in the Park, including marine and freshwater fishing, mangrove and other timber harvesting, shellfish collecting, palm weaving, salt production, seaweed farming, and farming for income or subsistence (Malleret and Simbua 2004, Malleret 2004). According to these studies, 35 percent of households depend on marine resources for at least part of their livelihood, and 25 percent of the households are dependant upon or directly involved in fishing.

However, this structure is not homogeneous across the Park but varies from village to villages. For example, 54 percent of households in villages bordering the sea are reported being dependent upon or engaged in fishing, compared to only 19 percent of households in villages bordering Ruvuma Estuary and the accompanying mangrove forests. This variation is a product of not only of villagers' relative proximity to marine resources, but also their access to markets and capital.

Following a consultancy on livelihood assessments and possible options for supplementary income generating activities (SIGs), a number of diversified SIG options were piloted and two of them (beekeeping and mariculture (i.e., fish, oyster, and crab farming) were seen to be the most viable (Harrison 2005). Information obtained from the most recent economic survey (MBREMP 2011) showed that apart from milkfish farming, which has proved to be viable in one or two villages in the park, many of the pilot SIGs are far from achieving their intended target of diversification of livelihood activities, away from those solely related to harvesting of marine resources.

There is a need to develop business plans for pilot projects to facilitate their profitability and successful adoption. There is also a need to address three principal factors critical to the success of SIGs: access to financial capital, acquisition of efficient technologies and equipment, and access to required knowledge and training (Harrison 2005).

3.3 Opportunities

3.3.1 Tourism

The exceptional natural beauty of MBREMP makes it a potential destination for tourists. The Park is endowed with wildlife, marine, and cultural resources, an unspoiled environment good beach, incomparable scenery, and friendly residents; all of which make the Park a unique tourist destination. Despite such potential, MBREMP is still experiencing only a small number of annual visitors compared to other marine parks in Tanzania. At present, people visiting the Park are limited to local resident expatriates and missionaries, local Tanzanians, and limited number of foreign tourists.

Tourism development in MBREMP is focused on balancing sustainable development whilst reaping economic benefits, which can be achieved through guidance from the Tourism Investment Framework (TIF). The TIF is intended to assist MBREMP officials in developing and implementing strategies to link tourism with biodiversity conservation and effective community participation in managing the Park.

3.3.2 Mtwara Development Corridor (MtDC)

The Mtwara Development Corridor (MtDC) is the initiative conceived in 1992 by the Southern African Transport and Communications Commission, which is part of the Southern African Development Community (SADC). The aim of MtDC was to reduce poverty by stimulating broad-based economic growth through the use of raw materials that will expand industrial production and boost exports.

Two key crossing points between Tanzania and Mozambique are among the projects envisaged under MtDC. The first project is intended to link the coastal corridor by upgrading the road from Mtwara to Mwambo in Tanzania and from Namiranga to Palma in Mozambique. This 100-kilometer section of road traversing MBREMP would be connected by the current ferry service across the Ruvuma River and constitutes the “missing link” in the coastal corridor between Mombasa to Maputo. The second project is a 720-meter Unity Bridge linking Tanzania and Mozambique. Work on this bridge was initiated on 12th May, 2010 by the presidents of Mozambique and Tanzania the bridge is already operational. MtDC will also upgrade the port of Mtwara to handle increased traffic of people and goods.

While these projects could have unintended negative impacts for the Park (e.g., population growth, increased resource use, pollution), improved transportation between the marine parks on the Mozambique side of the border and MBREMP could help in the creation of a Mnazi Bay-Quimbas transfrontier marine protected area, which would be an accomplishment of global significance and an attraction for tourism.

MBREMP must therefore work closely with other stakeholders in the Mtwara Development Corridor to ensure that this effort protects and benefits the environment and communities of the Park.

CHAPTER 4

GOAL AND OBJECTIVES

4.1 Goal

The goal of the Mnazi Bay-Ruvuma Estuary Marine Park is to conserve national and international significant and threatened marine biodiversity of MBREMP and to enable local community and other key stakeholders to participate in the protection, enjoyment, and sustainable use of marine and coastal resources for the benefit of present and future generations.

4.2 Objectives

As the objectives of this GMP, MBREMP adopts the purposes as clearly stated in section 10 of the Marine Parks and Reserves Act No. 29 of 1994; under section 10.

1. To protect, conserve, and restore the biodiversity of living marine resources, the integrity of non-living marine resources, and the ecosystem processes of the marine and coastal area;
2. To manage the marine and coastal area so as to promote sustainable resource use, the recovery of overexploited and degraded areas and resources, and the rehabilitation of damaged ecosystems;
3. To ensure that villages and residents of the park are involved in all phases of park management and have priority to the resources and economic opportunities afforded by the park's establishment;
4. To promote the rational development of under-utilised natural resources;
5. To promote community-oriented education and dissemination of information concerning conservation and sustainable use of the park's marine resources;
6. To facilitate and conduct research and monitoring of resource conditions and use within the park;

In addition, as an outcome of a participatory planning workshop held in Mtwara in January 2011, the following three more objectives were added for MBREMP;

7. To ensure that any exploitation of non-living resources does not affect the park's aesthetic and natural values;
8. To protect the cultural heritage of park residents; and
9. To ensure that tourism in the park is sustainable.

These objectives, and the local conditions described in previous sections, form the basis for the management strategies adopted in this GMP, including the zoning scheme and the research and monitoring program. The success of Park management depends on the extent to which these objectives are met.

CHAPTER 5

GUIDING PRINCIPLES AND MANAGEMENT STRATEGIES

The purpose of this section is to clearly state the framework of the GMP that will address the objectives outlined in the previous chapter.

5.1 Guiding Principles

The management strategies adopted in this GMP are guided by a number of principles.

5.1.1 Ecological Principles

An ecosystem approach, the precautionary principle, and adaptive management are essential elements to sustainable marine resource management.

5.1.1.1 Ecosystem Approach

An ecosystem-based approach to natural resource management requires that the integrity of the natural ecosystems and their key components, structures, and functions be upheld. This means maintaining natural species diversity and protecting critical habitat for the different stages in species' life cycles.

5.1.1.2 Precautionary Principle

Taking a precautionary approach means taking caution, when a decision could potentially impact the protected environment. This principle requires any individual, organisation, or government agency conducting activities that may harm the protected environment to take measures to avoid any potential impacts.

5.1.1.3 Adaptive Management Approach

Adaptive management is an on-going process that attempts to evaluate, modify, and improve resource management in the face of uncertainty and changing conditions. Adaptive management is an open process inclusive of all stakeholders. For an area as large and diverse as MBREMP, adaptive management means that the Park's management strategies may need to be adapted differently to individual villages. As a result, the GMP must be considered a work in progress, where the Park officials, local communities, and other stakeholders can cooperatively modify and improve the plan as necessary.

5.1.2 Socio-economic Principles

5.1.2.1 Integrated Management Approach for Multiple Uses

Biological and socio-economic studies have confirmed that residents depend upon a variety of the Park's natural resources for their livelihoods. However, natural resource conditions and patterns of use are not homogeneous throughout the Park. Accordingly, a single approach to natural resource management is neither advisable nor practicable. The only way to address this multiplicity of circumstances is through an integrated multi-use approach, where zoning can address the particular local conditions. For instance, where the dependence on fishing is very high, a zone dedicated solely to local artisanal fishers could be appropriate. In areas where sustainable tourism appears to be promising, no-take areas, or areas where the most destructive fishing methods are prohibited, might be necessary.

Finally, areas where endangered species, such as marine turtles, are known to forage or nest might need to be closed to other deleterious activities or to fishing activities where bycatch might be high. All designations will be made in cooperation with local communities, and will be periodically reviewed for reclassification, in response to new information and changing conditions.

5.1.2.2 Collaborative Management through Community Participation

It is widely understood that a Marine Park, particularly one that is home to almost 44,000 inhabitants, cannot possibly succeed without the full support of its local stakeholders. With an area of 650 km², the only chance of success of the GMP is if those who are impacted are willing to comply with the management measures. In other words, the only chance of compliance is self-enforcement, where stakeholders see the direct link between management measures, their own livelihood, and the health of local marine resources.

Currently, the park has 17 villages of which 10 reviewed their VEMPs, 5 new villages and 2 villages (Nalingu and Mkubiru) developed their VEMPs later under the guidance of MBREMP. VEMPS are the basis for Park management, and residents' most direct means of influencing how the Park's natural resources are to be sustainably managed. VEMPS also are the source of the Park's zoning scheme, with the final designations based on local recommendations, compatible with the available scientific data. Implementation of VEMPs at village level is foreseen by the Village council through Village Liaison Committee (VLC).

5.1.2.3 Equitable Sharing of Costs and Benefits

Marine parks are, in essence, a balance between the level of protection afforded to natural resources and the restriction of activities that may have occurred in the past or that were planned. The benefits of the Park include the increase in the value of the resources, whereas the costs are the value of extraction that is foregone. Costs of marine parks are often defined as opportunity costs, reflecting the revenue that was not collected when some resources were left unexploited. The costs are therefore borne by the local stakeholders, most often fishers, whose activities are curtailed, sometimes temporarily, when an area is closed to fishing or when an efficient but destructive gear is banned. These costs are balanced by the benefits that are expected from the Park, and over the long run, the benefits are expected to far outweigh the costs that were borne.

From an equitable stand point, however, it is of utmost importance that those who have borne the costs, by agreeing to see their activities restricted, also be the ones who reap the benefits of the Park. For instance, it would not be fair if after the local fishers had borne the costs of fishing less, with more selective gear, or not fishing in some areas, they were not the ones who benefited from the increased biomass that is likely to result from the restrictions that were put in place. Consequently, the fishers must be assured that they will be the ones who benefit from improved fisheries, resulting from recovering fish stocks. This can be achieved through a number of ways, including, for instance, restricting fishing over time to the local stakeholders only and banning visiting fishers/ vessels from outside the Park.

In addition, as benefits flow from other activities, such as natural gas development or ecotourism, a share of these benefits must be set aside to compensate those stakeholders who have seen their activities curtailed. This is particularly important in MBREMP, where the annual per capita income is less than \$100 USD. Given those circumstances, local fishers can hardly be expected to purchase less destructive gear (e.g., fishing nets with larger mesh size), but rather should benefit from other programmes, funded by the revenue generated by outsiders who exploit other resources in the Park (e.g., ecotourism developers or developers of the Park's natural gas reserves).

5.1.2.4 Incorporation of Gender Balance

The socio-economic assessments commissioned by MBREMP clearly show that women are extensively involved in the harvesting of marine living resources, and their involvement in the exploitation should be reflected in a parallel involvement in the management of the resources. Women make many household decisions that influence how and when resources are harvested. Therefore, to make management decisions without incorporating gender balance considerations could be detrimental to the well being of the villagers and could ultimately have a deleterious effect on the status of marine resources. Other examples in Tanzania and elsewhere have shown that sound decision-making cannot take place without meaningful participation of women and that their participation is better achieved from the outset of a management plan.

5.2 Management Strategies

The following management strategies, which reflect the guiding principles listed in the previous section, are means to achieving the objectives of MBREMP (see Chapter 4). The strategies consist of concrete actions and approaches to ensure the successful implementation of the GMP.

5.2.1 Objective: Conservation of Biodiversity and Ecosystem Processes

Strategies:

- a) Build on and complement existing knowledge of the following critical aspects of biodiversity and ecosystems:
 - Distribution of marine and terrestrial biodiversity within the Park
 - Status and distribution of species and habitats considered to be endangered, threatened, and/or critical, including turtles, dugongs, marine mammals, wrasses, and groupers;

- Status of the same species and habitats in the buffer zone; and
 - Ecological processes responsible for maintaining the productivity and diversity of marine and terrestrial resources, including, but not limited to, spawning areas, aggregation areas, current patterns, seed/larvae dispersal and recruitment patterns, and reproductive cycles.
- b) Include information on species, habitats and ecosystem processes in GIS format, in the MBREMP GIS database
 - c) Identify threats to critical and threatened habitats, species, and ecosystems, as they evolve
 - d) Phase-out activities damaging threatened habitats and/ or species
 - e) Isolate threatened and critical habitats from destructive activities through the designation of no-take zones (core zones)
 - f) Focus compliance efforts in critical and threatened areas, through patrolling and self-enforcement
 - g) Consider all other development plans when designating core zones in the GMP
 - h) Maintain a turtle conservation plan, including protection of nesting sites (with financial incentives, if necessary), a ban on targeted hunting, and reduction of incidental catches.
 - i) Undertake regular monitoring and assessment of critical and threatened habitats and species
 - j) Implement national legislation prohibiting the taking of endangered species, including sea turtles and dugongs, and the export of Maori humphead wrasses (*Cheilinus undulatus*).

5.2.2 Objective: Sustainable Use of Marine Living Resources and Rehabilitation of Damaged Resources

Strategies:

- a) Implement national legislation on banned gear (including but not limited to, dynamite fishing). Whenever possible facilitate gear exchange schemes.
- b) Ban coral mining within the boundaries of the Park, and facilitate the development of strategy for identification of alternative building materials.
- c) Develop a zoning plan to protect critical habitats (e.g., breeding grounds, spawning aggregation sites); limit fishing activities during key periods (e.g., spawning season), and control fishing activities through a permit system to outsiders.
- d) Establish a register of fishers in the Park, including for the various types of vessel and gear in use
- e) Establish a comprehensive and community-based fisheries catch and fishing effort data collection scheme
- f) Encourage sustainable harvesting of mangrove resources, through temporary closures of the affected areas and a temporary ban on the harvesting of the most threatened tree types
- g) Ensure that any destruction of natural resources is compensated through contingency valuation, where other areas are designated and protected whenever project development impacts ecosystems in the Park and species

5.2.3 Objective: Community Participation in Management and Access to Resources

Strategies:

- a) Facilitate mechanisms that assure that significant benefits from gas exploitation and ecotourism development are dedicated to compensating Park residents whose activities have been curbed by the implementation of the GMP
- a) Facilitate mechanisms to include part ownership by Park residents from any ecotourism development plan in the Park

- b) Develop community-based collaborative enforcement mechanisms, including the provision of radios, boats and petrol for community patrols in the most remote areas (including remote turtle nesting sites)
- c) Strengthen the capacity of the Village Liaison Committees (VLC) to participate in Park management
- d) Encourage and facilitate local residents involvement in sustainable tourism enterprises and other emerging economic opportunities, as a means to broaden residents' revenue base and relieve pressure from overexploited marine resources.

5.2.4 Objective: Environmental Education and Information Sharing

Strategies:

- a) Ensure all key working documents, including the GMP, are available in Kiswahili and widely distributed
- b) Prioritise outreach efforts and an environmental education programme to the local communities on the GMP and associated management activities in the Park
- c) Develop outreach material targeting key stakeholders
- d) Promote a culture of information sharing and transparency in decision-making through regular dialogue with all stakeholders, including residents of the buffer zone
- e) Design a turtle education programme, including regular workshops on the ecology and critical importance of marine turtles in marine biodiversity
- f) Develop incentives or small-scale award schemes for best environmental practice
- g) Develop an information centre for MBREMP

5.2.5 Objective: Research and Monitoring of Resource Conditions and Use

Strategies:

- a) Prioritise research and monitoring of resource condition around critical and threatened habitats and threatened/endangered species
- b) Develop research priorities to guide research activities in the Park
- c) Involve the local community in research and monitoring of resource condition and use where appropriate
- d) Develop a detailed monitoring and assessment programme, ensuring that all critical aspects of resources and resource use are monitored at regular intervals
- e) Develop, where appropriate, a reward scheme in the monitoring of resource condition and use (e.g., the most diligent villages, or those whose data collection is most thorough can be given priority in any supplementary livelihoods development programme)
- f) Ensure that research and monitoring of fisheries resources covers catch landed as well as level of fishing effort, and information on catch value
- g) Collaborate with scientific institutions in Tanzania, in East Africa, and overseas to build on the Park's existing literature and GIS database and to fill outstanding data requirements not covered by internal monitoring and research capacity
- h) Provide incentives to attract research capacity to MBREMP and to encourage focus on the Park's research priorities.

5.2.6 Objective: Sustainable Use of Under-utilised Resources

Strategies:

- a) Ensure that all major economic activities, including infrastructure for gas extraction, are subjected to Environmental Impact Assessments (EIAs) which address ecological, social, economic, cultural, and aesthetic viability
- b) Ensure that any proposed eco-tourism activity is compatible with the Tourism Investment Framework report prepared for MBREMP
- c) Facilitate mechanisms that assure a significant proportion of the benefits from ecotourism and other emerging economic activities are redistributed to local stakeholders
- d) Ensure that new fisheries and other fisheries-related activities are developed according to the precautionary principle
- e) Support the development of any new fisheries and other fisheries-related activities that entail partnerships between local stakeholders and investors
- f) Facilitate mechanisms that assure benefits from any gas extraction is shared with local stakeholders, especially those excluded from fishing in the vicinity of the gas wells
- g) Identify and assess under-utilized resources including their distribution, abundance, and potential for sustainable exploitation
- h) Facilitate the investigation and development of market of under-utilized resources.

5.2.7 Objective: Protection of Cultural Heritage of Park Residents

Strategies:

- a) Identify and collate, in association with local communities, existing information on sites of cultural significance within the Marine Park
- b) Establish a mechanism to evaluate new developments and ensure that they do not threaten the cultural integrity of Park residents
- c) Collaborate with key stakeholders including communities and mandated institutions to formulate and implement appropriate management measures in order to preserve and restore historical and sacred sites
- d) Encourage new investigations on historical and cultural resources
- e) Train staff and key stakeholders on the importance and management of cultural sites and relics

5.2.8 Objective: Protection of Aesthetic and Natural Values

Strategies:

- a) Ensure that all major economic activities including infrastructure, gas extraction are subjected to Environmental Impact Assessments (EIAs) which address ecological, social, economic, cultural and aesthetic viability
- b) Ensure that any proposed extraction of non living resources is compatible with the Tourism Investment Framework for MBREMP

5.2.9 Objective: Sustainable Eco-tourism

Strategies:

- a) Ensure that any proposed eco-tourism development project is compatible with the objectives and restrictions of the Tourism Investment Framework (including the restrictions on ecological and socio-economic carrying capacity)
- b) Promote development of small-scale, high-value, low-impact eco-tourism developments, while encouraging the development of higher volume tourism in the Park's vicinity, like Mtwara and Mikindani
- c) Provide incentives for developments using low-impact construction materials
- d) Support operators in promoting and marketing various activities and attractions, including recreational fishing, diving, wildlife observation, and local culture
- e) Collaborate with operators, where appropriate, in developing public facilities for Park visitors, such as nature trails and mooring sites
- f) Train Park staff and select individuals from local communities to interact with visitors in a professional, courteous, and constructive manner (Tour guiding)
- g) Assist investors in ensuring that they are fully aware of all restrictions on ecotourism developments within the Park
- h) Facilitate dialogue between ecotourism operators and communities in ensuring that resident communities share in the economic benefits of the Park
- i) Develop a system to record and monitor visitors to the Park
- j) Develop a visitor management plan that captures safety regulations for water sports and emergency procedures.

CHAPTER 6

ZONING SCHEME

6.1 Rationale

The zoning of a marine park is an integral part of any management plan. As described in chapters two and three, there are a number of resource-use activities carried out by residents, some of which are incompatible with the objectives of the Park. Zoning schemes are commonly used in marine protected areas, as a means of averting conflicts over resource use and accommodating multiple uses. Zoning schemes divide the protected area into multiple use-zones with different levels of protection depending on their respective conservation and economic importance. Zoning provides all users with a greater amount of clarity and predictability.

Zoning is the primary management tool of multiple-use marine protected areas. Its aim is to harmonize otherwise conflicting conservation and livelihood objectives by spatially separating extractive resource-use areas from sensitive habitats. Regulations in zones permitting resource-use also ensure that such activities are productive and sustainable.

6.2 Purpose

The aim of MBREMP's zoning scheme is:

- To protect critical and species-rich habitats including sub-tidal areas, mangrove forests, turtle and bird nesting sites, and fish spawning areas;
- To protect sites sacred under the beliefs and customs of local residents;
- To protect biodiversity within the Park and ensure the aesthetical values of MBREMP are maintained;
- To safeguard traditional local community fishing grounds and provide a means for continued but sustainable use of natural resources within these areas;
- To provide a geographical basis against which resource use is evaluated monitored and reviewed and the effectiveness of the management plan; is measured;
- To provide a framework for surveillance and enforcement activities by focusing on areas with higher levels of designated protection.

6.3 Designation of Zones

- Types of zones were designated and mapped through a participatory zoning workshop and recommendations contained in the VEMPs as well as inputs from scientific assessments.
- Core zones are designated in areas representing critical habitats, where the impact on the local communities will be limited. Close monitoring will assess and document the impacts of the closure, including impacts on adjacent areas through the “spill over” effect. Based on the results of this monitoring the boundaries and location of these zones may be modified, as appropriate.
- Core zones have been designated to encompass significant areas of coral reefs, sea grassbeds, and mangrove forests.
- Two more proposed core zones require further study before they can be designated.

6.4 Definition of MBREMP Zone Designations

There are three designated types of zones within MBREMP

6.4.1 Core Zones

Core zones provide the highest level of protection within the Park, including all areas that warrant primary conservation status and local resources-users can afford wholly to relinquish. Within MBREMP, both marine and coastal forest habitats are represented within Core Zones.

Criteria for selection: Areas designated as Core Zones must include one or more of the following criteria:

- Areas that are in relatively pristine or intact condition and representative of the main types of natural habitat found within the Park
- Areas containing relatively high levels of locally representative biodiversity

- Areas considered to be important breeding or spawning grounds, or otherwise important to the productivity of the Park's natural resources base
- Areas for which the protection is considered important to the survival of locally rare or threatened species
- Areas of special cultural significance

Resource-use strategy: Within Core Zones all biotic resources and ecosystem processes are, as far as practicable, protected from direct adverse effects of anthropogenic activities. Accordingly, extractive resource use is prohibited entirely within Core Zones. Controlled tourism, use of sacred sites, and scientific research are permitted.

TABLE: 6.1: Description of Core zones

No.	Name	Main habitat	Description/Justification
1	Ras Msangamkuu	Coral/ Tidal reef	Good reef flat
2	Kisiwa Kidogo/ Membelwa	Coral/ Tidal reef, Mangrove, sea grass and islands with tidal rock flat	Coral reefs with fish, good mangrove stands, deep water fisheries and coastal forest
3	Matenga	Coral/ Submerged reef	Good coral reefs with reef fish
4	Kilindi	Coral/ Tidal reef	Good coral reefs with reef fish
5	Ng'anje	Mangrove	Good mangrove stands, and potential fish breeding site
6.	Kingumi/ Litokoto	Sand beaches	Sand beaches which are potential turtle nesting sites
	Miti mirefu	Mangrove	Good mangrove stands of <i>Brugueira gymnorhiza</i> and <i>Heritiera litoralis</i> species; and breeding site for finfish, prawns and other estuarine animals

6.4.2 Specified use Zones

Specified use zones constitute an intermediate level of protection within the Park for areas that warrant primary conservation status but are also important to local resource users. Some resource extraction activities, including gas extraction, are specifically permitted but only for the designated beneficiaries.

Criteria for selection: Areas designated as Specified use Zones broadly meet the same criteria as those given in section 6.4.1 for Core Zones, but are either:

- Of greater importance in sustaining the livelihoods of local communities, making it impractical to prohibit extractive resource-use entirely;
- Of greater importance to providing ecological services that sustain the livelihood of Park residents and the national economy, making it impractical to prohibit extractive resource-use entirely; or
- Qualify for one or more of the criteria for Core Zone status, but to a lesser degree of importance than other Core Zones.

Resource use strategy: The strategy in Specified-use Zones is to prohibit activities likely to cause significant alterations to the park environment. Such activities include:

- Significant change or damage to benthic or terrestrial habitats not likely to self-regenerate from year to year;
- Significant depletion of the abundance or biodiversity of representative species assemblages; and
- Significant depletion over time of species that are considered locally rare or threatened.

TABLE. 6.2: Description of Specified use zones

No.	Name	Main habitat	Description/Justification
1.	Mnazi Bay	Coral/ Tidal reefs	Good coral reefs with abundant commercial fish and invertebrates
2.	Matunda	Coral reef and fringing reef	Beautiful coral reefs, potential commercial fish fisheries
3.	Ruvuma Estuary	Mangroves and coastal forest	Good mangrove stands that serves as fish and invertebrates breeding site. It is potential feeding, nursery and breeding site for resident fish and diadromous species.

6.4.3 General-use Zones

General-use Zones are intended to allow for sustainable resource use by MBREMP residents, thereby relieving resource use pressure from zones with higher levels of protection. Despite their lower protection status, some areas that are designated as General-use Zones also play an important role in maintaining ecosystem processes and the overall productivity of the Park through connectivity with other zones. In a General-use Zone only legal resource use activities are permitted, including non-residents but with a permit issued at the village level.

Criteria for selection: Areas designated for General-use Zones include areas that do not fulfil the criteria set for Core Zone status or Specified-Use Zone status.

Resource use strategy: Extractive resource use is permitted in General-Use Zones. The objective of regulations in General-Use Zones is to ensure that fish catches and other resource harvests are sustainable from year to year, notwithstanding natural variations in breeding and recruitment. A certain level of permanent habitat alteration is acceptable provided that the overall productivity of the environment is not significantly undermined and that adjacent areas with a higher protection status are not degraded in ways defined above (section 6.4.3.). This protection excludes methods of resource use likely to damage benthic habitats or otherwise adversely affect the breeding and recruitment of commercial species, as well as methods that remove an unsustainable number of juvenile or adult organisms. This strategy also entails restricting the number of resource users to a sustainable level.

Park residents will have priority access to resources in General-Use Zones. Nonetheless, other resource users from outside the Park may undertake certain resource use activities under permission from the Park and, where applicable, local village councils.

6.4.4 Buffer Zone

The Buffer Zone is the area outside and adjacent to the Park boundary that serves as a cushion against activities outside the Park. MBREMP has no jurisdiction over activities within the Buffer Zone. However, all new developments and land allocations within the Buffer Zone are obliged to undergo the same EIA scrutiny as developments within the Park boundary, following the official EIA Guidelines of the Marine Parks and Reserves and as provided in the Act (Section 16), which further provide that the marine parks must be informed in writing 30 days in advance of conducting an EIA.

Such scrutiny is in no way intended to discourage sustainable development or investment in Mtwara District. Sustainable development in the District is generally in the interest of the marine park and is welcomed. EIA procedures are intended only to mitigate unnecessary environmental degradations by improving the design and operations of such development.

The Buffer Zone is tentatively 1000 meters from the boundary on the aquatic side, excluding the area along Ruvuma River on the border with Mozambique, and on the terrestrial side, where the Park management and Mtwara District Council will negotiate the agreement. In order to capture transboundary issues negotiations have to be held with Mozambique Government to extend 1000 m MBREMP buffer zone to protect the continuum of marine ecosystems (e.g. mangrove, coral reefs, sea grasses, etc) extending across the border. This will be in harmony with other conservation initiatives implemented in Mozambique by the Quirimbas National Park (Parque Nacional das Quirimbas - PNQ).

It is intended, therefore, that following implementation of this plan, negotiations will be held with the Mtwara District Authorities and probably Mozambican side to see the possibility to extend the requirement for EIA scrutiny to a considerably wider area within the District to the bordering country, probably one of the following means:

- Extending the MBREMP Buffer Zone
- Instituting appropriate District by-law relating to EIA requirements: or
- The institution of National legislation on EIA requirement



Map 3. Core and Specified Use Zones for Mnazi Bay Ruvuma Estuary Marine Park

6.4.5 Future review and modification of the zoning scheme

The initial attempt to delineate the various zones is based on the biological and socio-economic information that is currently available. This information, however, is incomplete and local conditions may evolve over time. As a result, the zones may need to be evaluated and adjusted if there is a need. This is particularly true for the designation of core zones, which represent a compromise between the value of the habitats being protected and the opportunity costs for stakeholders whose activities within these areas will be restricted. In certain cases, the boundaries of Core Zones may need to be adjusted to limit the impact on traditional users. Zoning designations may not be permanent and restrictions in certain areas may be reduced or removed once the objectives of protection have been achieved.

CHAPTER 7

Prohibited And Regulated Activities

This chapter outlines activities that are prohibited within MBREMP, either in whole or within particular zone types. These regulations follow strategies for zone types outlined in section 6.4. As part of implementation of this management plan, these regulations will be drafted and duly adopted pursuant to the Marine Parks and Reserves Act. No 29 of 1994.

7.1 Prohibited Activities

All activities prohibited under the existing national legislation shall be prohibited within the Park boundaries. In addition, the following activities are prohibited:

7.1.1 Prohibited Extraction of Living Resources

- Use of beach seine nets, including those known locally as *juya*, *kavogo*, *juya la kusini*, *juya la kojani*, *kokoro*, or *mtando*
- Any activity involving mechanical damage to, or breakage of, coral and other benthic habitats and organisms, whether by hand or by other implements
- Killing of turtles, whether in accidental or deliberate, including removal of turtle eggs
- Killing of dugongs, whether in accidental or deliberate
- Trawling
- Use of propelled spear guns and harpoons
- Use of dynamite
- Use of chemicals and poisons for fishing
- Use of SCUBA gear to collect any marine organism, other than for research purposes and subject to prior authorisation
- Mangrove cutting for commercial purpose
- Mining of live coral from inter-tidal and sub-tidal areas
- Using of monofilament or turtle net (*likembe*)
- Use of pull nets with stretched-mesh size of less than 2.5 inches, including *tandilo*

7.1.2 Prohibited Extraction of Non-living Resources

- Mining of dead coral from inter-tidal and sub-tidal areas
- Sand mining from beaches and sub-tidal areas
- Any form of seabed mining
- Hydrocarbon exploration and drilling, except where exploitation has been subject to the required review by the Warden-in-Charge and other relevant authorities
- Production of salt by boiling sea water using fuel wood or other hydrocarbons

7.1.3 Prohibited Construction and Development

- Port development and/or dredging (marine development and permanent docking facilities, including wood jetties, require submission of an EIA and prior approval)

- Industrial development
- Use of explosives for any purpose
- Dumping or release of solid waste, untreated waste water, sewage, or any type of chemical pollutant into marine waters
- Cultivation or farming on Islands including; Namponda, Membelwa/ Mmongo, Bahasha and kisiwa kidogo.

7.1.5 Prohibited Tourism Activities

- Jet skis

7.2 REGULATED ACTIVITIES

7.2.1 Fishing Activities

Fishing activities within MBREMP are subject to the following restrictions:

- All fishing activities in the core zones are prohibited.
- All fishing in specified-use zones is restricted to artisanal fishers who are residents of the Park.
- All artisanal fishers in the Park are to be issued a fishing license and must provide the required information on the type of vessel/ gear they use.
- Lobster and octopus fisheries may be subject to minimum catch weight limits.
- Destructive and illegal gears will be phased out.
- Sport fishing is restricted to designated areas within the Park and is subject to prior issuance of license and payment of the appropriate fees.
- Sport fishers may be bound by size restrictions (minimum and maximum), species restrictions, and release requirements.
- Sport fishers must show permits and provide catch information to any duly authorised Marine Park staff. Furthermore, and, as deemed necessary by the Warden-In-charge and subject to scientific justification, an official Park observer may be posted on sport fishing vessels, at the sport fisher's expense.

7.2.2 Mangrove Harvesting

Harvesting of mangrove products, especially tree cutting, will be regulated under a permit system. In addition, the following restrictions will apply:

- Mangrove harvesting in all core zones is prohibited.
- Mangrove harvesting for charcoal and firewood for kilns is prohibited.
- Mangrove harvesting is restricted to Park residents with a required permit.
- Mangrove harvesting for commercial purposes is prohibited.
- Non-residents caught harvesting mangroves within Park boundaries will be prosecuted to the full extent of the law.
- For permitted harvesting, clear cutting of mangroves should be limited.
- Mangrove harvesting is subject to potential size and species restrictions.
- Permits for harvesting may be limited to a certain number of trees and may require the applicant to replant the effected area with seedlings.
- Prior to harvesting, specific approval may be required by the Warden-in-Charge or one of his/ her representatives.

7.2.3 Non-mangrove Harvesting (Other Forest Products)

Harvesting of non-mangrove products in the Park will be subject to a permit system, and the following conditions:

- Pole cutting is strictly prohibited in all core zones.

- Pole cutting is restricted to Park residents who have obtained the required permit.
- Even where a permit has been issued, the cutting of poles may require the applicant replanting the affected area.
- Burning of any forest products is illegal in the Park.

7.2.4 Scientific Research

Scientific research within the Park is permitted pursuant to the following requirements:

- Scientific research within the Park is subject to prior issuance of a scientific permit by the Warden-in-Charge, at his/ her discretion but subject to scientific justification.
- A scientific permit allows for the limited collection of specimens for scientific reasons, but not for commercial purposes (bio-prospecting).
- A different fees system will be applied to Tanzanians and non-Tanzanians, though the fees may be waived if the Warden-in-Charge finds that the planned research is in the interest of the Park.
- All the results from scientific research carried out will be forwarded to the Warden Incharge in the most useful format (and in GIS format wherever possible).
- Any publications the Warden Incharge based on scientific research carried out are to be forwarded as soon as they become available.
- Failure to abide by these requirements may result in a ban on further scientific research within the Park for the individuals/ institutions involved.

7.2.5 Tourism Activities

The following activities are subject to permission of the Warden-in-Charge:

- Landing seaplanes within the Park’s marine and freshwaters.
- See restrictions on sport fishing (section 7.2.1)

Summary Of Permitted Fisheries Activities By Zone

Activity	Core Zones	Specified-use Zones		General-use Zones	
	All users	Residents	Others	Residents	Others
Handlines, basket traps, fencetraps	X	LRUC	X	LRUC	P
Longlines	X	LRUC	X	LRUC	P
Pull nets (mesh size >2.5’) ¹	X	X	X	LRUC	X
Set-nets / shark nets (mesh size 2.5 – 7’) ²	X	LRUC	X	LRUC	P
Shark nets (mesh size > 7’)	X	X	X	LRUC	P
Sportfishing	X	X	X	LRUC	P
Octopus collection	X	LRUC	X	LRUC	P
Sea cucumber, lobster, crab, shells (for food)	X	LRUC	X	LRUC	P
Shellcollection for trade	X	X	X	X	X
Aquarium collection (all organisms incl. corals)	X	X	X	X	X

KEY:

- X = Not Permitted
- LRUC = Local Resident User Certificate Required
- P = MBREMP Permit Required

¹ Includes nets known locally as *mtando*, *nyavu za kuzungusha*, *nyavu za kuvuta*, and *tambo*.

² Permissible set nets between 2.5 -7’ include nets known locally as *jarife* and *nyavu za kupweleza*. However 2.5 mesh size nets may be used in an estuary.

Summary Of Permitted Marine Resource-Use (Non-Fishing) By Zone

Activity	Core Zones	Specified-use Zones		General-use Zones	
	All users	Residents	Others	Residents	Others
Mangrove cutting (subsistence)	X	X	X	P	P
Other mangrove resources (leaves, fruits, bark, etc.)	X	X	X	LRUC	P
Seaweed/seagrass collection (wild)	X	X	X	LRUC	P
Mariculture ³	X	P	X	LRUC	P
Other marine bio-prospecting ⁴	X	X	X	P	P

KEY:

X = Not Permitted

LRUC = Local Resident User Certificate Required

P = MBREMP Permit Required

Summary Of Permitted Forest And Terrestrial Resource-Use By Zone

Activity	Core Zones	Specified-use Zones		General-use Zones	
	All users	Residents	Others	Residents	Others
Pole-cutting	X	P	X	LRUC	X
Cutting of reserved trees for timber	X	X	X	P	X
Medicinal plants, firewood, and raffia fibre collection	X	P	X	LRUC	X
Agriculture and agro-forestry	X	X	X	LRUC	X
Bee-keeping	X	P	X	LRUC	X
Hunting	X	X	X	LRUC	X
Land-based fossil coral mining	X	X	X	LRUC	X
Construction (non-tourism) ⁵	X	X	X	LRUC	P
Camping (fishermen)	P	P	P	LRUC	P

KEY:

X = Not Permitted

LRUC = Local Resident User Certificate Required

P = MBREMP Permit Required

³ Includes seaweed farming, oyster farming, crab farming, fish cage-culture, lobster ranching, seacucumber farming, etc.

⁴ Includes collection of limited samples of biological or inorganic material for development of medicinal, pharmaceutical or other commercial products

⁵ Includes any structure, except those providing services to tourism, whether temporary or permanent and whether for domestic or commercial purposes.

Summary of tourism regulations by zone

Activity	Core Zones	Specified-use Zones	General-use Zones
SCUBA diving	P	P	P
Snorkelling/Swimming	Freely allowed	Freely allowed	Freely allowed
Windsurfing/Sailing	Freely allowed	Freely allowed	Freely allowed
Construction ⁶	X	P	P
Sport-fishing	X	X	P
Overnight boat mooring	X	X	P
Camping	P	P	P
Sea plane	X	X	P

KEY:

X = Not Permitted

P = Permit Required from MBREMP/ Villages

⁶Specifically tourism-related construction of all kinds whether by MBREMP residents or tourism operators, including accommodation buildings, shops, restaurants, shelters, water-sport related structures and structures providing utility functions such as waste disposal, water and electricity.

CHAPTER 8

Management Structure And Operational Framework

In accordance with Act No. 29 of 1994, the Board of Trustees, through the Marine Parks and Reserves Unit (MPRU), is responsible for the management of Mnazi Bay-Ruvuma Estuary Marine Park (MBREMP). Day-to-day operations are the responsibility of the Warden-in-Charge, supported by a team of professionals and support staff in the field. In the case of conflict among directives, priority is given to Village Environment Management Plans (VEMPs), which form the basis of management within the Park through Village Liaison Committees.

8.1 Management Structure, Roles And Responsibilities

8.1.1 Board of Trustees and Marine Parks and Reserves Unit

The Board of Trustees formulates policies on all marine parks in Tanzania and directs the MPRU on all matters regarding the designation and management of the marine parks. Part II of Act No. 29 of 1994 establishes MPRU, whose functions include:

- To seek funds for the establishment and development of marine parks and reserves; and
- To implement and enforce the provisions of Act No.29 of 1994 and any subsidiary legislation pursuant to sections 18 to 38 of the Act.

8.1.2 MBREMP Advisory Committee

The purpose and composition of the MBREMP Advisory Committee is provided in the Second Schedule of Act No. 29 of 1994. As such, the Advisory Committee is established to advise the Board of Trustees; consult the Warden-in-Charge on technical, scientific and operational matters. The Advisory Committee constitutes a representative forum of the Park stakeholders, including local communities, regional and district government officials, a non-governmental organisation, a research institution, and representatives of the tourism and fish processing investors within the Park. The Advisory Committee meets quarterly and submits its regulations directly to the Board of Trustees. The Warden-in-Charge is the Secretary of the Committee.

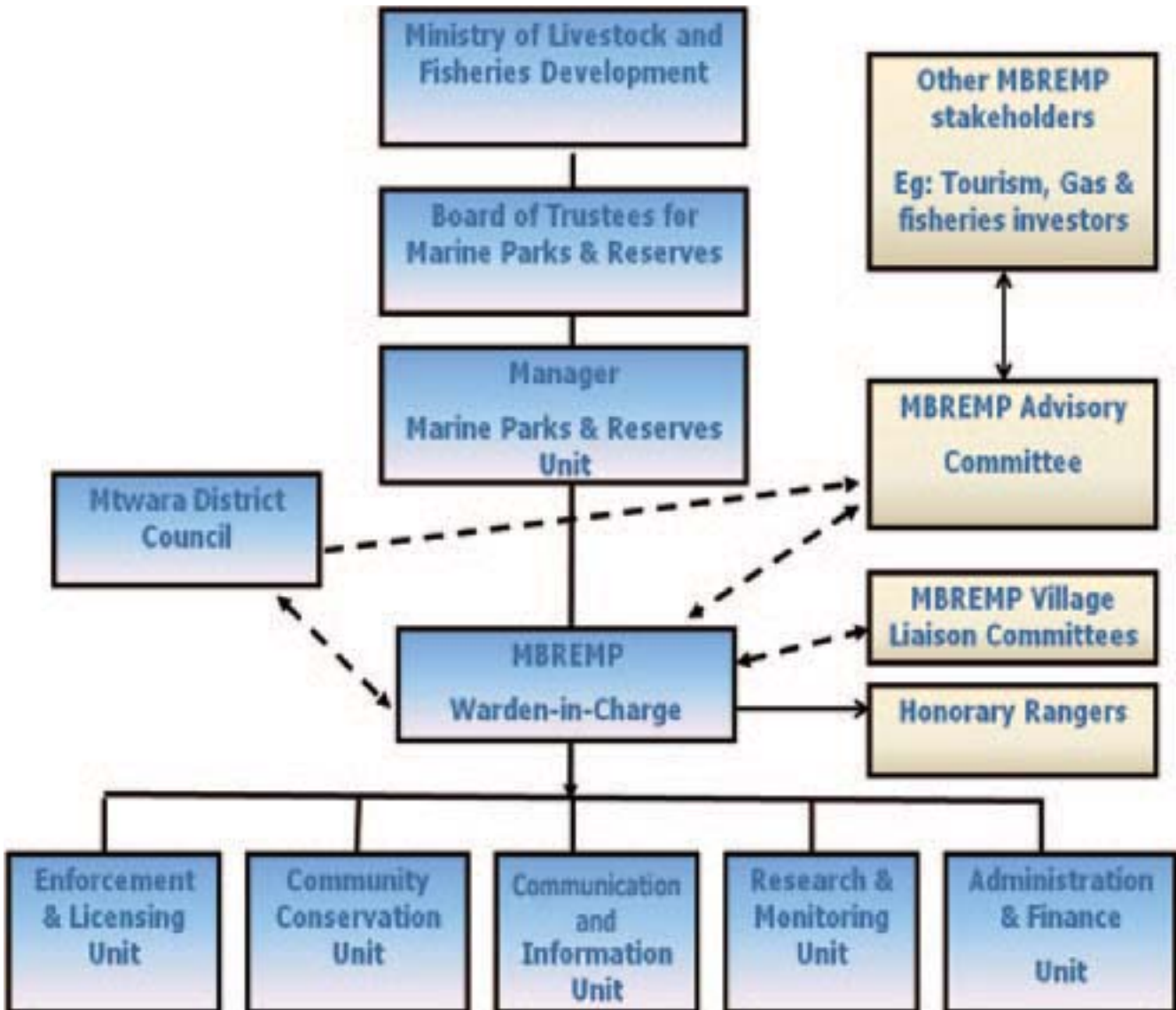
8.1.3 Warden-in-Charge

The Warden-in-Charge is responsible for all matters concerning the Park's administration. The Warden-in-Charge is responsible to local communities, district authorities and other stakeholders, including for notifying them of planning efforts and ensuring that they have an adequate opportunity to participate in Park management.

8.1.4 Village Liaison Committees (VLCs)

Part V of Act No. 29 of 1994 provides that each Village Council which "affects or is affected by the marine park, either directly or through a designated committee shall participate fully in all aspects of the development of regulations, zoning and the general management plan." Accordingly, the committees shall continue to serve as the primary interface between the communities and the Park. The constituency of VLC may include some members from the fishers' co-operative association, and the fishers' co-operative association shall work under the VLC of respective villages.

Management Structure of Mnazi Bay-Ruvuma Estuary Marine Park:



8.1.5 Key Roles of VEMPs

Once they are finalised and approved by Park authorities, the VEMPs collectively form the basis for Park management. Each VEMP contains the following:

- Short description of the village
- Assessment of natural resources, management issues, problems, and opportunities
- Rationale for each VEMP
- Village-based zoning scheme
- Management system, including committees with roles and responsibilities with authority to work with MBREMP officials, enact rules and regulations for local resource use, and manage their financial issues
- Objective hierarchy of the VEMP
- Action plan for natural resource management; and
- Section addressing plan monitoring and evaluation.

8.1.6 Mtwara Rural District Council

There are a number of important issues in the management of the Park that require collaboration and agreement with the Mtwara Rural District Authorities. These include:

- EIA requirements for developments outside the boundary of MBREMP;
- Issuance of fishing licenses and collaborative patrolling;
- Collection of user fees within the marine park and disbursement of revenue; and
- Issues relating to land title and concession fees within the park boundary

In many ways, the format of each VEMP follows that of the GMP, in order to ensure that each village implements the GMP at the local level. Such an approach is the only way to ensure that the local communities are truly and meaningfully involved in the management of the Marine Park, as required by Act No. 29 of 1994.

8.2 Subsidiary Legislation

Effective enforcement of the GMP requires the preparation of subsidiary regulations and financial arrangements. Those regulations shall cover, *inter alia*, the following:

- ◆ the Zoning Plan
- ◆ supplementary legislation on specific resource-use restrictions
- ◆ qualifications for MBREMP residency status and criteria for the issuance of user fees
- ◆ detailed legal provisions for permit and licensing schemes
- ◆ financial arrangements for revenue-sharing and the collection of levies, staged license/permit fees,
- ◆ user fees and concession fees
- ◆ mariculture development guidelines
- ◆ Tourism Investment Framework
- ◆ EIA and Investment guidelines

All these implementing regulations are referred collectively as the General Regulations for the MBREMP. Sections 7, 13, 16, 18, 19, 20, and 23 of the MPRU Act No. 29 of 1994 will guide their preparation. The Warden-in-Charge and the Park field staff normally initiate the process of preparing draft regulations under the guidance of MPRU headquarters and in consultation with local stakeholders. A preliminary agreed draft is submitted to the Marine Park Advisory Committee.

Following the Committee's modification and approval, the proposed drafts are then submitted to MPRU for professional legal drafting and subsequent submission to the Board of Trustees for further input and approval. The Board then recommends the proposed regulations to the Minister for approval and gazettment.

CHAPTER 9

Monitoring, Evaluation And Review Of The GMP

9.1 Why Monitor Management Effectiveness

The long-term success of a marine park depends on effective management and community participation, combined with an accountable demonstration of its usefulness as a conservation and resource management tool to government agencies, donors and the public (Mangubhai and Wells, 2005). Assessing management effectiveness in MBREMP means regularly measuring the degree to which all 9 objectives of the park are being achieved, by using biophysical, socio-economic, cultural and management/governance parameters. The monitoring thereby provides feedback on how successfully the park is designed, planned and managed. It can also help to identify emerging threats and needs of the park (both issues that are within the control of the manager and those that go beyond it) and provide important lessons learned so that adjustments can be made as needed.

The MBREMP GMP relies on adaptive management as the key guiding principle, where assessments are carried out to establish the Park successes and to translate any shortcomings into improvements that generate positive change. The sharing of knowledge, skills and experiences in the planned participatory assessments with stakeholders furthermore help in understanding as to why management measures and practices are implemented the way they are.

9.2. How to assess management effectiveness for MBREMP

In order to assess the effectiveness of the park, it is necessary to track changes in the biophysical, socio-economic and governance, and this is usually done by using a combination of change indicators for measuring trends. Depending on the selected methodology, the set of indicators can include, for example, habitat distribution and complexity (biophysical), perception of local resource harvest (socio-economic), or the degree of interaction between managers and stakeholders in collaborative enforcement, gender monitoring etc. (Pomeroy *et al.* 2004).

9.3. Periodic review of the plan

This GMP is not a static document and will be reviewed at least after every ten years with midterm review of 5 years to reflect resource use trends. New information acquired through more comprehensive research and monitoring, and possible attitude and perceptions changes of the local community and resource users during the course of implementation of this GMP. The review will also be conducted in an open, transparent and consultative manner to incorporate the views and concern of resource users.

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APPENDIX I

BOUNDARY DESCRIPTION FOR MNAZI BAY-RUVUMA ESTUARY MARINE PARK

The Marine Parks and Reserves (Declaration of Mnazi Bay-Ruvuma Estuary Marine Park) Order, 2000

Government Notice No. 285, published on 4/8/2000

Made under Section 9 of the Marine Parks and Reserves Act, No. 29 of 1994

1. This Order may be cited as the Marine Parks and Reserves (Declaration of Mnazi bay Ruvuma Estuary Marine Park) Order, 2000.
2. This Order shall come into operation on the First day of July, 2000
3. The area covering the Mnazi Bay Ruvuma Estuary Marine Park specified in the Schedule to this Order is hereby declared a Marine Park for the purposes of section 9(1) of the Marine Parks and Reserves Act, 1994.

SCHEDULE

All that area of land and water in the Mtwara District the boundaries whereof are more particularly defined as follows –

Commencing at a point (10°34'46"S, 40°16'13"E) on the Ruvuma River and its International Boundary between Tanzania and Mozambique;
Thence following the Ruvuma River Easterly and Northerly direction to RasMwamba; thence Easterly direction to Ras Ruvuma (10°34'40"S, 40°16'13"E);
Thence in Northerly direction bearing of 10°07'29" for a distance of approximately 14 km to a point (10°20'31"S, 40°28'10"E);
Thence Northwesterly direction to a point (10°17'46"S, 40°26'29"E) for a distance of 6.75 km;
Thence Northwesterly direction bearing of 313°34'04" for a distance of approximately 5.5 km to a point North of RasMsangamkuu (10°09'28"S, 40°13'56"E);
Thence due South for a distance of 7.75 km to a point (10°13'40"S, 40°13'57"E);
Thence Southeasterly direction to a point (10°14'43"S, 40°14'34"E) for a distance of 2.25 km;
Thence Southeasterly direction to a point (10°15'35"S, 40°15'48"E);
Thence in a bearing of 110°33'21" for a distance of 1.3 km to a point (10°15'50"S, 40°16'42"E);
Thence Southwesterly direction to a point (10°17'35"S, 40°16'24"E);
Thence Southerly direction for a distance of 3.25 km to a point (10°19'35"S, 40°16'59"E);
Thence Southerly direction to a point (10°17'35"S, 40°15'48"E);
Thence in a bearing of 110°33'21" for a distance of 1.3 km to a point (10°15'50"S, 40°16'42"E);
Thence Southerly direction to a point (10°17'35"S, 40°16'24"E);
Thence Southerly direction for a distance of 3.25 km to a point (10°19'35"S, 40°16'59"E);
Thence Southerly direction to a point (10°19'57"S, 40°17'28"E);
Thence Southerly direction to a point (10°22'30"S, 40°17'46"E);
Thence Southerly direction to a point (10°23'39"S, 40°19'09"E);
Thence in a bearing of 191°07'45" for a distance of 3 km to a point (10°23'39"S, 40°19'09"E);
Thence in a bearing of 185°37'50" to a point (10°27'14"S, 40°18'38"E) for a distance of 3.5 km;
Thence Southerly direction in bearing of 208°43'52" for a distance of 9.4 km to a point (10°31'45"S, 40°16'10"E);
Thence Southerly direction to a point South of Mahurunga Village (10°32'52"S, 40°15'55"E);
Thence Southerly direction for about a distance of 2.8 km approximately to a point (10°34'25"S, 40°16'02"E);
Thence in a bearing of 151°41'57" for a distance of 38 M approximately to the point of commencement.



**Board Of Trustees
Marine Parks And Reserves Unit**

September 2011