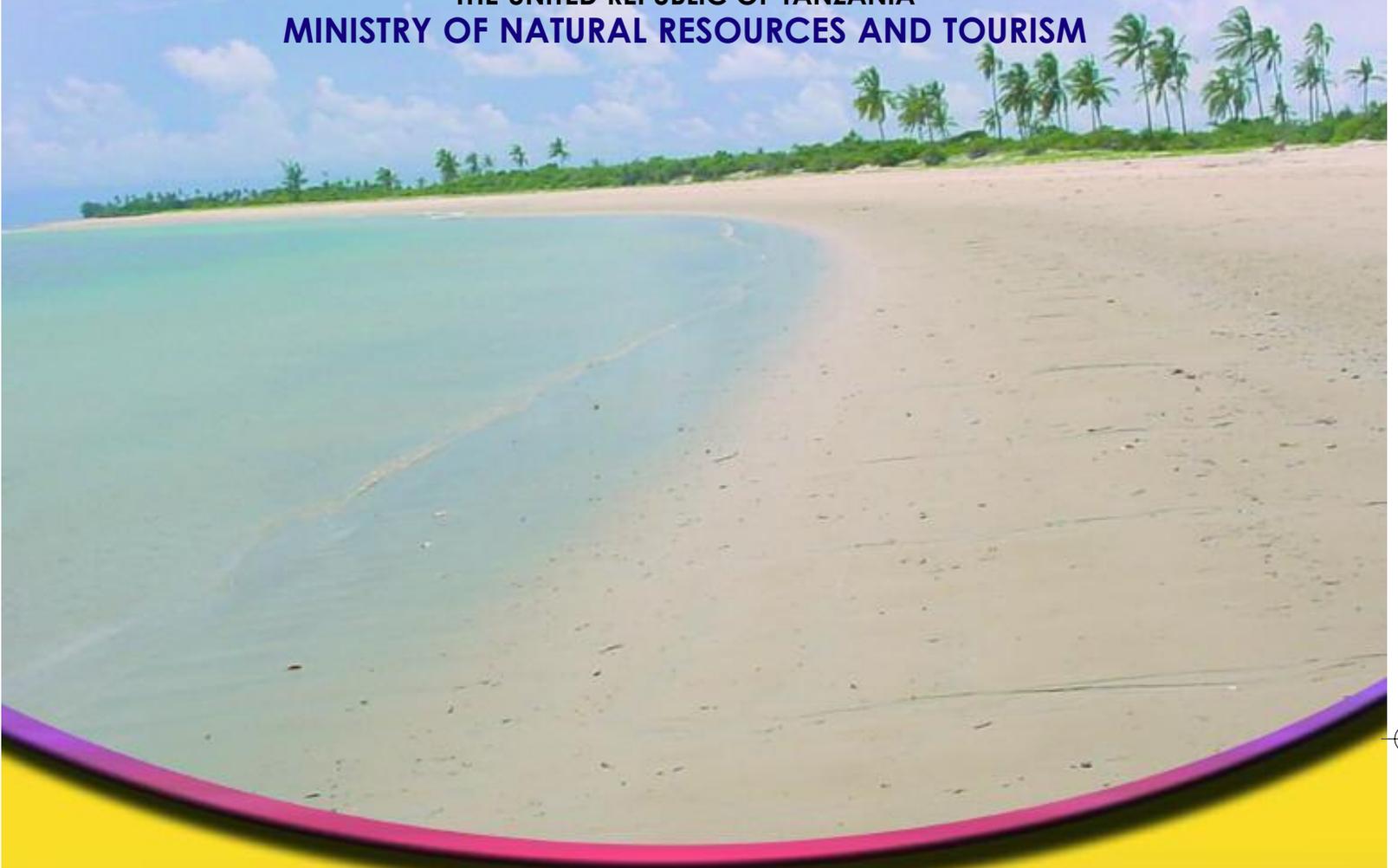


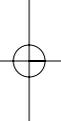
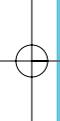


THE UNITED REPUBLIC OF TANZANIA
MINISTRY OF NATURAL RESOURCES AND TOURISM



GENERAL MANAGEMENT PLAN
**MNAZI BAY RUVUMA
ESTUARY MARINE PARK**

**BOARD OF TRUSTEES FOR
MARINE PARKS AND RESERVES, TANZANIA
September, 2005**



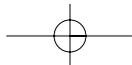
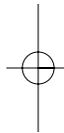
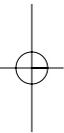
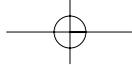


The United Republic of Tanzania
Ministry Of Natural Resources and Tourism

MNAZI BAY RUVUMA ESTUARY MARINE PARK

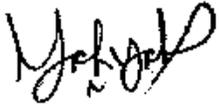
GENERAL MANAGEMENT PLAN

Board of Trustees for Marine Parks and Reserves, Tanzania
Marine Parks and Reserves Unit
September, 2005

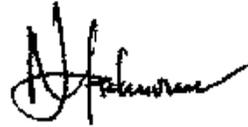


APPROVAL PAGE

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 30th April 2005



Alhaji Yahya Mbillah
Chairman
MBREMP Advisory Committee

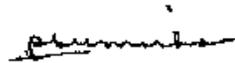


Mr Milali E. Machumu
Warden-in-Charge, MBREMP
Secretary, MBREMP Advisory Committee

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 nineteenth sitting of 14th June 2005

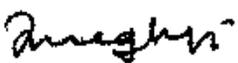


Prof. Yunus D. Mgaya
Chairman
Board of Trustees

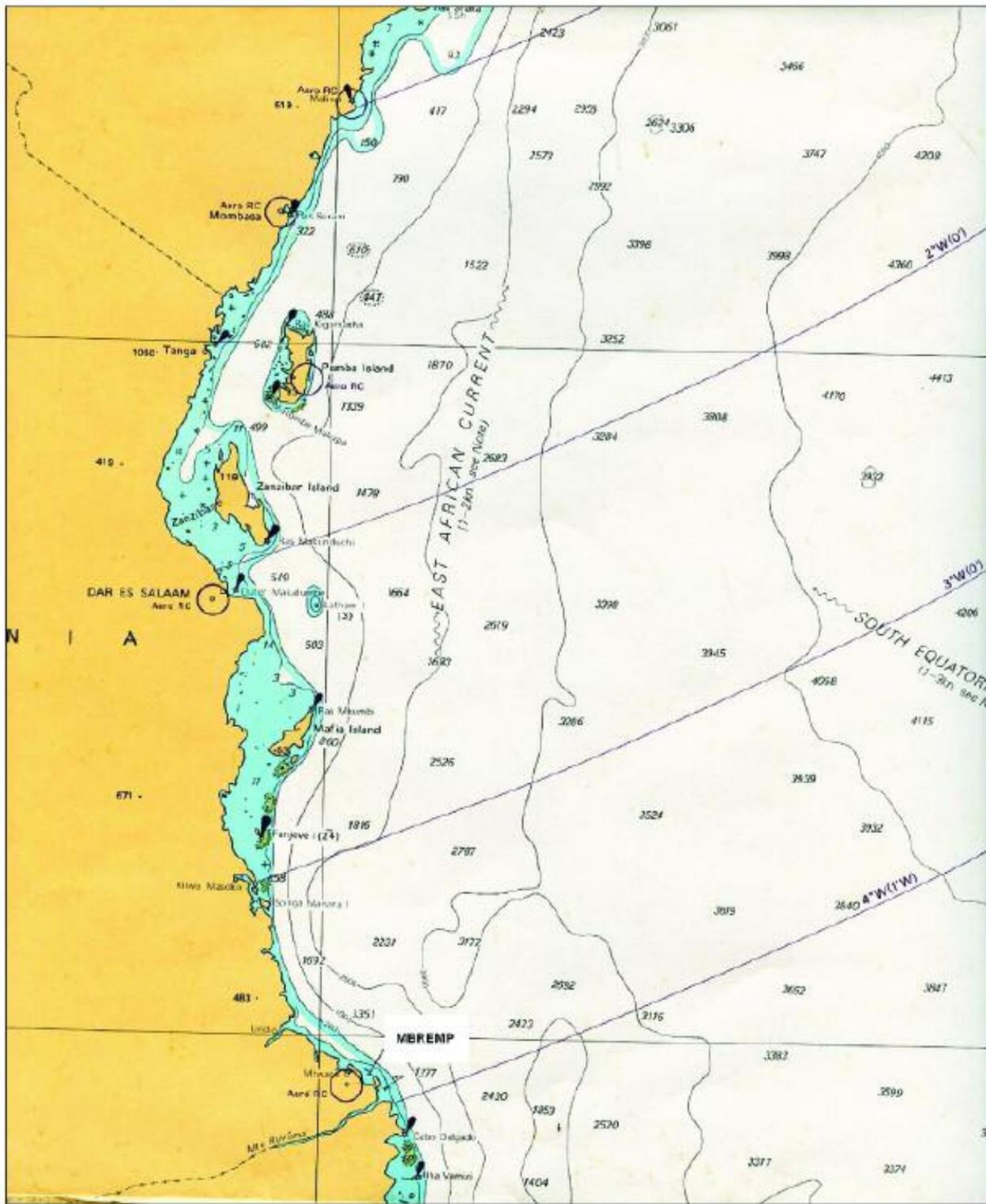


Mr Chikambi Rumisha
Unit Manager, MPRU
Secretary, Board of Trustees

This General Management Plan has been adopted by the Minister of Natural Resources & Tourism pursuant to section 14 of the Marine Parks & Reserves Act No. 29 of 1994.



Hon. Zakia H. Meghji (MP)
Minister of Natural Resources & Tourism
United Republic of Tanzania



Map 1. Admiralty Chart showing the location of Mnazi Bay-Ruvuma Estuary Marine Park

FOREWORD

Five years ago we launched a General Management Plan for the Mafia Island Marine Park. The plan being the first for our first marine park in our history of conservation, it was indeed an ice break. With that modest beginning, we are now putting up in place a GMP for our second marine park- Mnazi Bay Ruvuma Estuary Marine Park. This plan, we must admit that it encompasses the experience we have acquired nationally and internationally in the field of conservation of marine resources. This fruitful experience has shown that marine protection was necessary to enable nature to recoup. The creation of Mafia Island Marine Park has increased fish propagation, a result seen in increased fish landings and the re-emergence of threatened species such as dugong, turtle and coelacanth, species hitherto thought to have become extinct.

Mnazi Bay Ruvuma Estuary Marine Park (MBREMP) was gazetted in 2000 with much expectation for the benefits we look forward to leap from its effective management. This second park is unique because its borders lies close to Mozambique and moreover its importance is rising daily because of the prospects of opening the bridge across the Ruvuma linking Tanzania and Mozambique.

The Plan besides responding to that challenge, also finds a way to lessen the over dependence of some 30,000 residents of the 11 villages within the park on marine resources. The ratio of their dependence for both livelihood and economic return is slightly over 30 per cent. While we seriously uphold the concept of conservation, we have our belief too in sustainable consumption, which must help our people pull out of the irritating poverty. Consistent with the national poverty reduction strategy, the GMP outlines plans to stimulate tourism, encourage sustainable fishing, eco-tourism and participatory conservation. The park has demarcated user zones, delineating delicate ones for strict conservation while others allowing them for exclusive use top priority given to park residents.

This GMP should be envisioned as the first phase of the all-embracing plan to manage the park and offering opportunities of investments to investors. It sets out an active and ongoing process for making choices on how to effectively conserve and manage the resources we steward without losing sight to the goals and objectives identified in the national Policies and laid down in the mission of Marine Parks and Reserves Unit (MPRU).

This plan provides a management framework for resource management designating resource management areas or " management zones" within the park, each having appropriate uses ranging from recreational, research to biodiversity propagation. The zoning of the park into user zones would save fragile areas designed for conservation to rekindle and give chance to biodiversity facing extinction such as turtles, dugong, seahorse and a diversity of other plants to rejuvenate.

The delineation of management zones is based upon an evaluation of many factors, including the established purpose of this park, the nature and significance of the park's natural and cultural resources, the ability of each zone to support identified uses, the desired visitor experience and management objectives.

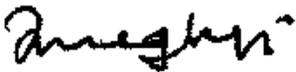
In compliance with Act no.29 of 1994, communities resident in the park are given access to decision-making process and active participation in resource use, tour guide, enforcement and of course in proceed sharing. The park returns a part of user fees to the villages for social services development such as school and dispensary construction and running.

Throughout the GMP implementing process, opportunities for public participation and comment will be

provided. These include public meetings and workshops, informal work sessions on specific issues and public review and comment on draft documents. Involvement of the public will be initiated at the earliest stages of the implementation process; early enough before the Parks authority make decisions.

The GMP serves as a guide to ensure that resource protection and recreational facility development remain balanced and compatible with one another.

The launching of the GMP for Mnazi Bay Ruvuma Estuary Marine Park is indeed the demonstration of our serious intentions on conservation, and the resilience of the government to use our natural resources to transform the well being of our people. Let me again take this opportunity to reassure our people living in conservation areas that if they will participate fully in conservation and sustainable harvesting of the resources, they will definitely reap more than what they are getting today.



Hon. Zakia H. Meghji (MP)
Minister of Natural Resources & Tourism
United Republic of Tanzania

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EXECUTIVE SUMMARY

The general Management Plan(GMP) for The Mnazi Bay – Ruvuma Estuary Marine Park (MBREMP) which lies south of Mtwara town in southern Tanzania is to fulfil the legal obligation which stipulates that every marine park or reserve must have a plan guiding its management. The park, which was gazetted in 2000, is the second such a park after Mafia Island Marine Park that took off in 1995.

The park, which includes the last 45 kilometres of coastline, to the Ruvuma River, has 11 villages within its boundaries that border the Republic of Mozambique. With a total area of 650 square kilometres, it includes the northern portion of the Ruvuma Estuary, Mnazi Bay to the headland of Ras Msangamkuu and the three islands of Namponda, Membelwa (or Mongo), and Kisiwa Kidogo.

The MBREMP is unique in that its land to marine ratio 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.

This plan would be a long-term roadmap for conservation of marine and coastal biodiversity, and sustainable management of human activities. 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 has marine, coastal and terrestrial habitats that include large tract of mangrove forests around the Ruvuma delta (the Ruvuma River forms the International boarder with neighbouring Mozambique), and part of highly productive and undisturbed ecosystems such as estuary, coral reefs and sea grass beds. It is also famed for sand dunes that feature mostly along the coastline.

The location of the park on the border with Mozambique, coupled with the inclusion of a large track of land and 11 villages with a population of almost 30,000 people within its borders utilising marine resources from Mnazi Bay and mangrove forests of the islands of Membelwa and Namponda, and of the Ruvuma Estuary demands a detailed management plan that will reconcile the interests of the residents without infringing conservation. This plan will take care of the existence of the natural gas deposits found in the southern part of Mnazi Bay several years ago.

The main challenges this plan is geared at solving are:

1. Fishing pressure and unregulated fishing
2. Shell and sea cucumber collection
3. Over fishing
4. Destructive fishing- Dynamite fishing in the Park has probably been the most destructive fishing technique in the past. Beach seine (Juya) fishing
5. Endangered species: Mnazi Bay provide suitable habitat for sea turtles and marine mammals.
6. Coral mining
7. Mangrove harvesting
8. Erosion particularly affects the seaward half of Ruvuma Estuary and the Ruvuma River bank itself. Coastal erosion can be a serious problem in some areas of the Park.
9. The Park is home to some 30,000 inhabitants, whose dependence on marine resources is an indicator of

potential threats to marine resources.

In view of the aforesaid, and without jeopardy to Act no 29 of 1994, the GMP is a roadmap to realise the objectives of the Act this time around by involving all stakeholders in the conservation of nationally and internationally significant and threatened marine biodiversity in the protection, enjoyment and sustainable utilisation of marine and coastal resources for the benefit of the present and future generations.

By implementing fully the GMP, MBREMP would succeed:

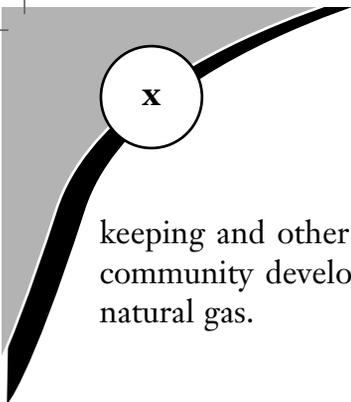
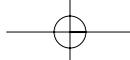
1. To protect, conserve and restore the species and genetic diversity of living and non-living marine resources and the ecosystem processes of the marine and coastal areas;
2. To ensure that villages and other local resident users in the vicinity of, or dependants on a marine park are involved in all phases of the planning, development and management of that marine park share in the benefits of the operation of the protected area and have priority in the resource use and economic opportunity afforded by the establishment of the marine park;
3. To stimulate the rational development of under utilised natural resources;
4. To promote community oriented education and dissemination of information concerning conservation and sustainable use of aquatic resources in the marine park; and
5. To facilitate research and to monitor resource conditions and uses within the marine park.

In order to ensure that peoples living in the park participate fully in conservation, the plan would:

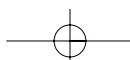
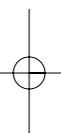
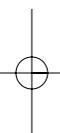
1. Facilitate mechanisms that assure a significant benefits from gas exploitation and eco-tourism development is dedicated to compensating Park residents whose activities have been curbed by the implementation of the GMP
2. Facilitate mechanisms to include part ownership by Park residents from any eco-tourism development plan in the Park
3. Strengthen the capacity of Village Liaison Committee (VLC) to participate in management of the Park
4. Prioritise outreach efforts and an environmental education programme to the local communities on the GMP and associated management activities in the Park
5. Ensure that each village has a designated Marine Park staff to which its residents can go with questions, suggestions and complaints about implementation of the Plan
6. Design a turtle education programme, including regular workshops on the ecology and critical importance of marine turtles for marine biodiversity

The plan divides the area of the park into user zones to protect critical and species-rich habitats including sub-tidal areas, mangroves, forest, bird nesting, fish spawning and turtle-breeding grounds. Under this scheme, core zones provide the highest level of protection, specified zones which are intermediate level protection within the park that warrant primary conservation status but are also important to local resource-users. In these zones activities likely to cause significant alterations to the park environment are prohibited. There are also general-use zones where MBREMP 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 cut over reliance on marine resources for the residents, the park will promote alternative source of livelihood to the residents, encourage eco-tourism and utilisation of under utilised resources such as bee



keeping and other small-scale ventures. The Park will also disburse a portion of collected User fees for community development, just as much as it would ensure that villagers get some proceeds from sale of natural gas.



CHAPTER 1. INTRODUCTION

The Mnazi Bay – Ruvuma Estuary Marine Park (MBREMP) is located to the south of Mtwara town in southern Tanzania, including the last 45 kilometres of coastline to the Ruvuma River forming the border with Mozambique (Map 2). The Park covers 650 square kilometres (162,500 acres or 65,000 hectares) and includes the northern portion of the Ruvuma Estuary, Mnazi Bay to the headland of Ras Msangamkuu. Within the Park boundaries there are three islands, Namponda, Membelwa (or Mongo), and Kisiwa Kidogo and numerous small rocky islets.

The Government and people of Mtwara region chose this area for development under the status of Marine Park for a number of reasons. These include; the area contains good representative examples of all the marine habitats found along the shores of Eastern Africa, it has highly productive and diverse fisheries that are important for the residents; it holds promise for coastal tourism and has reserves of gas. The Park was gazetted in 2000 and is the second marine park in Tanzania formed under the Marine Parks and reserves Act, 1994. A recent analysis of the whole Eastern Africa Region conducted by WWF and others concluded that the Park area and neighbouring northern Mozambique form a site of global importance in terms of marine biodiversity.

As stipulated in Section 14 of the Marine Parks and Reserve Act No. 29 of 1994, Mnazi Bay Ruvuma Estuary Marine Park (MBREMP) is required to develop a General Management Plan (GMP). The GMP is the principle-planning document for the marine park and aims to provide a strategic framework for long-term conservation of marine and coastal biodiversity and sustainable management of human activities. This Plan provides a basis for partnership among stakeholders in the management of the Park. To this end, the GMP contains management goals, with specified objectives, and the appropriate management strategies to achieve the stated objectives.

1.2. Target Audience of the General Management Plan

This GMP is intended as a broadly accessible document that will inform all interested parties in a transparent manner of the concepts and strategies behind the management of the marine park.

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

- The local communities within and adjacent to the marine park
- The MBREMP staff
- Other MPRU staff
- Local and central Government staff and public institution representatives involved in the broader field of natural resources management, including, but not limited to, staff from the Fisheries Department and Forestry Department
- Investors who may or have an interest in economic activities in MBREMP and in the buffer zone adjacent to the Park (including fisheries operators and tourism developers)
- Researchers, scientists and other technical experts working in related fields
- Other managers involved in marine protected areas in East Africa and around the world, including members of IUCN's World Commission on Protected Areas
- Government staff and key stakeholders in Mozambique who manage activities that may have a direct

impact on MBREMP, particularly in the area immediately south of the Ruvuma Estuary.

1.3 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 sea grass 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 condition of the resource base on which they depend. 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 to the designation of the area as a Marine Park. In 2000, MBREMP was gazetted as a Marine Park, the second in Tanzania after Mafia Island Marine Park (Government Notice No. 285, published on 4/8/2000).

The development of the marine park is being assisted through a UNDP/GEF and Fonds Français pour l'Environnement Mondial (FFEM) funded project, which was initiated in 2002 in order to assist the Government of Tanzania in "conserving a representative example of internationally significant and threatened marine biodiversity". The development objective of that project is 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 in 2003-2005 to establish baseline knowledge on mangroves, corals, intertidal areas and sea grasses and the status of the marine resources. A socio-economic assessment was also carried out to establish an understanding of the social and economic context within which people living in the Park use and/or impact these marine resources. These assessments contributed to inform the development of the 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, their children and grandchildren.

Up-to-date baseline information on all habitats in the Park is the starting point from where a marine biodiversity-monitoring programme will continue. The findings of this programme will provide data that will assist in the evaluation of the effectiveness of the management of the Park. Such programme also helps the Park tie in with national, regional and international initiatives monitoring marine biodiversity.

The development of this GMP was participatory involving the Marine Park's numerous stakeholders as required by the law. Two principal mechanisms for stakeholder input to the GMP were used: a village based environmental planning process to develop Village Environmental Management Plans (VEMPs); and a series of consultative workshops for stakeholders. As a result of this process, ten villages have drafted VEMPs comprising natural resource profiles, zoning, by-laws, management systems/modus operandi, main aims, action plans monitoring and evaluation systems. These VEMPs form the keystone of the GMP.

¹By Law, a buffer zone is described as "an outside and inside marine parks boundary that serves as a cushion against impacts from activities outside the marine park. (see chapter 7)"

Three major stakeholder workshops were held in Mtwara to solicit the input of all the stakeholders affected by the adoption of the GMP: (i) a technical workshop on December 16 and 17, 2004 to present the conceptual framework of the GMP based largely on the VEMPs (ii) a feedback workshop on January 7, 2005, where the first draft of the GMP was presented and comments were received, and (iii) a zoning workshop where proposals from the VEMPs and the scientific assessments were integrated. As a result of these workshops and the VEMPs process, this GMP truly reflects the views of the communities and all stakeholders. Local community participation will not be limited to the drafting of the GMP, but will continue throughout its implementation.

1.4 MBREMP Uniqueness

The MBREMP is unique for having a high ratio of dry land. It is the highest in East Africa. In fact, when looking at the majority of marine parks around the world, the terrestrial boundary usually only extends to the high - water mark and MPA managers are often hampered in their efforts in that they tend not to have jurisdiction over land-based activities that can have a significant impact on marine resources. 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 aim was also to ensure that local marine resource users would be included in the management and planning processes as required by Marine Parks and Reserves Act (1994). Thus the park includes in its boundaries 11 villages, 8 sub-villages and a population of approximately 30,000 people. Biophysical assessments of the area have shown that the marine environment is highly impacted by human activities, particularly by over fishing, destructive fishing and coral mining (Guard et al 1998, UNDP/GEF, 2000, Guard 2004, Obura 2004, Malleret 2004, Labrosse et a.,l 2005) and mangrove forests already bear the mark of anthropogenic use (Wagner et al., 2004).

MBREMP is thus distinguished by two characteristics that set it apart from other marine parks:

- a) The land area represents 33% of the park
- b) The management plan must take into account the wellbeing and livelihoods of 30,000 stakeholders who will be directly impacted by its implementation.

The importance of community participation and involvement is probably among the highest compared to any other marine park around the world.



Map 2: Mnazi Bay Ruvuma Bay Estuary Marine Park showing bathymetry and habitat types

CHAPTER 2: RESOURCE DESCRIPTION AND RESOURCE USE

2.1. Area and Location

The Mnazi Bay - Ruvuma Estuary Marine Park (MBREMP) is located in Mtwara Rural District – Mtwara Region, between 10° 34' 46" S 40° 16' 13" E and 10° 34' 25" S 40° 16' 02" E and 10° 07' 29" S 40° 28' 10" E and 10° 09' 28" S 40° 13' 56" E. Mtwara Rural is the southern most coastal District in Tanzania. Covering an estimated area of 650 km² of which 220 km² is land, while the remaining 430 km² is marine. On the northern side the park is extending from Ras Msangamkuu at the entrance of Mtwara Port stretching southwards on the seaboard along 45 km coastline to the Ruvuma River where it extends inland along the river to Mahurunga Village. Other features found within the Park are the Islands of Namponda, Mmongo and Kisiwa Kidogo, two of these islands (Namponda and Mmongo) are surrounded by the healthy stands of mangrove forest. The Park area also includes Msimbati channel, Mnazi bay, Ruvula peninsula and Ruvuma Estuary. The MBREMP comprise marine, coastal and terrestrial habitats including large tracts of mangrove forests around the Ruvuma delta (the Ruvuma River forms the international border with neighbouring Mozambique), and part of highly productive and undisturbed ecosystems such as estuary, coral reefs and sea grass beds. The sand dunes north of this estuary are the highest on the East Africa Sea board, and have plant species not found anywhere on continental Africa. A large population of crab plovers has led to the area being designated as an Important Bird Area (IBA).

Building on previous findings, the recent studies confirm that the waters of the Park are home to a great diversity of marine life, with features unique in Tanzania and the region. The mangrove forests of the Ruvuma River are healthy and robust and provide reproductive and nursery facilities to many fish and crustaceans. Open sand habitat is extensive and sea grass beds are variable, diverse, and luxuriant in places. Over 250 species of hard coral, a preliminary list of 400 fish and some 100 echinoderms are other salient findings from the assessments to date. This Biodiversity Status Report presents the most up-to-date summary of the natural history, its diversity, distribution and condition within the Mnazi Bay – Ruvuma Estuary Marine Park. The marine and coastal plants and animals found in the Park are there because of the climate, the physical features, influences of the Indian Ocean and the movement of the sea (tides and currents) and location of the Park along the coast of Africa. These topics are described briefly in the following pages.



Extensive surveys were carried out to assess the status of marine resources

2.2 Physical Features

2.2.1. Geology and Topography

The geology of the Park is based primarily on sedimentary deposits from the Jurassic and Lower Cretaceous (around 150 million years ago). Within 100 kilometres from the coast begin the slopes of the

Malone Plateau rising to over 500 metres. The Makonde Plateau extends into Mozambique but is bisected by the Ruvuma River that flows from close to the shores of Lake Nyasa as well as from a large part of northwest Mozambique through its largest tributary, the Lugenda River.

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 dunes in Tanzania, probably also accumulated over thousands of years. The vegetation associated with these 10-15 metre high dunes includes plants that are probably found nowhere else in the region.

A fringe of rocky limestone platform extends for about 25 kilometres along the outer perimeter of the Park starting from the Ruvuma Estuary east of Msimbati to Ras Msamgamkuu in the north, in two sections, interrupted by the Msimbati Channel. This feature was produced by past coral reef growth, mainly during the Pleistocene (less than one million years ago), but since elevated relative to sea level. The southern portion starts south of the villages of Msimbati with a patchy outline, then accommodating the Lijombe Lagoon, extending more intact to Ras Ruvula. The northern platform extends for 20 kilometres from Namponda Island on the north side of Msimbati Channel, onwards incorporating Mmembelwa Island to Ras Msamgamkuu.

The geophysical configuration of Msimbati Channel and southeast Mnazi Bay is unique in Tanzania. Here there exists a deep channel close to the open ocean, penetrating into a large, sheltered bay with scattered coral patch reefs growing from 30 metre depth. The southern side of the Channel extends for almost 5 kilometres of patchy coral growth quickly backing onto a sand beach. No other sites are known to house such a combination of geological and biological features. A few of the passes of Pemba Island are close, but their inner bays are far shallower than Mnazi Bay. 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 for Mnazi Bay a vital link for the passage water exchange into Mnazi Bay. Some of that water has come across the Indian Ocean.

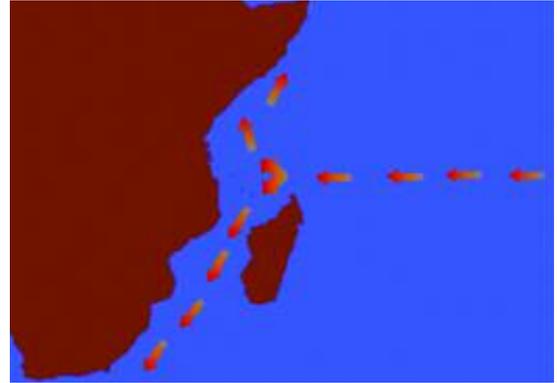
2.2.2. Bathymetry

The western and central parts of Mnazi Bay to the north are predominantly sandy environment. The bays cover an area of about 70 square kilometres. The depths, or bathymetry is less than 25 metres deep, especially in the northern portion, where the substrate is also predominantly sand. Towards the southern end, a distinctive line of three rocky or coralline patches of between 400-1,000 metres in width extends for 6 kilometres from the shore towards Namponda Island. These patches are of coralline formation. The patch reef closest to Namponda is called Chamba cha Lusale, and is irregularly shaped, about 1,000 metres wide and with reef slopes extending to depths of 25 metres onto the sand bottom. The other two patches, Chamba cha Chumbo and Ilili, have rocky portions exposed during the lowest tides, and are also products of coral development, though to shallower depths of 9-16 metres. Scattered among these larger patch reefs, and numerous in the slightly shallower waters (5-9 metre depth) to the east of the Chamba cha Chumbo are small coral patches and boomies that have so far not been fully charted. One of the most distinctive and probably the largest is Matenga (nearest the Gas Well). The water in this relatively shallow southern Mnazi Bay area is generally more turbid than other parts of Mnazi Bay, probably due to inputs from three small mangrove creeks (from Rivers Mnazi, Lilindi and Mlamba) and the more muddy surrounding intertidal areas.

2.2.3. Oceanography

2.2.3.1. Current

Three currents, the South Equatorial Current (SEC), the East Africa Coastal Current (EACC), and the Equatorial Counter Current (ECC) influence the coastal waters of the MREMP as with the rest of the coastal waters of Tanzania. Flowing across the Indian Ocean, starting from Australia, the Indonesian islands of Sumatra and Java, the South Equatorial Current meets the coastline of Africa approximately at the border of Mozambique and Tanzania where MBREP is located. When the current meets the shores of southern Tanzania and northern Mozambique the current divides with a large portion swerving northwards to become the East Africa Coastal Current. The smaller southern flow form the Mozambique Current (MC). The north-flowing EACC is a steady current, strongest during the southern monsoon when surface currents can exceed 3 metres per second, especially when southerly winds are strongest.



Depending on the strength of the North East Monsoon the northward flowing EACC in any particular time of the year this current change direction to eastward and flow offshore as ECC.

This is significant for the park because the waters that are brought across have come a long way. Within the waters of the SEC are the eggs and juvenile stages of thousands of marine animals and plants that were produced among the mangroves, sea grass 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 the Park is therefore strategically located and is very important for the settlement and subsequent dispersal of marine organisms both north and south along the coast of East Africa. The location of the Park at this arrival point of the SEC is likely to result in higher diversities of certain animals and plants that have long larval or egg periods.

2.2.3.2. Tides

In most of Tanzania, including the MBREMP, the maximum tidal range is about 4.5 metres, occurring during spring tides (around new and full moon). During the low water of spring tides, big changes are seen over the area of Mnazi Bay. Over 70 square kilometres of sand and sea grass is exposed. Seawater visibility is clear most of the times.

During spring high tides the sea enters Mnazi, Mtwara and Mikindani bays and cover about 80 square kilometres of intertidal areas. This seawater flows in from the Indian Ocean through three routes. The most obvious is through the 50-metre deep Msimbati Channel in the south, but also through two smaller gaps or 'mlango' in the northern part of Mtwara and Mikindani Bays. When the tide is over half way up, the seas flood over the eastern reef platform along the islands of Membelwa and Namponda. At highest speeds, the water flows through the Msimbati Channel at 4 metres per second or more.

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 November and March, and the Southeast Monsoon that blows from April to August (Kusi). In

between the changing monsoons there is an intermediate easterly wind (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 degrees Celsius), high surface water temperature up (as high as 31°C) and a few showers. Winds are moderate to strong. Beyond June, into the Southern Monsoon, the climate is cooler and drier, but the consistently strongest winds are normally experienced during this season, slowing down to November. Cyclones in this part of the Indian Ocean occur between January and March, mainly in Madagascar and the Comoro Islands. Fortunately for the people of Mtwara Region, during the cyclone season, rarely is there any impact other than occasional days of strong winds.

2.2.4.3 Rainfall and Sediments

Rainfall is generally low, usually between 500-1,000 millimetres per year and most of it falling over a short period. The wet season lasts from April to May. Within the Park, the Ruvuma River is the largest source of freshwater. During the wet season, waters from the Ruvuma River flood across the narrow sand causeway linking the Msimbati Peninsula. In Mnazi Bay, there is only one small river near Mnazi village, and some seasonal streams drain upland areas to the west.

Prolonged wet season showers swell the volume and strength of the Ruvuma River and all its tributaries, increasing erosion and washing sediment into the river, which is washed into the sea. The much smaller Mnazi River in the southwest also carries loads of sediment during floods. The erosion problem is attributed to poor agricultural practices in the catchment areas. From the Ruvuma Estuary, the sediment-laden waters spread north along the Msimbati Peninsula. The other location where suspended sediments exist is at the southern end of Mnazi Bay. Limited exchange with the Ruvuma Delta and four creeks with seasonal streams have created an area where waters are generally turbid over a muddier seabed. Sediments in water usually mean there are nutrients as well, which can be beneficial to local productivity, especially of plankton and seaweeds.

2.2.4.4. El Nino

In late 1997 and early 1998, the seawater along the east coast of Africa became warmer than average by 2-3 degrees Celsius. This caused the hard corals on the reefs to lose their symbiotic algae, which leads to dis-colouration and whitening or bleaching. The bleached corals can survive for several months but if the high water temperatures continue, many coral colonies die. The rise in water temperature is a global phenomenon that has been called the El Nihho event, usually starting at around the end of the year. During the El Nihho of 97-98 many coral reefs in the Indian Ocean suffered with the death of many coral colonies. In certain parts of Tanzania, Kenya and Seychelles over 70% of corals died.

2.3. The Natural Environment

A summary of the status of the marine and coastal biodiversity, its distribution and general condition is presented in the following sections, beginning with the coastal dunes and beaches, shorebird populations, mangroves and muddy shores, sea grass beds, rocky shores, shallow sub tidal habitats, coral reefs and fish populations.

2.3.1 Coastal Forests and Shrubs

Coastal forests are important fresh water catchments for the Park area. They occur as small patches ranging from less than 200 ha up to 600 ha. Coastal forest is remnant of the once continuous East African coastal

forest that extended to Somalia.

A total of 254 records of plants have been reported in the Park area representing 248 taxa. Of these, 119 taxa are trees, 49 shrubs, 45 climbers or scandent shrubs, 32 herbs, 2 ferns and 1 hemi-parasite.

35 species including coconut and casuarinas among others have been classified as exotic plants. However, none of these aliens are considered 'virulent'. Most are either crop plants or irritating exotic ornamentals like the sweet smelling tree near Latham's house, *Millingtonia hortense*.

Some plants such as; *Vepris lanceolata*, *Cassipourea mossambicensis*, *Pentarrhopalopilia umbellulata*, *Aloe massawana*, *Psydrax recurvifolia*, *Phellocalyx vollesenii*, *Psilanthus sp* and *Tarenna littoralis* were new records with the most exciting finding being a small tree near the beach that is most likely *Diospyros quiloensis* (named after the port of Kilwa), apparently not collected in Tanzania for over 100 years (White, 1996). Although known from Mozambique, Malawi, Zambia and Zimbabwe. Other possible new records include; the climbing orchid, *Vanilla roscheri*. A sedge that could be the fairly rare species *Remirea maritime* (Haines & Lye, 1983) was also recorded. Another interesting record is that of the white flowered twiner, *Derris trifoliata*, many years ago this plant was a source of the insecticide "Derris Powder".

Endemic tree, *Baphia macrocalyx*, *Berlinia orientalis*, *Commiphora madagascariensis* and the extremely rare endemic shrub, *Premna hans-joachimii*. Were also recorded from this stands probably the last remaining population of the rare (in Tanzania) endemic tree. Although found in quite extensive *Berlinia* dominant woodland in northern Mozambique (where we found it in a mass of white flower), it would appear to be extremely rare in Tanzania. This was found to contain many interesting species, including what appears to be the first record of in Tanzania. Other records of interest were the yellow flowered shrub *Hugonia busseana* and the tree *Strychnos cocculoides* with its extremely corky, fire-proof bark.

2.3.2 Sand dunes and beaches

The impressive sand dunes of Msimbati are over 15 meters high, extending about 3 kilometres along the coast. Such a formation is a rare feature along Tanzania's coastline. The specialised vegetation community associated with these dunes is unique to the country thus contributing to the special status of the Park. The dunes and dune vegetation also attract specific communities of birds and insects that are only unique to the park.

Sand beaches are common within the Park and occur in two main areas. The eastern shores of the Msimbati Peninsula, including Lijombe to Ras Mivinjeni and around Ruvula as far as the Police Post, with an estimated distance of about 12 kilometres long. Strong currents between Lijombe and Ras Mivinjeni are creating visible beach erosion problems with loss of coconut plantations. More sheltered sand beaches are present for about 15 kilometres along western parts of Sinde and Mnazi Bays. Vast expanses of open sand are also exposed during low

MBREMP is home to some unique sand dune habitats tides in central parts of Sinde to Mnazi village and between Namponda and Membelwa Islands. These areas greatly contribute to the diversity of habitats in the Park.



Beaches are very important for nesting turtles. Greens and Hawksbill turtles are known to nest inside the

Park. Animals living in the sand beach environment normally seek protection from the sun by digging holes or living under washed up seaweeds and other debris. In the Park, ghost crabs, sand crabs, sand hoppers, and butterfly shells (*Donax* spp.) are the more obvious inhabitants of these sandy habitats. Although not normally visible, other molluscs and polychaete worms live below the surface. Some of these are food for wading and shorebirds, such as Crab plovers, Whimbrel and Yellow-billed Storks.

2.3.3. Mangrove Forests and Muddy Shores

Of the nine mangrove species found in Tanzania, seven species have been reported in MBREMP namely; *Avicennia marina*, *Xylocarpus granatum*, *Rhizophora mucronata*, *Ceriops tagal*, *Sonneratia alba*, *Bruguiera gymnorhiza* and *Heritiera littoralis*. However the following species *Lumnitzera racemosa* and *Pemphis acidula* are not reported.

Mangrove forests are important habitats with great ecological and socio-economic value. In Mtwara, as in most parts of Tanzania, mangroves are a source of firewood, charcoal, building poles and materials of boat construction. These forests and the animal life they support can also be a great tourist attraction.

There are about 70 square kilometres (or 7,000 hectares) of mangrove forest in the Park, accounting for almost 10% of the mangrove forests of Tanzania. All nine main species are present.

The largest single mangrove forest stand is located in the northern portion of the Ruvuma Estuary. Within this Ruvuma mangrove forest, the best-developed areas are adjacent to the Ruvuma River itself. In these areas, between the Litokoto and Lidengo Rivers, the forests are best developed with healthy mixed stands of mature trees that include the *Heritiera littoralis* - a species that has suffered greatly in the Rufiji Delta forests. In terms of density and tree size, measured by basal area, this area of the Ruvuma forest (with a basal area of 1,015 square centimetres per square metre) rivals the better parts of the Rufiji delta forest (basal area 1,261 square centimetres per square metre).



When viewed from a map or the air, the Ruvuma Estuary gives the impression of having four main tributaries or creeks. Closer inspection reveals that the northern three are tidally fed by seawater and that only the most southern creek of Chikomolela and Litokoto are regularly influenced by freshwater. This influence is noted in the southern portion of the estuary where, combined with river-borne nutrients from the Ruvuma River, accounts for the better development of the southern portion of the forest.

Marine animal life in mangrove forests is limited to a few specialist species tolerant to muddy conditions, desiccation and seasonal freshwater flooding. About 15 species of crustacean and mollusc are documented and 20 species of fish are reported from capture in the Ruvuma forest. Notable examples include the mud crab *Scylla serrata*, penaid prawns, fiddler crabs, *Uca* spp. and mud snails *Terebralia palustris*, the mullet *Valamugil sabeli* and the seven-spot herring *Hilsa kelee*. Unidentified monkeys have been heard in the forest.

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 forest much closer to the ocean, with less mud substrate and freshwater input. This makes these islands fairly unique, because especially on Membelwa, mangroves are present on the sheltered western shores and on the more exposed

east coast. This juxtaposition of island, mangrove, and narrow shallow sea grass bed, rocky reef crest and reef slope is a feature of the Park that exists in few other areas.

The land immediately behind the mangrove forests of the Park is 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*. These barren saline flats cover about 4 square kilometres (400 hectares). Seaward of the mangroves, in most parts of the Park, extends a gently sloping mud flat that usually becomes colonised by sea grass lower down the shore, extending into the sub tidal.

2.3.4 Sea grass beds

Recent studies have shown that both the intertidal and sub tidal sea grass beds are in good condition with luxuriant growth and high diversity. Nine species of sea grass that have been reported in MBREMP include; *Thalassia hemprichi*, *Halodule uninervis*, *H. wrightii*, *Halophila stipulacea*, *H. ovalis*, *Thalassodendron ciliatum*, *Cymodocea rotundata*, *Cymodocea serrulata*, *Syringodium isoetifolium*. A tenth species, *Zostera capensis* is also reported to occur in MBREMP, however this needs to be validated. The long, blade-like *Enhalus acoroides* typical of sandy slopes and high currents has not been reported

Sea grasses need soft substrata for rooting and light. Sea grass beds are present inshore of the reef crest along much of the eastern shores of Msimbati Peninsula, but less along the Ruvula Peninsula. There is a 1,000 metre wide, tidal expanse of thick, healthy sea grass 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 is known as Mivinjeni, also noted by a cluster of *Sonneratia alba* mangrove trees. Extending west down the parallel shores of the Ruvula Channel, the seabed steeply slopes with only small patches of sub tidal beds of *Thalassodendron* and *Syringodium*. The southern Mnazi Bay area is mostly soft bottom with large amounts of mud and silt. Sea grass beds are thinner but extend from middle shore to subtidal depths, dominated by *Thalassia hemprichi* and *Cymodocea rotundata*. The western shores of Mnazi and Sinde Bays support well-developed seagrass beds along most of their length, beginning about 200 meters from the beach, and in places extending into the sub tidal. Thicker and more luxuriant beds, about 500-1,00-metre width, mostly of *Thalassia 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.

Within the sea grass normally exists an animal community that includes members of the phylum Echinodermata that include sea cucumbers, starfish and sea urchins; mobile molluscs such as Cowries (*Cypraea spp.*) plus various buried bivalves and crustacean such as crabs and shrimps. Many of these animals as well as some fish lay egg masses on the sea grass and algae within sea grass beds.

2.3.5. Shallow Sub tidal Habitats

This section is the first one covering the aquatic environment, a realm that a few scientists and many fishers explore, but one that some people inside the Park have never observed. What goes on under the surface of the ocean can be documented, measured and monitored. The life of the marine animals and plants can be followed and ways can be found to increase the productivity of the seas. In many cases, this can simply be achieved by decreasing the destructive influences.

The shallow sub tidal area of the inner bays of Mnazi and Sinde are generally bare sand, Sinde Bay especially. Along the shallow edges sea grass beds are common, and in deeper sites patchy sea grass beds occur. Towards the southern end of Mnazi Bay coral outcrops are common. Towards Msimbati Channel the depth rapidly increases and a complex patch reef (Chamba cha Lusale) extends from near the surface to 30 metres or more. The southern portion of Mnazi Bay supports numerous small, shallow-water patch reefs.

2.3.6. Rocky Shores

Inside the Park, rocky shores are found in three different forms. The Pleistocene cliffs of the Islands of Membelwa, Namponda, Kisiwa Kidogo and associated islets support upper shore rock habitats. In this environment, a few small red seaweeds can exist in the shady crevices, with characteristic residents being snails of the genus *Nerita*, rock oysters *Crassostrea cucullata* and the light-footed *Grapsus tenuicrustatus*. On the western shores of Membelwa the base of these cliffs and islets extend onto the second form of rocky substrate, the intertidal rocky flats punctuated by shallow rook pools. This stretch extends for some 500 metres, with some smaller patches around Namponda and Kisiwa Kidogo. Common inhabitants include cerith snails and the red-eyed rock crab, with the red seaweed *Gracilaria salicornia* firmly fixed on rocky edges. The third form of rocky substrate is the reef crest; a 100-200 metres wide band of mostly bare rock scattered with fixed and loose boulders. The reef crest is found along most of the outer reef platform for about 25 kilometres, starting with the upper parts of Kipwa Kidogo and Kipwa Kikubwa, then the outer edges of Lijombe Lagoon onwards to Ras Ruvula, and beyond to the passes near Ras Msangamkuu. The stones and boulders provide a special daytime refuge to various species of mobile invertebrate (e.g. crabs, shrimps, snails, starfish, sea cucumbers and brittle stars) as well as sites for egg laying, especially for octopus and gastropods such as the seashells of the genus *Cypraea*. Smaller examples of the reef crest also occur in the more sheltered reef outcrops of Chamba cha Chumbo and Ilii inside Mnazi Bay.

2.3.7. Coral Reefs

Recent studies have confirmed that coral reefs within the Park have a more diverse hard coral community than most sites in East Africa. This high diversity is probably due to the complex range of habitats in close proximity that is a feature of the Park. The count from 2003 surveys is 258 species in 59 genera from 15 families. The comparable Mafia Island site hosts about 270 species, and locations in Kenya about 225 species. The coral fauna is typical with the Acroporidae (fragile, mostly branched forms) and Faviidae (honeycombed solid dome colonies) the most well-represented families (65 and 64 species, respectively). The abundance of coral genera vulnerable to bleaching, such as *Acropora*, *Stylophora* and *Seriatopora* was notable, given their widespread mortality during the El Niño in 1998. From 22 sites surveyed in November 2003, four reef zones were identified:

- **Outer fore reef slopes** covers much of the outer perimeter, extending over 30 kilometres from the Msimbati Peninsula, past Namponda, Membelwa as far as Ras Msangamkuu. In the south, includes the fragmented patch reefs of Kipwa Kidogo and Kipwa Kikubwa, as well as the shallow coral patches and outcrops in Lijombe Lagoon.
- **Msimbati Channel with deep**, sheltered, high current reefs extending on the southern banks for about 5 kilometres.
- **Patch reefs** within the Mnazi bay or lagoon - including deep reefs of Chamba cha Lusale, as well as Chamba cha Chumbo and Matenga and the smaller coral patches in the muddy environment of the southern end.
- **Outer shelf northwest** of Msangamkuu point.

The fore reefs, channel and lagoon patch reefs between them provide a variety of depth zones and structures. Where this is not impacted by destructive fishing practices there is high topographic complexity and reef growth. On these reefs hard corals, with an average cover of 30%, dominated the seabed composition. Soft corals and rubble accounted for about 18% each. Localised high levels of algal growth or rubble are seen, indicative of past destruction.

All the reef types 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 will be different to corals growing in the

more muddy waters of southern Mnazi Bay near Mnara wa Gas. The cover of both hard and soft corals, new recruitment and the development of coral species assemblages (e.g. *Acropora staghorn* beds, deep-water communities and others) suggest the Park ecosystem has a high productive capacity.

In 1999, the reefs of Mnazi Bay were included in the national coral reef monitoring network by scientists based at the Institute of Marine Science (University of Dar es Salaam), from CORDIO (Kenya), and with volunteers from Frontier-Tanzania. Studies to assess levels of reef damage from coral bleaching and death following the seawater temperature rise during the El Niño of 1998 has showed that the reefs of Mnazi Bay were significantly impacted with declines in coral cover of 30-50%. Following that event, average hard coral cover was 25-30%. It was noted that there was good potential for coral recruitment. Evidence of coral mortality from the El Niño event of 1998 is still apparent, though recovery through re-growth and colonisation by new larvae of hard and soft corals has been high and robust. This demonstrates a high resilience of the Mnazi reefs to seawater warming.

2.3.8. Productivity and Resilience

The complex structure of Mnazi Bay, with deep-water patch reefs, deep strong-current Msimbati Channel with high water exchange may contribute to the high biodiversity and productivity of the area. These qualities likely contribute high ecological resilience to the reefs of the Park, supporting its robust recovery from the El Niño-related bleaching of 1988, and potentially high recovery from destructive fishing practices. The high cover and diversity of corals at depths beyond the impacts of bleaching and dynamite fishing are likely to act as a refuge or reserve for supply of larval recruits to damaged areas.



(Macro algae) – The few older studies on seaweeds revealed about 50 species in the Park, split between 29 green, 14 brown and 16 red seaweeds. Some studies have not yet been completed and it is certain that the number of seaweeds will increase, probably to several hundred species.

(Crustacean) - The present collection of less than 20 species serves only as an introduction to this large group. Notable examples include the spanner crab *Ranina ranina*, the freshwater prawn *Macro brachium* sp. (from Ruvuma River), and the mantis shrimp *Natosquilla investigatoris* (washed in the 100s of thousands over a few days, beginning March 22, 2004).

2.3.9. Molluscs

This group potentially holds 600 or more species likely to be found in the Park. Among the snail-like gastropods, 400 species might occur. For this reason, the genus *Cypraea* was selected as an indicator of the group. These are generally large, easily identified and conspicuous shells, collected from numerous sites throughout the Park. The collection includes 17 species, of a total known from Tanzania of about 55 species. A more dedicated search is certain to reveal more species. Together with bivalves from sea grass samples, the mollusc collection includes 30 species.

2.3.10. Echinoderms

Members of the Phylum Echinodermata are common members of the sea grass community, but are also found in rocky and coral reef habitats. This exclusively marine phylum comprises over 400 species in the

western Indian Ocean, and includes the sea cucumbers, starfish, brittle stars, the spiny sea urchins and feather stars. The echinoderms were the mobile taxa most comprehensively studied and serve as an indicator of the biodiversity of the Park.

About 100 species of echinoderm have been reported from the Park so far, but the number should be about double this. Around the shores of Mnazi bay sea cucumbers were noticeably found only in low numbers (30 species) than would be expected for the richness of habitats. This is probably because of the active sea cucumber fishery currently taking place in the Park. Further studies should increase the total number of echinoderm species to 150-200, with 40 sea cucumbers.

So far, about 100 species have been found in the Park. These include, from the following classes: 24 sea urchins, 20 starfish, 30 sea cucumbers, 27 brittle stars and 3 feather stars. The collection includes about 170 specimens, mostly of species that occur in the intertidal zone, with only a few collected from the sub tidal. A fuller study will certainly add more species.

2.3.11. Fish diversity and populations

About 400 species of fish have been identified, an estimate based on reports from numerous studies using landed catches (including from the Ruvuma River), underwater visible identification and examination of underwater images. Among these are about 150 genera from 50 families. A detailed fish study, particularly focusing on the more cryptic families, is likely to increase this number to a more realistic 1,000 species.

The species richness of fish is high comparable with species lists from the Mafia Island reef systems to the north (where 400 species were also reported), but not higher than numbers reported from other parts of East Africa where detailed investigations have taken place. In the Watamu Marine Park of Kenya for example, 1,300 species are reported. From only 3 square kilometres in the Chumbe Island Coral Park (CHICOP) of Zanzibar, 370 species have been identified. In the mid 1960's, the small Kitutia Reef, now within the Mafia Island Marine Park, yielded 192 species. Following comprehensive studies, the known number of fish species in the Park is likely to increase to beyond the 1,000 species mark.

Of note among the fish fauna at many sites studied was the absence of top carnivorous species such as groupers, emperors, snappers, and barracuda. Herbivorous fish were also almost totally lacking from the reefs, such as parrotfish, surgeonfish and rabbit fish. Fish that form schools too were absent. These are all indicators of heavy fishing. In contrast to the many positive aspects of the biodiversity within the Park, the fish community appears highly degraded, a situation made more serious because the overall fish size was also generally too small, indicating high capture of immature and adults. On reefs protected from fishing because of rough sea conditions, the abundance of fish was higher, at times exceeding 2,000 per 250 square metres. By comparison, in the sheltered areas with easy access to fishers such as in the lagoon and Msimbati Channel, densities varied between 20 and 150 per 250 square metres.

Pelagic fish species such as tunas, kingfish and jacks are caught at the entrance and inside Msimbati Channel. During some of the year the Torpedo Scad (*Vibua ngozi*) dominates the catches. This fishery may be unique in Tanzania. Furthermore, the presence in deeper waters of large schools and predatory fish such as sharks suggests high levels of productivity of the ecosystem. This is encouraging and supports the belief that with sensible fishing practices, fish numbers can increase and yields maintained.

2.3.12. Marine Turtles

Of the world's eight species sea turtles, five species have been recorded in Tanzania including MBREMP. The most common one are Greens and Hawksbill turtles. Other recorded species are Olive Ridley, Leatherback and Loggerhead turtles. Marine turtles are protected internationally under the Convention on International Trade on Endangered Species (CITES) as well as under the National law.

Important nesting sites for the turtles within the Park area are the beaches of Litokoto and Kingumi in the Ruvuma Estuary, and the shores of Msimbati and of Msangamkuu. Most nesting is between April and August, though Green turtles have nested in February. The female turtles usually return to the same beaches from which they hatched, at night to dig a pit and lay eggs, refilling the hole with sand. After about 60 days the baby turtles hatch and must immediately take to the sea where they will feed and grow for 40 years before the females return to lay eggs again in the beaches of the Park. Green turtles feed on sea grass, while the other species also eat seaweeds, sponges and jellyfish

2.3.13. Shorebird populations

So far, 180 bird species have been recorded inside the Park, but the area has not been thoroughly studied and the true number of species could be greater. The Mafia Island Marine Park reports about 160 bird species and Mikumi National Park has over 400 species of birds.

Among the birds, many groups exist, and it is the shorebirds that Mnazi Bay is most famous for. This is a group of very visible birds that includes the herons and egrets and smaller birds called waders (usually grey to brown with long legs). The more commonly seen birds on the beaches and mudflats are the Dimorphic Egret (both colour phases), Black Herons, Grey Herons, Crab Plovers and Whimbrel. Up to 3,000 Crab plovers have been seen in the past, during the northern monsoon season when these birds visit to feed before flying to northern Europe to breed. In January 2004, on the shores of Sinde Bay over 1,000 Crab Plovers were seen as a single flock. The mangrove forests of Namponda and Membelwa Islands provide important roosting sites for waders as well as feeding and breeding areas for other birds.

During the northern monsoon period, in February 2004, about 80 Yellow-billed Storks were seen roosting along the northwestern 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 on the shore depending on marine as their food source, thus the Park populations may be unique. Yellow-billed Storks are also present in the Watamu Marine Park of Kenya.



Although shorebirds are an important feature of the biodiversity of the Park, other types of birds exist. For example, this area is the first record in East Africa for the Shy Albatross. The Masked Booby and Peregrine Falcon are also recorded here. On the mainland, in neighbouring shrub forests, farmland and plantations, Red-eyed Doves, White-bellied Sunbird, Pied Crows and Black Kites are present, the latter commonly seen on beaches near fish landing sites. The diversity of birds noted for the Park is definitely worth promoting. The Indian House crow has not so far been seen in the Park or even in Mtwara. It is important for the natural bird population that this pest is kept out of the Park and ideally the whole Region. The Mnazi bay has been identified as one of Important Bird Area (IBA 28) in Tanzania.

2.3.14. Fresh water animals

There are a number of fresh water animals within the Ruvuma River, the most common one are hippo and crocodiles. The Ruvuma River not only forms an important feature of the MBREMP ecosystem in terms of providing nutrients and fresh water but also is a major reservoir for aquatic life.

2.3.15. Marine Mammals

Humpback and Sperm Whale and three species of dolphin are reported. No extensive marine mammal study has been conducted to date.

Several other taxonomic groups exist of animals large enough to be visible that are also well represented in the Park. In particular the sponges, tunicates, polychaete worms, soft corals and myriad groups of small shrimp-like crustaceans. Between these at least 1,000 species can be added to the overall tally for the Park.

2.4. Human Population and Activities (Resource Use)

Within the Park are 11 villages with a population of almost 30,000. According to United Nations figures for the year 2000, the average income is less than \$100 per year. This human population has long utilised the marine resources from Mnazi Bay and mangrove forests of the islands of Membelwa and Namponda, and of the Ruvuma Estuary.

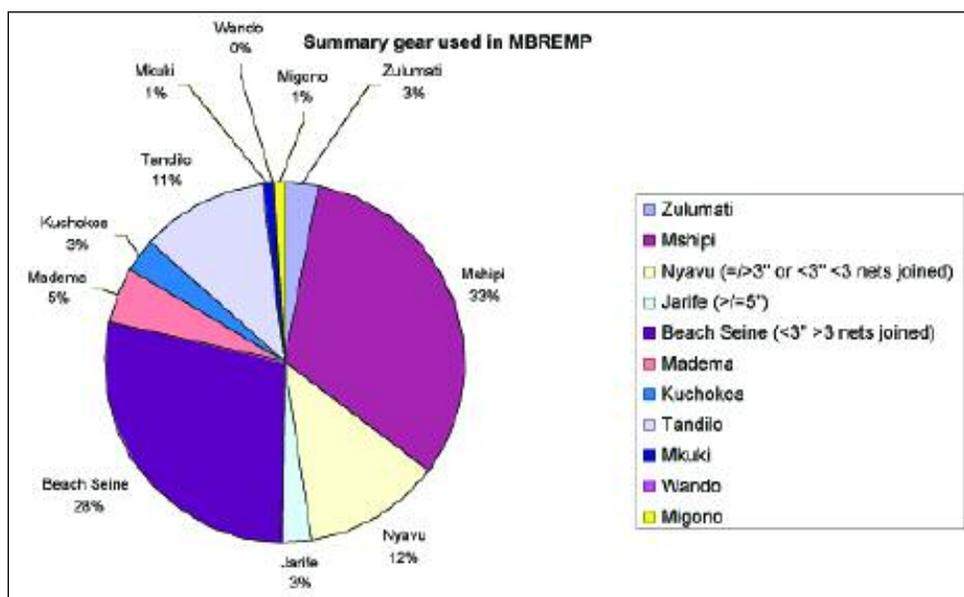
2.4.1 Fishing

Fishing is the mainstay of livelihood source and economy of the majority of Park residents. However, it is small scale, multi species, and multi gear and is therefore typical of many tropical fisheries. There are approximately 1500 fishers based in the Park area. Men dominate fishing. Women and children do collect live seashells, octopus and sea cucumbers.

The majority of fishers about 70% are using traditional dug out canoes particularly, those operating in the estuary and mangroves (Linemen and Kilambo villages). Other fishing crafts are boats propelled by sails and few propelled by engines. The boat based fisheries is falling under both artisanal and semi industrial categories. A large proportion of the traditional fishers in the area fish mainly for subsistence and the majority own neither fishing crafts nor fishing gears. That's why the socio- economic relationship within the fishing community is difficult to assess when it comes to ownership of the fishing crafts and gear.

There are two main fishing grounds in the Park namely, Mnazi bay and its associated reefs including the main two islands of Namponda and Mmembelwa and mangrove/estuary area. Main fishing gear used includes; beach seine, hand line (mishap), gill nets, Tandilo, basket traps (madema), hooks (zulumati), spear and weir (wando). The fishing gear in the Park are summarised in the diagram below:

The common fish species that feature are mainly snappers, emperors, groupers, mackerel and other reef species. Other types include rabbit fish, goatfish, parrots and milkfish caught from sea grass beds, mangrove and estuary.



The analysis of the common fishing gear employed in the Park area show a high dependence on destructive and illegal fine meshed nets & beach seines (30% of fishers).

2.4.2. Agriculture and Livestock Keeping

Agriculture and livestock keeping is one of the income-generating activities in the MBREMP. Small-scale agriculture is

practiced throughout the Park, both for subsistence crops and as a primary occupation for cash income. The economic crops include cashew, simsim, groundnuts and coconut; while the food crops are maize sorghum, cassava, rice and pigeon pea. Farming is seasonal and limited by generally poor soil conditions and insufficient rains. This situation increases dependence on the marine resources for livelihood support for the majority of the Park residents. Livestock keeping in MBREMP is very minimal although the area is a Tse - tse fly free zone. The main livestock are goat, sheep and indigenous chicken for subsistence and income generating. 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 used.

2.4.3. Mangroves

Mangrove forests are considered as critical habitats with great ecological and socio-economic value. Ecologically they are keystone ecosystems since they provide important ecological services that extend far beyond their area of coverage. They have high productivity, producing large quantities of organic matter that serves as food for many organisms, not only living within the forest, but also outside it, since much of the organic matter produced is exported to other areas of the marine environment. Mangroves also serve as feeding, breeding and nursery grounds for a great variety of invertebrates and fish, in addition, mangroves filter river water and facilitate the settlement of sediments, which would otherwise be detrimental to surrounding sea grass beds and coral reefs. Mangroves also play an important role in stabilizing the coastline, thus preventing shoreline erosion.

Economically, mangroves are important to local community especially of nearby villages such as Litembe, Tangazo, Kilambo, Msimbati and Mngoji. Mangroves provide wood product in terms of timber, poles, posts, firewood, charcoal, materials of boat construction and tannin. Non-wood products provided by mangroves include fish, animal fodder and traditional medicines. Moreover, mangrove forests serve as great tourist attractions and have important scientific value.

Most of mangrove used within the Park area is for building and roofing, the preferred species for building are *Rizophora mucronata* and *Ceriops tagal* as they are more termite resistant. The most important seeds for medicinal use are those of *Xylocarpus granatum*. The remaining species are commonly used for Firewood.

2.4.4. Coastal forests and shrubs

Coastal forest and shrubs within the Marine Park area are important sources of building materials (timber, poles and rafter) to the majority of Park residents. They are important source of fuel in forms of firewood and charcoal. Collection of medicinal plants, raffia fibre, mushrooms and hanging of beehives are also of significant importance.

Other uses include carvings from *Dalbergia melanoxylon* (Mpingo) listed as an endangered species. Most of these uses with exceptional to carving, are on a subsistence basis.

Certain sites within the forest are important sacred and are used for ritual performance by local communities. Other use includes graveyards.

2.4.5. Coral Mining

Live coral mining is known to occur in the Park's buffer zones particularly Msangamkuu and Mikindani. Current estimates are 4800 tones of live coral and 3000 tones of fuel wood being used being used in the industry (Guard, 2004). The massive coral *Porites lutea* are the primary resource for lime making. Massive *Porites* heads are among the most important reef framework builders in East Africa (Hamilton and Brakel, 1985). However, the practice of mining of live coral particularly *Porites* for lime production in Mtwara are at alarming stage and threats to biodiversity conservation of the Park.

Deliberately efforts are being made by MBREMP in collaboration with the Mtwara Rural District Council to develop alternatives to live coral as a source of lime for local and urban building, and phasing out live coral mining. Fossilized coral mining for cement and lime on land has been recommended as suitable alternative.

2.5 Tourism

Pristine, attractive and clean beaches along the coast of Msimbati to Ruvula, which are friendly, sun bathing as well as wind surfing, characterize the area. The spectacular and fascinating Ruvuma delta offers a unique experience. Snorkeling and diving along Msimbati/Ruvula channel and associated coral gardens found in the inner and outer reef of the Park. The scuba diving is carried out by tourists and for research purposes. Other attraction includes; sand dunes covered with endemic plant species. Wild animals such as Crocodiles (*Crocodile nilitioscus*) and hippos (*Hippopotamus amphibious*) can be viewed along the Ruvuma River. Other animals include monkey, pig, bush baby, warthogs, and bats. Birds like herons and crab plover are also common in the Park area. The presence of International migratory birds makes the Park an Important Bird Area (IBA 28) in Tanzania.

A school of Dolphin are often observed in the Bay while whales (Humpback and Sperm whales) do frequent the Park area especially in the bay and offshore waters during their migration to and from the northern hemisphere.

Tourism activities that are undertaken in the Park so far include; snorkeling, scuba diving, bird watching, camping, wind surfing and sun bathing. Although the level of visitation to the Park is still low, a few visitors that come to the Park are basically from the resident expatriates and missionaries based in Mtwara and Lindi Regions. There are no tourist facilities within the Park area. However, there are interest from developers to put up such facilities, Ruvula Safari Lodge is a case in point.

2.6. Natural Gas

The MBREMP sits on the natural gas deposit. Natural gas was found in the southern part of Mnazi Bay several decades ago. Recently the Tanzania Petroleum Development Corporation on behalf of the Government of Tanzania has signed the agreement of intent with a Canadian company Ms. Artumas Group Inc. for "Well Re-entry Programme", that aimed at exploration of Hydrocarbon Gas, and later develop to a larger Project i.e. Mtwara Gas-to-Power Project.



Makonde Carving

The "Environmental and Social Management Plan" (ESMP) of well re-entry programme as well as seismic test to ascertain if there is enough quantity of the gas in the existing well by Artumas Group Company was approved by the Board of Trustees for Marine Parks and Reserves, with endorsement of the Minister for Natural Resources and Tourism in 2004. The approval was subject to a number of recommendations that were to be observed by the exploration company in the process of Well Re-entry. If quantities of the gas found to be economically feasible for the development of Gas-to-Power Project, the rigorous EIA will be undertaken prior to commencement of Gas-to-power Project. At the time of preparation of GMP the well re-entry activities and seismic test were going on.

2.7. Local Makonde Culture

Makonde is the main tribe for the Park residents. The Makonde's are famous in traditional dancing called Sindimba. They are also well known for the Makonde carvings an important attraction in this part of the World. Of interest in the local culture is the presence of local institutions including initiation ceremonies (Jando and Unyago) as well as Communal working and age grouping (Chikudi).

CHAPTER 3: MANAGEMENT ISSUES AND OPPORTUNITIES

The recent biodiversity and socio-economic studies and the VEMPs have highlighted the importance of the marine biodiversity of the Park on a national and regional scale, as well as its significance to the local inhabitants. The productivity of the waters of the Park, yielding fish, molluscs, sea cucumbers, lobsters and octopus, is linked to the integrity of the various marine habitats, in particular the coral reefs, sandy shores, sea grass beds, and the extensive mangrove forests of the river delta. The studies have also described a number of threats to this unique environment from human activities manifest 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. The study 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 stakeholder consultation process (Hogan and Bashagi 2004) include cultural/spiritual sites, coastal forests and other vegetation for carving and medicinal, freshwater sites, wildlife notably hippopotamus and crocodiles, tourism development, gas exploration, salt making, beach and upstream pollution, land use and boundaries.

3.1. Natural resource issues

3.1.1. Fishing pressure and unregulated fishing

A very useful summary of the diversity of gears and fishing practices was presented in 'A socio-economic baseline assessment of the Mnazi Bay - Ruvuma Estuary Marine Park' (Malleret, 2004) and a modified version of this is included here in the table below.

Table 3.1. - Summary of Fishing Gears and Practices in MBREMP (after Malleret, 2004)

Gear	Daily pattern	Monthly patterns and seasonality	Main species
Nets (2.5"-7")	-Day and Night -Going at low tide and coming back high tide -6-7hours at sea	All year Peak season: NEM, MAT	Grunters; Purse mouth; Jacks; Mullet; Tuna; Red Snapper; Groupers; King fish; Milkfish; Shark; Wolf-herring
Nets (<2.5")	-Day and Night	All year Peak season: NEM MAT	Mackereels; Prawns; Small mullets; Half-beaks; Emperors; Sardines
Juya	-Day	All year Peak season: NEM	Small barracuda; Emperor; Half-beaks; Mackereel; Sardines
Tandilo	-Day, evening, and night (full moon)	All year Peak season:	Anchovy; Small herrings;

Continues on opposite page

Gear	Daily pattern	Monthly patterns and seasonality	Main species
	particularly) -May be done twice in a day -Done at low or high tide depending on the area - 2 to 4 hours spent.	NEM Best: spring tide	Sardines; Silver Silago
Beach seine	-Mainly Day -Low tide -May be done twice	All year Best: Spring tide	Emperor; Jacks; Anchovies; Herrings; Synodontidae; Sardines
Handlines	-Day and/or night- day only when boats do not permit -High or low tide depending on areas -Once or twice a day 5 to 7 hours	All year Peak season: NEM, MAT	Mullet; Jacks; Snappers; Purse mouth; Grunter; Shark
Traps (few) (Mainly in Mkubiru Mgoji Mitaambo Kilambo)	-Day (difficult in windy days) -Low tide -Once or twice depending on tide	All year Peak season: NEM	Emperor; Parrot fish; Goat fish; Rabbit fish; Catfish (R); Small tilapia (R); Prawns (R)
Tidal weir (few mainly Kilambo, Msimbati)	-Day -Low tide check -Once or twice depending on tides	Mainly SEM Best: Spring tides	Prawns
Spear gun (Msimbati)	-Day time -Low tide	All year Peak season: MAT	Jacks; Groupers; Squirrel Fish
Spear, Hand, diving (Sea cucumbers)	-Day and night (with pressure lamps) -Not every day -Low tide for hand collection -Any tide for diving	Mainly in SWM No diving: when river high (muddy waters in Mkubiru)	
Spear, Hand (Octopus)	-Day or night -Low tide	All year Mainly: Springs	

NEM: Northeast monsoon

SWM: Southwest Monsoon

MAT: Calm period in between Monsoons.

E: Estuary

- They highlighted the importance of fishing for 1) subsistence 2) for trade, demonstrating a high dependency on marine resources. Any monitoring programme, should consider using consumption indexes as an indicator of households fishing activities.
- High variability of Catch Per Unit Effort (CPUE), which cannot be explained by the variables of the fishers' survey.
- The importance of finfish in the catches and shellfish and crabs as second rank, therefore monitoring and management options should give priority to these two groups of seafood.
- Tandilo (mosquito net) is one of the third most frequently used gears, and nyavu (beach seine) the second. Both are illegal and should be addressed specifically in the management strategy.
- Fishing grounds are generally distinct for each village, which greatly facilitates the implementation of Beach Management Units, as called for in the new Fisheries Act.

However, data on fishing effort, catch landed and biological stock assessments, which are all essential to enact sustainable fisheries management, are still lacking and/or inadequate. As a result, it is difficult at this stage to be too prescriptive given the lack of real depth of knowledge on what the fisheries, and the fishers, need. Other fisheries issues of concern include: shell collection, Sea cucumber harvesting, over fishing, destructive fishing practices, coral mining, hunting for Sea turtles and other endangered species.

3.1.2. Shell and sea cucumber collection

Gleaned on foot in the intertidal areas during the low tide, mostly on spring tide days. Bivalve molluscs (and a few gastropods) are collected in large numbers, mainly for food at household level. Some larger bivalves locally known as tondo are collected for lime production. The collection of holothurians or 'majongoo bahari' for export takes place at intensity greater than in most other parts of Tanzania and in the recent past many of the large specimen of sea cucumbers are notably becoming scarce. Concern exists that the collection of all these animals is being done at levels beyond the natural production rate.

3.1.3. Over fishing

The fish surveys show that many species of commercial importance (e.g. groupers, snappers and emperor fish) were found only in small sizes, indicating that these species are very heavily fished. In addition, the herbivores (parrot fish, surgeon fish and rabbit fish) occur in very low densities indicating "fishing down the food chain" has occurred, a strong indication of over fishing. The danger exists that with few individuals reaching reproductive age, population growth cannot keep up with the removal by fishing. Consequently, overall catches of these fish species within the Park will decrease. In the Park, numerous fishing gear types are used, including destructive gears, from tiny mesh sizes of a few millimetres (such as mosquito nets) to monofilament nylon gill nets and massive fish fence traps. Restriction of fishing in certain areas and regulation of fishing gears can alleviate these problems.



Dynamite blast damage

3.1.4. Destructive fishing

Dynamite fishing in the Park has probably been the most destructive fishing technique in the past. The blast can cause immediate destruction of the coral on which the fish communities rely for shelter, reproduction and sources of food. The practice was phased out in 1998, but some isolated incidents are still reported. The national legislation banning dynamite fishing needs to be implemented very strictly.

Dragging nets across the seabed in a manner known as beach seining can be very damaging to sedentary marine life. Nets called variously 'kavogo', 'juya' and the like are used in this way. When used in coral areas dragnets can quickly destroy large areas of coral that will take decades to recover. In areas where fragile corals grow, this form of fishing can have similar impact as those of dynamite blasting. Beach seining is also illegal in Tanzania.



Beach seine (Juya) fishing

3.1.5. Endangered species

The extensive sea grass beds and coral reefs of Mnazi Bay provide suitable habitat for sea turtles and marine mammals. However information on the current status, distribution and abundance of turtles and cetaceans (dolphins and whales) is limited, while the presence of dugongs is unconfirmed.

An assessment of the status of turtles, dugongs and cetaceans was carried out in MBREMP (Muir 2003). The results of the survey confirm the importance of MBREMP as a feeding, breeding and nesting area for endangered green and critically endangered hawksbill turtles. The other three Western Indian Ocean species do frequent MBREMP waters but do not nest and are much less common. Although turtle sightings were still said to be relatively frequent, populations were reported to have declined over the past 10-20 years due to accidental capture in gillnets, poaching of nesting females and eggs, trade in tortoiseshell and habitat disturbance such as from fisher camps (Muir 2003, Frazier, 1980).

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Turtles are hunted for meat, the trade which is an important and lucrative local business. Dedicated turtle hunters operate on all the nesting beaches and pose a major threat. Foraging turtles are also hunted deliberately at Matanango and Nanano reefs off Msimbati. Turtle eggs are harvested, mostly for domestic consumption, shells are occasionally sold and oil is sometimes used to cure ailments such as burns and rashes.

The regular capture and slaughter of turtles in gillnets was confirmed in most of the villages visited during turtle survey and subsequent coral reef surveys.



Green turtle captured in a gillnet in Msimbati Channel

This threat, together with poaching of nesting females and their eggs, suggests that turtle populations in MBREMP are highly threatened, although baseline population data is lacking. However at current rates of exploitation, it is possible that in another decade they will be locally extinct.

Marine turtles are officially protected under the Fisheries Act 2003, and also the Marine Parks and Reserves Act No. 29 of 1994. Despite these legislations, few, if any, perpetrators are arrested and held accountable. Future concerns include by-catch from commercial prawn trawlers, and disturbance of nesting beaches from tourism development. Clearly, awareness of national legislation needs to extend to all levels of government so that existing penalties are exacted. Further, national and regional turtle conservation strategies need to be integrated into the Marine Park. Turtle nests protection programmes in the Park have proven successful and must be maintained and enhanced.

3.1.6. Coral mining

Inside the buffer zone of the Park, especially around Ras-Msangamkuu, live coral has been broken off the seabed and transported to the shore where it is used to make lime. The main type of coral used is a slow growing massive (boulder) form species (*Porites* spp.) that is important in reducing wave action and provides the main framework of the reef. Continued extraction of these corals can destroy coral reefs and lead to increased erosion of the adjacent coastlines, as found in Sri Lanka and the Maldives, and this in turn reduces fish catches. The uncontrolled harvest of timber for kilns to burn the coral also leads to deforestation that can increase soil erosion further adding pressure to the marine environment within the Park from increased sediment levels.

3.1.7. Mangrove harvesting

For centuries, people inhabiting the area have used mangroves for firewood and building materials. Since human populations were low in the past and migration was limited, it is likely that most human uses of these mangrove resources were sustainable.

However, in recent decades, some types of resource use have been a threat to the health of the mangrove forest. Moreover, human populations in the MBREMP area have increased over the past decade and there is greater influence of human populations from other areas; thus, the pressure on mangrove resources has been increasing. There is now heavier harvesting of mangroves for firewood, charcoal, building materials and boat making.

Besides mangrove harvesting, there are several other issues or problems which threaten the biodiversity in the MBREMP mangroves (Wagner *et al* 2004). These include clear-cutting, unsustainable fishing methods, harvesting of macro fauna, particularly edible shellfish and erosion.

While there is evidence of mangrove harvesting in many sites, so far, it still appears to be more or less sustainable in most areas. 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 areas open to the extent that the conditions of the forest environment and soil properties could have changed significantly. However, there are some areas of Ruvuma Estuary where harvesting seems to have exceeded the natural regeneration rate.

Erosion is an issue in the Ruvuma Estuary. Erosion, which is brought about by four types of water movement (i.e., wave action, tidal movement, ocean currents and river flow, particularly during flooding), is largely a natural process that is often dynamically balanced with accumulation of sediments in other places or at different times. However, when erosion exceeds accretion, it becomes an issue to be concerned about, particularly when it is exacerbated by human activities.

Erosion particularly affects the seaward half of Ruvuma Estuary and the Ruvuma River bank itself. This is due to the huge volume of water that must move from the upper reaches of the Estuary to the ocean within six hours, especially during spring tides. The situation is exacerbated during the rainy season due to flooding and rapid river flow. In several channels (Nganje River, Lague River, Kingumi River) as well as along the Ruvuma River itself, several meters of riverbank have been swept away in recent years.

It is likely that various human activities have caused an intensification of the problem of erosion. In particular, deforestation, construction and poor agricultural practices upcountry within the Ruvuma watershed area have undoubtedly altered rainfall patterns, severity of flooding and sediment loads.

In spite of integrating the National Mangrove Management Plan and the Forest Act No. 14 of 2002, which

regulates the harvesting of mangroves into this GMP, erosion and mangrove harvesting, are still potentially significant threats, so steps should be taken to deal with these issues in a holistic manner.

3.2. Socio-economic issues

The Park is home to some 30,000 inhabitants, which is almost twice that of Mafia Island Marine Park. Since many depend to some degree on the exploitation of marine living resources, a great deal of attention must be paid to some of the constraints that may guide their activities. Dependence on marine resources (proportion of households involved in marine resources related livelihood activity, importance of marine related activities in the household's livelihood system) is an indicator of potential threats to marine resources. The more households are dependent on marine resources for their livelihoods, the more they are likely to be defensive about their activity, and reducing pressure on marine resources by zoning activities or banning certain gears without acceptable alternatives proposed may be difficult.



Coastal erosion can be a serious problem in some areas of the Park

Occupational structure and household surveys showed that there is a wide array of activities carried out in the Marine Park (Malleret and Simbua 2004, Malleret 2004). These include marine related activities such as fishing, seaweed farming, shell collecting, and trading fish, prawns, sea cucumbers and octopus. Other activities include river based fishing and river fish trading, other natural resource exploitation such as woodcutting and trading (including mangrove wood), charcoal production, palm weaving, sea salt production, and farming for income or subsistence.

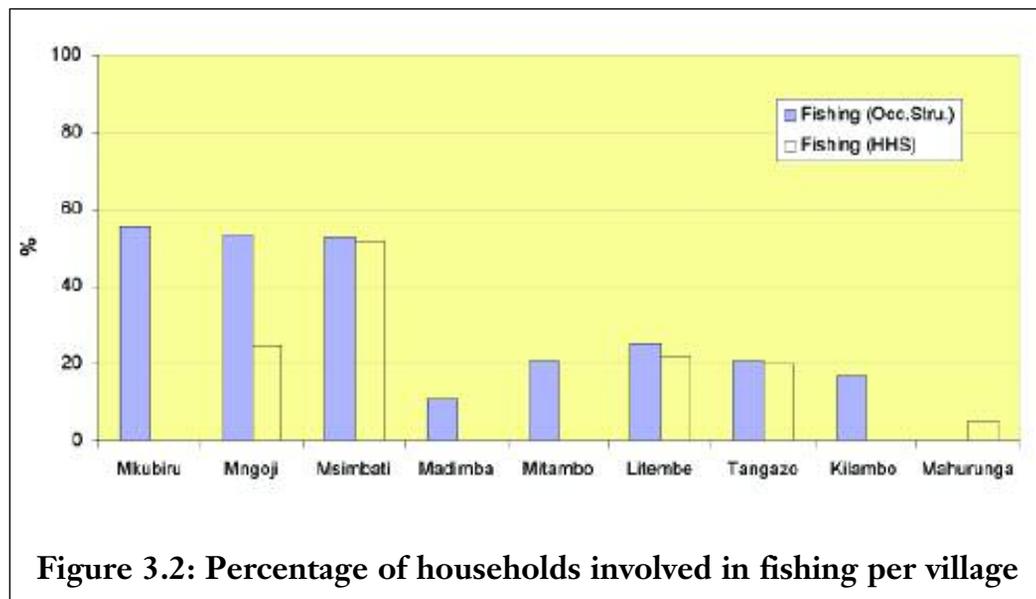
The results show that 35% of the Marine Park households are involved in marine resources associated activities (depend on marine resources at least for part of their livelihood), which is the second most important activity after farming. Fishing came out as one of the most important activities for the sea front villages and a number of mangrove villages. It was found that a total of 25.6 % of Marine Park households depend or is involved in fishing (54% for the sea bordering villages households and 19% of mangrove bordering village households). However, this structure is not homogeneous across the Marine Park but varies according to villages. The villages could be grouped according to their geographic location, on the basis of their proximity to the sea, to the river, the mangrove area. This illustrates the relationship between the physical environments and livelihood activities. However, other aspects such as access to markets and infrastructure may also have an impact.

Villages can be grouped as follows:

- Sea bordering villages (Mkubiru, Nalingu, Mngoji and Msimbati). These villages represent 31% of the listed households, excluding Nalingu (see table 1)
- Mangrove villages (Madimba, Mitambo, Litembe, Tangazo and Kilambo). These villages represent more than half the households listed (52.6%, table 1).
- River villages (Kitunguli and Mahurunga), which represent 10.8% of the listed households.
- Other: Kihimika, which is, located the furthest from the sea, river or mangrove (5.5% of the listed households).

The proportion of households involved in marine resources associated activities (dependent on) are highest

in sea bordering villages. More than 60% of their households are involved in marine associated activities (74% in Msimbati). However, in these villages farming is still one of the most important activities with 80% households farming in Mngoji. Msimbati and Mkubiru are the villages with the least farming households (60% and 61% respectively) within the Marine Park.



Occupational Structure: findings from the occupational structure survey, HHS: Findings from the household survey.

In addition, the household survey showed that, at the household level, time commitment to fishing is high. Fishers fish on average 5 to 6 days a week and their days off are generally devoted to religious practices or gear repair and maintenance. Most fishers in seafront villages and Tangazo fish all year round. Most fishers in Litembe fish at least three quarters of the year. The household survey also showed that fishing is considered as the main source of income by the majority of fishing households surveyed except in Mahurunga despite the fact that a high percentage of these households do not consider fishing as a sufficient source of income to sustain the households.

Furthermore, many activities, which are directly related to fishing, would be impacted by any changes in fishing practices.

All the above suggests that the number of people resident in the Park is high, and their level of dependence on marine resources at the household and Marine Park levels is high, especially in seafront villages and Tangazo. Consequently, any recommendations pertaining to the level or type of fishing must take into consideration the economic impact such displacement of activity would have, on the fishers and on all the associated stakeholders.

3.3. Opportunities

3.3.1. Tourism

The MBREMP is an exceptionally beautiful and potential destination for special interest tourist groups. The resources available in the area present itself as an attractive destination of its own kind. The Park is endowed with wildlife, marine and cultural resources; low tourist density, unspoiled environment and beautiful scenery, safe destination, authenticity and the unique African experience and friendly people.

Despite of such potentiality the MBREMP still experienced a small number of tourists compared to other areas like MIMP. At present the only few people visiting the Park include resident expatriates, missionaries, local people and limited number of tourists.

Tourism development in MBREMP is focusing upon balancing sustainable development whilst reaping economic benefits. This can be achieved through Tourism Investment Framework (TIF) guidance. The TIF assist the MBREMP management to develop and implement strategies of linking Tourism to biodiversity conservation and effective community participation in managing Park.

3.3.2. Mtwara Development Corridor (MtDC)

The Mtwara Development Corridor Spatial Development Initiative (SDI) is among the on going development initiatives aimed at promoting trade and investments in the Region. The initiatives will potentially transform southern Tanzania and Northern Mozambique . The SDI is being promoted by the governments of Tanzania, Mozambique, Malawi, Zambia and South Africa and hinge on the development of the deep-water port of Mtwara and the road to Mbamba Bay on Lake Nyassa/Malawi. Mnazi Bay – Ruvuma Estuary Marine Park is adjacent to the port of Mtwara and any activities relating to the development of the port will probably have potential impact on the marine park integrity.

The MBREMP is therefore required to work very closely with the Mtwara Development Corridor (MtDC) project and identify a number of overlapping areas of interest that are likely to lead to a working partnership and complimentarity of the MBREMP activities.

CHAPTER 4:

GOAL, PURPOSE AND OBJECTIVES OF THE MNAZI BAY RUVUMA ESTUARY MARINE PARK

The goal of the Mnazi Bay Ruvuma Estuary Marine Park is to:

Conserve national and internationally significant and threatened marine biodiversity of the MBREMP and to enable local community and other key stakeholders participation in the protection, enjoyment and utilise sustainably marine and coastal resources for prosperity of present and future generations.

The MBREMP adopts the purposes of a marine park clearly stated in the Marine Parks and Reserves Act of 1994, under Section 10, as the objectives of the GMP:

1. To protect, conserve and restore the species and genetic diversity of living and non living marine resources and the ecosystem processes of the marine and coastal areas;
2. To manage the marine and coastal area so as to promote sustainability of existing resource use; the recovery of areas and resources that have been over-exploited or otherwise damaged and to rehabilitate damaged ecosystems;
3. To ensure that villages and other local resident users in the vicinity of, or dependants on, a marine park or marine reserve are involved in all phases of the planning, development and management of that marine park or marine reserve, share in the benefits of the operation of the protected area and have priority in the resource use and economic opportunity afforded by the establishment of the marine park;
4. To stimulate the rational development of under utilised natural resources;
5. To promote community oriented education and dissemination of information concerning conservation and sustainable use of aquatic resources in the marine park; and
6. To facilitate research and to monitor resource conditions and uses within the marine park.

In addition, as an outcome of the three-stakeholder consultation workshops participants added three more objectives for the Park:

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

The identification of these objectives, and the management issues and opportunities discussed previously, form the basis for the GMP management strategies including the zoning, and the monitoring and evaluation of the Park. The success of the management of the Park, and of the implementation of this GMP, 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. The GMP management strategies are guided by a number of principles.

5.1. Guiding Principles

The following are a set of principles that guided the development of the GMP and will guide the management of the Park.

5.1.1. *Ecological principles*

The ecosystem approach and the precautionary approach are two of the tenets of the sustainable management of marine resources and both have become an integral part of international law. For instance, the Convention on Biological Diversity (CBD), to which Tanzania is a party, recognises these two elements are key to the conservation of marine biodiversity. Further, adaptive management is now widely recognised as an essential element of natural resource management.

5.1.1.1. *Adoption of an ecosystem approach*

An ecosystem-based approach to management requires that the integrity of the natural ecosystem and its key components, structure and functions be up held. This means maintaining natural species diversity and protecting critical habitat for stages in species life cycles.

5.1.1.2. *Incorporation of the precautionary principle*

Taking a precaution principle approach means, when in doubt, is cautious. This principle puts a burden of proof on any individual, organisation or Government agency conducting activities that may cause damage to the marine ecosystem.

5.1.1.3. *Adoption of an adaptive management approach*

In as much as the local communities were consulted in the development of the GMP, their participation will be required further when the Plan is implemented. The GMP will need to be fine-tuned and adapted to changing circumstances. As well, some of the strategies that are suggested below may need to be adapted to different villages, with different conditions, different sources of pressure and different levels of pressure on the marine resources. As a result, the GMP must be considered a work in progress, where the authorities, the local communities and studies can add to it, modify it and improve it in the next two years. The Plan is not a static document but it will evolve over the next two years, before it can be finalised after more input from all those affected.

5.1.2. Socio-economic principles

5.1.2.1. *Adoption of an integrated management approach for multiple uses*

It is very clear from all the studies that have been carried out that a variety of uses sustain the inhabitants of the Park, all of which are important for sustainable livelihoods. It is also clear that different activities are more prevalent in some areas and that a single approach will not be appropriate for all the villages. In some

cases, the villagers are heavily reliant on fishing, whereas in others, farming dominates. 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. As well, in areas where sustainable tourism appears to be promising, no-take areas, or areas where the most destructive fishing methods are prohibited might make sense. Finally, areas where endangered species, such as marine turtles, are known to forage or nest might be off limits to other deleterious activities or to fishing activities where by catch might be high. These zones will at first be designated on an experimental basis, incorporating the suggested zones included in the vemps and with thorough input from the local communities.

5.1.2.2. Collaborative management through community participation

It is now widely accepted that a Marine Park, particularly one that is home to almost 30,000 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-enforced, where the stakeholders see to it that the management measures are respected because they know that they will benefit in the long-term by ensuring the sustainability of the marine living resources.

All but one of the 11 villages have participated in the development of Village Environment Management Plans (VEMPs). These constitute a good base to build on, and embody the villagers' understanding of their marine and coastal resource situation, where the resources are located, and what needs to happen for those resources to be managed sustainably. They also include a first shot at a zoning scheme and, to the extent possible, the zones suggested are incorporated in the final zoning scheme, to the extent that they are compatible with the scientific data available and do not conflict with the zones suggested by other villages.

5.1.2.3. Equitable sharing of the benefits and costs of the Marine Park

Marine parks are, in essence, a balance between the level of protection afforded natural resources and the restriction of activities that may have occurred in the past or that were planned. The benefits of the park are an 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 not exploited. 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 standpoint, however, it is of the 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 restricting fishing over time to the local stakeholders only, for instance by 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 revenue from the cash economy amounts to less than US D 100 per person per year. 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 gear

exchange programmes, funded with the revenue generated by outsiders who exploit other resources in the Park (e.g. the ecotourism developers or the developers of the natural gas reserves).

5.1.2.4. Incorporation of gender balance considerations in decision-making

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 the 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 this participation is better achieved from the outset of the management plan.

- a) Ensure the integration of local residents' indigenous knowledge with scientific data in the planning of sustainable resource use strategies

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 the marine park (see Chapter 4). The strategies consist of concrete actions and approaches to ensure the successful implementation of the GMP.

5.2.1 Strategy to conserve biodiversity and ecosystem processes

- a) Build on and complement existing knowledge and understanding of the following critical aspects of biodiversity and ecosystems:
 - The distribution of marine and terrestrial biodiversity within the Park
 - The status and distribution of species and habitats considered to be endangered, threatened and/or critical, including turtles, dugongs, marine mammals, wrasses (including Maori hump head wrasse) and groupers
 - The status in the buffer zone of the same species and habitats
 - Ecological processes responsible for maintaining the productivity and diversity of marine and terrestrial resources, including, but not limited to, spawning areas, other aggregation areas, current patterns, seed and larvae dispersal and recruitment, and reproductive cycles
- b) Collate all information on the species, habitats and ecosystem processes in GIS format, building on the database established by MBREMP
- c) Identify threats to critical and threatened habitats, species and ecosystems, as they evolve
- d) Phase out all resource-use practices damaging to threatened habitats and/or species
- e) Isolate all threatened and critical habitats from destructive activities through the designation of no-take core zones
- f) Focus compliance efforts in critical and threatened areas, through patrolling and self-enforcement
- g) Subsume all other development plans to the designation of core zones in the GMP
- h) Maintain a turtle conservation plan, including protection of nesting sites (with financial incentives if necessary), a ban on the slaughter of nesting turtles, and reduction of accidental catches through gear replacement, where necessary and appropriate
- 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 hump head wrasse (*Cheilinus undulatus*)

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

- a) Implement national legislation on banned gear (including but not limited to, dynamite fishing). Wherever possible destructive but not prohibited gear will be exchanged.
- 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 limit fishing activities to local Park stakeholders only
- d) Establish a register of fishers in the Park, including type of vessel/gear(s) used
- e) Establish a comprehensive and community-based fisheries catch and effort data collection scheme
- f) Encourage sustainable harvesting of mangrove resources, including temporary closing of the most affected areas and a temporary ban on the harvesting of the most threatened
- 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 Community Participation in Management and Access to Resources

- a) Facilitate mechanisms that assure a significant benefits from gas exploitation and ecotourism development is 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 attribution of radios, boats and petrol for community patrols in the most remote areas (including remote turtle nesting sites)
- c) Strengthen the capacity of Village Liaison Committee (VLC) to participate in management of the Park
- 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 over – exploited stocks.

5.2.4 Environmental Education and Information Sharing

- 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) Ensure that each village has a designated Marine Park staff to which its residents can go with questions, suggestions and complaints about implementation of the Plan
- d) Develop outreach material targeting key stakeholders including decision makers
- e) Promote a culture of information-sharing and transparency in decision-making through regular dialogue with all stakeholders, including residents of the buffer zone
- f) Design a turtle education programme, including regular workshops on the ecology and critical importance of marine turtles for marine biodiversity
- g) Develop incentives or small-scale award schemes for best environmental practice
- h) Develop a MBREMP information centre

5.2.5 Research and Monitoring of Resource Condition and Use

- 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 alternative 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 database and GIS 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 it to focus on the Marine Park's research priorities.

5.2.6 Sustainable Use of Under-Utilised Resources

- a) Ensure 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 ecotourism 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 under the precautionary principle
- e) Support the development of any new fisheries and other fisheries related activities that entails partnership 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 well
- 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 Protection of Aesthetic and Natural Values of the Park

- a) Ensure 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 Report prepared for MBREMP

5.2.8 Protection of Cultural Heritage of Park Residents

- 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 communities and mandated institutions to formulate appropriate management measures to preserve and restore historical and sacred sites
- d) Facilitate implementation of appropriate management measures in collaboration with communities, tourism operators and, where appropriate, institutions and partners to preserve and restore historical and sacred sites
- e) Encourage new investigations on historical and cultural resources

- f) Train staff and key stakeholders on the importance and management requirements of cultural sites and relics

5.2.9 Sustainable Ecotourism

- a) Ensure that any proposed ecotourism 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 but high value, low-impact ecotourism developments, while encouraging the development of higher volume tourism in the buffer zone, including Mikindani
- c) Provide incentives to developments that use low impact construction material
- d) Provide incentives to developments that provide partial ownership to local communities
- e) Support tourism operators in the promotion and marketing of a diversity of tourism attractions, including recreational fishing, diving, wildlife observation and local culture
- f) Collaborate with tourism operators, where appropriate, to develop public tourism facilities, such as nature trails and mooring sites
- g) Train Park staff and selected individual from local communities to interact with visitors in a professional, courteous and constructive manner
- h) Assist investors to ensure that they are fully aware of all restrictions on ecotourism developments
- i) Facilitate dialogue between ecotourism operators and communities to ensure that resident communities share in the economic benefits of the Park
- j) Develop a system to record and monitor visit use of the Park
- k) Develop visitors' management plan that captures safety regulations for water sports and procedures in the events of an emergency.

CHAPTER 6: ZONING SCHEME

6.1. Rationale

The zoning of a marine park is an integral part of any management plan. As described in chapter two and three, there are a number of activities and because of their nature some of which are incompatible. In similar cases in order to avert conflicts in resource use as well as accommodate multiple uses, zoning schemes have been used. Zoning schemes divide the multiple-use areas into use-zones that have 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 primarily 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. Beyond this, the regulations in zones permitting resources-use ensure that resources-use activities are productive and sustainable.

6.2. Purpose of MBREMP Zoning Scheme

The aim of this zoning scheme

- To protect critical and species-rich habitats including sub-tidal areas, mangroves, forest, bird nesting, fish spawning, turtle-breeding grounds.
- To safeguard beliefs and customs of local residents by protecting the sacred sites
- To protect the biodiversity and ensure aesthetical values of MBREMP are maintained
- To safeguard traditional/local community fishing grounds and provides a means for continued but controlled use;
- To provides a geographic basis against which to evaluate resource use and to monitor and review the effectiveness of the management plan;
- To provides a framework for surveillance and patrolling activities by focusing enforcement in zones with higher levels of protection

6.3. Designation of Zones

- Zones types were designated and mapped through a participatory zoning workshop and recommendations contained in the VEMPs as well as inputs from scientific assessments carried out in MBREMP.
- The zones have been designated on an experimental basis and will be adjusted in the course of the two-year implementation phase, with participation from the local communities
- Some core zones are designated, where the impact on the local communities is limited but where the most critical habitats exist. 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 will be modified, as appropriate.
- Core zones have been designated to cover significant areas of coral reefs, sea grass beds and mangroves
- Two proposed core zones require further study before they can be designated

6.4. Definition of Zone Types for MBREMP

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. It is intended to include all areas of the marine park that both warrant primary conservation status and that local resources-user can afford wholly to relinquish.

Criteria for selection:

- Areas are selected for designation as core zones if they qualify for one or more of the following criteria
- All areas that in relatively pristine or intact condition, that are also respective of the main types of natural habitat found within the marine park
- All areas containing relatively high levels of locally representative biodiversity
- All areas considered to be important breeding or spawning grounds, or otherwise important to productivity and generation of the park's natural resources base
- All areas whose protection is considered important for the survival of locally rare or threatened species
- All areas of special cultural significance

Within MBREMP, both marine and coastal forest habitats are represented within Core Zones.

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

Specified-use zones

Specific-use zones provide intermediate level protection within the park. It is intended to include areas of the marine park that warrant primary conservation status but which are also important to local resource-users. In this zone some activities are specifically permitted and only for the designated beneficiaries including area set aside for gas extraction.

Criteria for selection:

An area is designated as a *Specified-use Zone* where it qualifies broadly to the same criteria as those given in 6.4.1 for *Core Zone* status, but either

Its greater importance in sustaining the livelihoods of local human communities makes it impractical to prohibit extractive resource-use entirely,

Its greater importance by providing essential service in sustaining the livelihood of local populace and national economy makes it impractical to prohibit extractive resource-use entirely.

or it qualifies to one or more of the criteria for *Core Zone* status, but to a lesser degree of importance than other *Core Zone* status.

Resource-use strategy:

The strategy in *Specified-use Zones* is to prohibit activities likely to cause significant alterations to the park

environment. This is defined as:

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;

Significant depletion over time of species that are considered locally rare or threatened.

6.4.3. General-use zones

General use zone is intended to provide for sustainable resource-use for MBREMP residents, thereby relieving resource-use pressure from zones with higher-level 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 marine park area through connectivity with other zones. In a *General-use Zone* only activities that are legal are allowed, in addition outsiders are allowed but require a permit issued at village level

Criteria for selection:

General-use Zone status is accorded to 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 exploitation is sustainable from year to year, notwithstanding natural variations in breeding and recruitment. A certain level of permanent habitat alteration is acceptable only provided that the overall productivity of the environment is not significantly undermined and that adjacent areas with a higher protection status do not deteriorate in ways defined (in 6.4.3.) above. This entails excluding from *General-Use Zones* 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. It also entails restricting the number of resource-users of each type to a sustainable level.

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

6.4.4. Buffer Zone

The buffer zone is an area outside and adjacent to the marine park boundary that serves as a cushion against from activities outside the Park. All new developments and land allocations within the buffer zone are obliged to undergo the same EIA scrutiny as developments within the marine 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 preparation of an EIA.

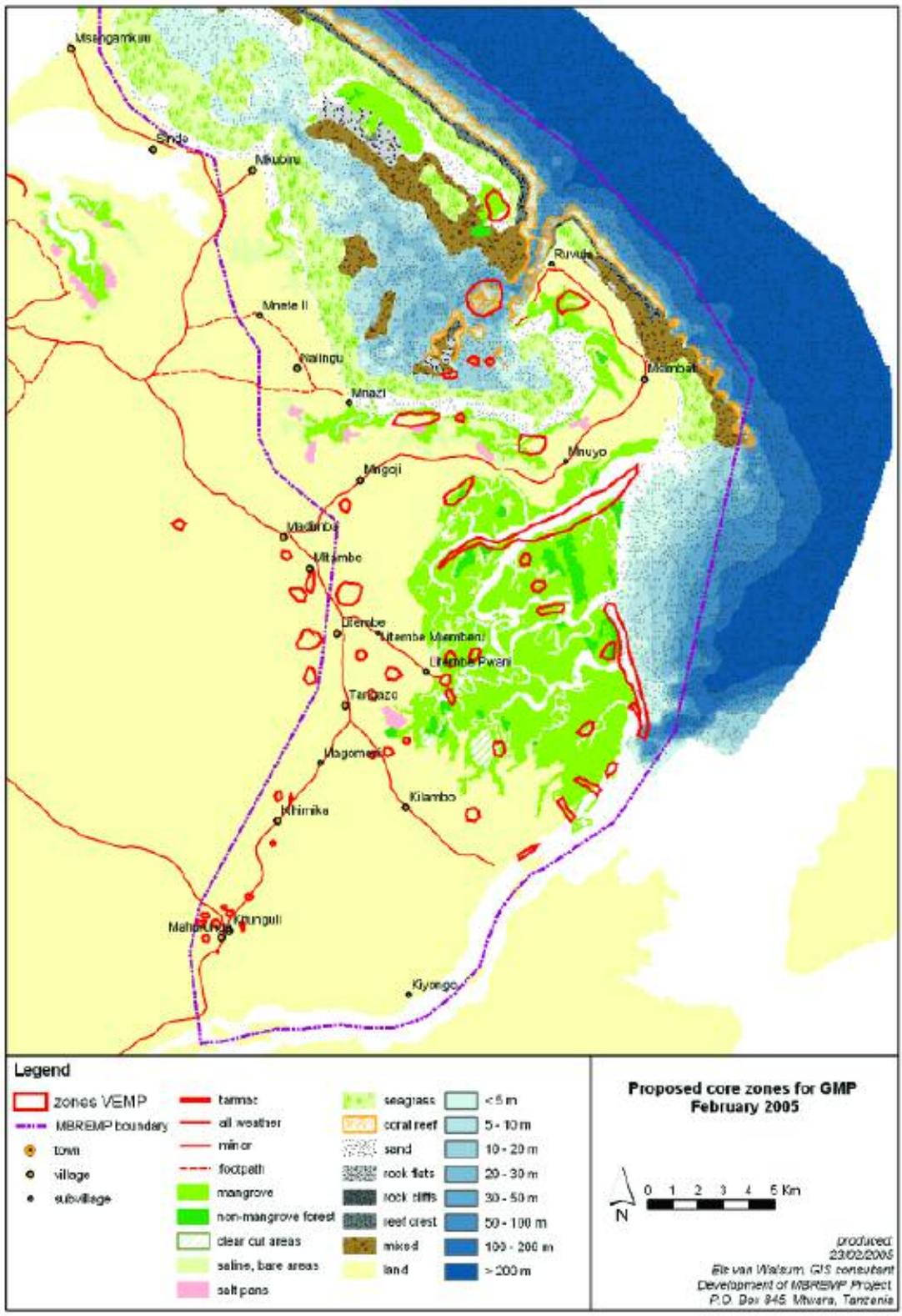
The marine park has no jurisdiction over activities in the buffer zone.

It is emphasized that 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.

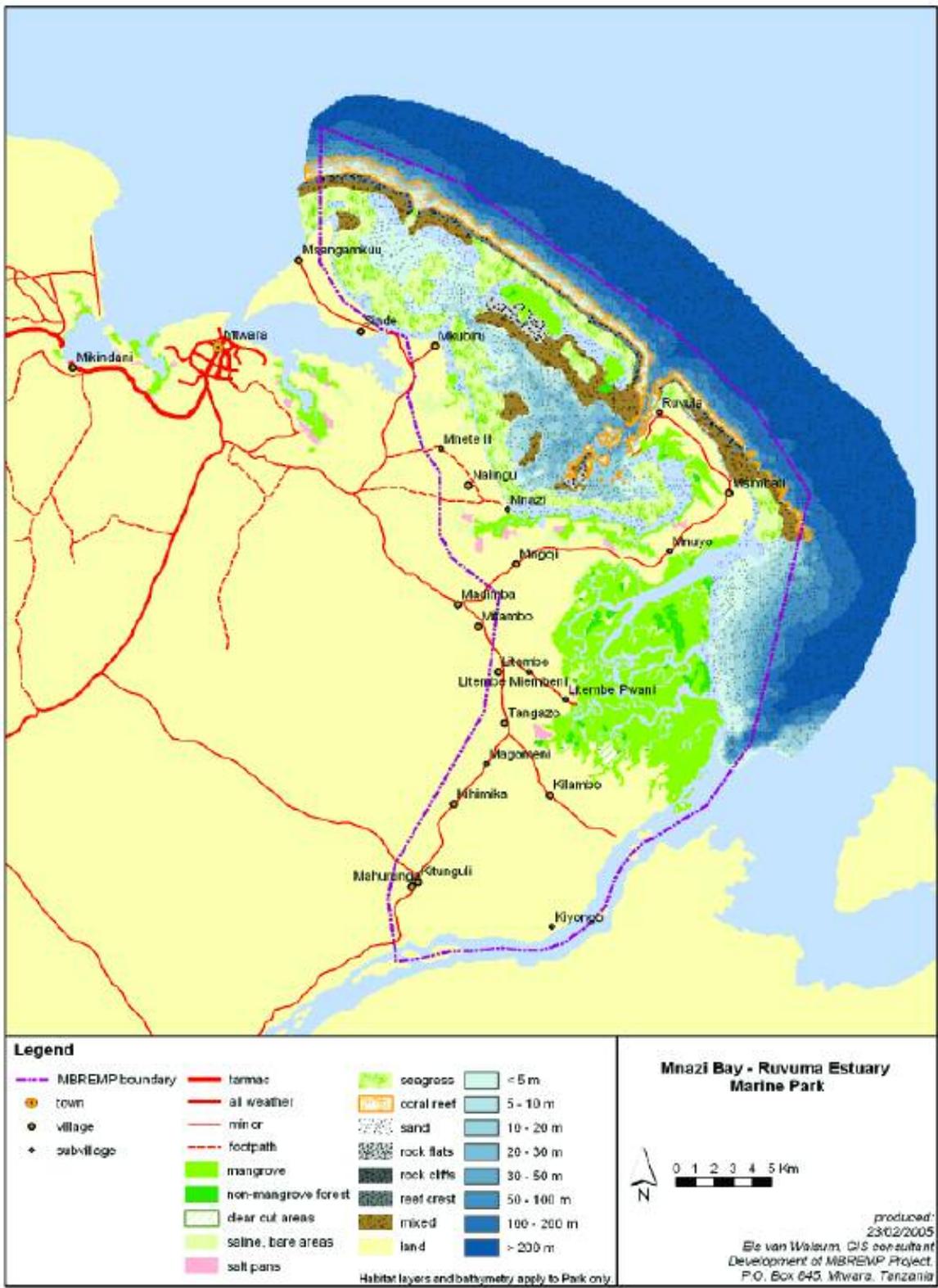
The buffer zone is tentatively 1000m from the boundary on the aquatic side, excluding the area along Ruvuma River at the boundary between Tanzania and Mozambique and on the terrestrial side, where the Park management and Mtwara District Council will negotiate the agreement.

It is intended therefore that following implementation of this plan, negotiations will be held with the Mtwara District Authorities to extend the requirement for EIA scrutiny to a considerably wider area within the District, probably one of the following means;

- Extending the MBREMP buffer zone
- Instituting appropriate District bye-law relating to EIA requirements: or
- The institution of National legislation on EIA requirement



Map 3. Core zones proposed in the Village Environmental Management Plans



Map 4. Core and Specified Use Zones for Mnazi Bay Ruvuma Estuary Marine Park

6.5. Modification of the zoning scheme

The first attempt to delineate the various zones is based on the biological and socio-economic information available. This information, however, is incomplete and the situation may evolve over time. As a result, the zones may need to be evaluated and adjusted. This is particularly true for the designation of the core zones, which represent a compromise between the value of the habitats being protected and the opportunity costs of the stakeholders who will not be able to carry out their activities. In that case, the boundaries of the core zones may be fine-tuned to limit the displacement of traditional users. In addition, the designation of some core zones may not be permanent and the restrictions in these areas may be reduced or removed once the objectives of the core zone have been achieved (e.g. after the recovery of a damaged habitat).

CHAPTER 7:

PROHIBITED AND REGULATED ACTIVITIES

This chapter outlines activities that are prohibited within the marine park as a whole or that are restricted within particular zone types. It follows the resource-use strategies for zone types outlined in section 6.4 of the previous chapter. Following implementation of this management plan, regulations will be drawn up in line with this plan and notified under the Marine Parks & Reserves Act, 1994.

7.1. Prohibited activities

All activities prohibited under the existing national legislation shall be prohibited in all zones 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 or organisms, whether by hand or by use of poles or other implements
- Killing of turtles, whether accidental or deliberate, including removal of turtle eggs
- Killing of dugongs, whether 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 sale
- Mining of live coral from inter-tidal and sub-tidal areas
- Using of monofilament or likembe
- In addition, the use of pull nets with stretched-mesh size of less than 2.5 inches – including tandilo – will be phased out within the boundaries of the Park

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 (other than the existing gas well, where exploitation will be subject to review by the Warden and other relevant authorities)
- Production of salt by heating sea water using fuel wood or other hydrocarbons

7.1.3. *Prohibited construction and development*

- Port development and/or dredging (marina development and permanent docking facilities – including wood jetties - will require submission of an EIA and prior approval of the Warden)
- Industrial development
- Use of explosives for any purpose
- Dumping into marine waters of solid waste, untreated waste water and sewage or chemically polluted

water or liquid

- Any cultivation or farming within the Islands of Namponda, Mmembelwa/Mmongo and Bahasha

7.1.4. Regulated tourism activities

Sea-planes

7.1.5. Prohibited tourism activities

Jet skis

7.2. Regulated activities

7.2.1. Fishing activities

- All fishing will be prohibited in the core zones
- All fishing in the Specified Use zones will be restricted to artisanal fishers who are resident in the Park
- All artisanal fishers in the Park will be issued a fishing license and will provide all 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 with due compensation
- Sport fishing will be restricted to designated areas within the Marine Park
- Sport fishing will be subject to prior issuance of a sports fishing license and payment of the appropriate fees
- Sport fishers may be bound by minimum and maximum size restrictions. Furthermore, the fishing of some species, to be determined by the Warden, may be restricted to catch and release only
- Sport fishers will show permits and provide catch information to any duly authorised Marine Park staff.
- Furthermore, and, as deemed necessary by the Warden and subject to scientific justification, a Marine 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 strictly regulated under a permit system. In addition, the following will apply:

- Mangrove harvesting will be strictly prohibited in all core zones
- Mangrove harvesting for charcoal and firewood for kilns will be forbidden
- Mangrove harvesting will be restricted to Park residents who have obtained a permit to do so.
- Harvesting mangroves for commercial purposes within the Park boundaries is prohibited.
- Non-residents caught harvesting mangroves within Park boundaries will be prosecuted to the full extent of the law.
- Even when a permit has been granted, clear felling of mangroves should be limited.
- Further regulation may establish limits on the species of mangroves that may be harvested.
- Permit issuance may be subject to a limited number of mangroves to be cut and may require the applicant to plant seedlings.
- Prior to harvesting, a cutting site may be specifically approved 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 will be subject to a permit system.

- Pole cutting will be strictly prohibited in all core zones
- Pole cutting will be restricted to Park residents who have obtained a permit to do so. The number of

permits issued will be limited.

- Even where a permit has been issued, the cutting of poles may be subject to replanting alternatives as a condition of cutting natural trees
- Burning of any forest products is illegal in the Park area

7.2.4. Scientific Research

- All scientific research within the Park boundaries will be 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 bio-prospecting purposes
- A differential fees system will be applied to Tanzanians and non-nationals, though the fees may be waived if the Warden-in-Charge deems the planned research to be in the interest of the Marine Park
- All the results from scientific research carried out in the Park will be forwarded to MBREMP in the most useful format (and in GIS format wherever possible)
- Any publications based on scientific research carried out in the Park should be forwarded to MBREMP 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

SUMMARY OF PERMITTED FISHERIES ACTIVITIES BY ZONE

Activity	Core Zone	Specified-use zone		General-use zone	
	All users	Residents	Others	Residents	Others
Hand-lines, box-traps, fence-traps	X	LRUC	X	LRUC	P
Long-lines	X	LRUC	X	LRUC	P
² Pull nets (2.5" or more mesh-size)	X	X	X	LRUC	X
³ Set-nets / shark nets between 2.5 – 7" mesh	X	LRUC	X	LRUC	P
Shark nets > 7" mesh	X	X	X	LRUC	P
Sport-fishing	X	X	X	LRUC	P
Octopus collection	X	LRUC	X	LRUC	P
Sea cucumber, lobster, crab, shells (food)	X	LRUC	X	LRUC	P
Collection of shells for the curio trade	X	X	X	X	X
Aquarium collection (all organisms inc. corals)	X	X	X	X	X

KEY:

- **X** = Not permitted
- **LRUC** = Local Resident User Certificate required
- **P** = MBREMP Permit required

²Includes nets known locally as 'Mtando', 'Nyavu kuzungusha', 'Nyavu kuvuta' and 'Tambo'

³Set nets > 2.5" < 7" include nets known locally as 'Jarife' and 'Nyavu kupweleza'

SUMMARY OF PERMITTED MARINE RESOURCE-USE (NON-FISHING) BY ZONE

Activity	Core Zone	Specified-use zone		General-use zone	
	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/ sea grass collection (wild)	X	X	X	LRUC	P
⁴ Mariculture	X	P	X	LRUC	P
⁵ Other marine bio-prospecting	X	X	X	P	P

KEY:

- **X** = Not permitted
- **LRUC** = Local resident user certificate required
- **P** = MBREMP Permit required

⁴Includes seaweed farming, oyster farming, crab farming, fish cage-culture, lobster ranching, sea-cucumber ranching etc

⁵Includes collection of limited samples of biological or inorganic material for development of medicinal, pharmaceutical or other commercial product

SUMMARY OF PERMITTED FOREST AND TERRESTRIAL RESOURCE-USE BY ZONE

Activity	Core Zone	Specified-use zone		General-use zone ⁶	
	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 & raffia fibre collection	X	P	X	LRUC	X
Agriculture & 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
⁷ Construction (non-tourism)	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

⁶Includes all land areas of the Marine park including all of the islands of Namponda, Mmembelwa, and Kisiwa kidogo.

⁷Includes 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 Zone	Specified-use zone	General-use zone
SCUBA diving	P	P	P
Snorkeling, swimming	Freely allowed	Freely allowed	Freely allowed
Windsurfing, sailing	Freely allowed	Freely allowed	Freely allowed
⁸ Construction	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

⁸Specifically 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 Reserve 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 professional and support staff in the field. In the case of MBREMP, priority is given to Village Environment Management Plans (VEMPs), which form the cornerstone of management within the Park. 8.4 Organization structure, roles and responsibilities

8.1. Management Structure, Role and Responsibilities

The Board of Trustees and the Marine Parks and Reserve 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 park system. Part II of Act 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 29 and any subsidiary legislation pursuant to sections 18 to 38 of the Act

8.1.2. *The Advisory Committee*

The purpose and composition of the MBREMP Advisory Committee is provided in the Second Schedule of Act 29 of 1994. As such, the Advisory Committee is established to advise the Board of Trustees; consult with the Marine Park Warden on technical, scientific and operational matters and to propose names to the Board of Trustees for the purpose of appointing a Warden. The Advisory Committee constitutes a representative forum of MBREMP stakeholders, including local communities, regional and district government, a non-governmental organisation, a research institution and representatives of the tourism and fish processing investors within the Park area. The Committee meets quarterly and submits its regulations directly to the Board of Trustees. The Warden-in-Charge serves as Secretary of the Committee.

8.1.3. *The Warden-in-Charge*

The Warden is responsible for all matters concerning the Park's administration and is subject to the control of the Board of Trustees and the Advisory Committee. The Warden has a responsibility to local communities, district authorities and other stakeholders, including that of notifying them of planning efforts and ensuring that they have an adequate opportunity to participate in the management of the Park.

Village Liaison Committees

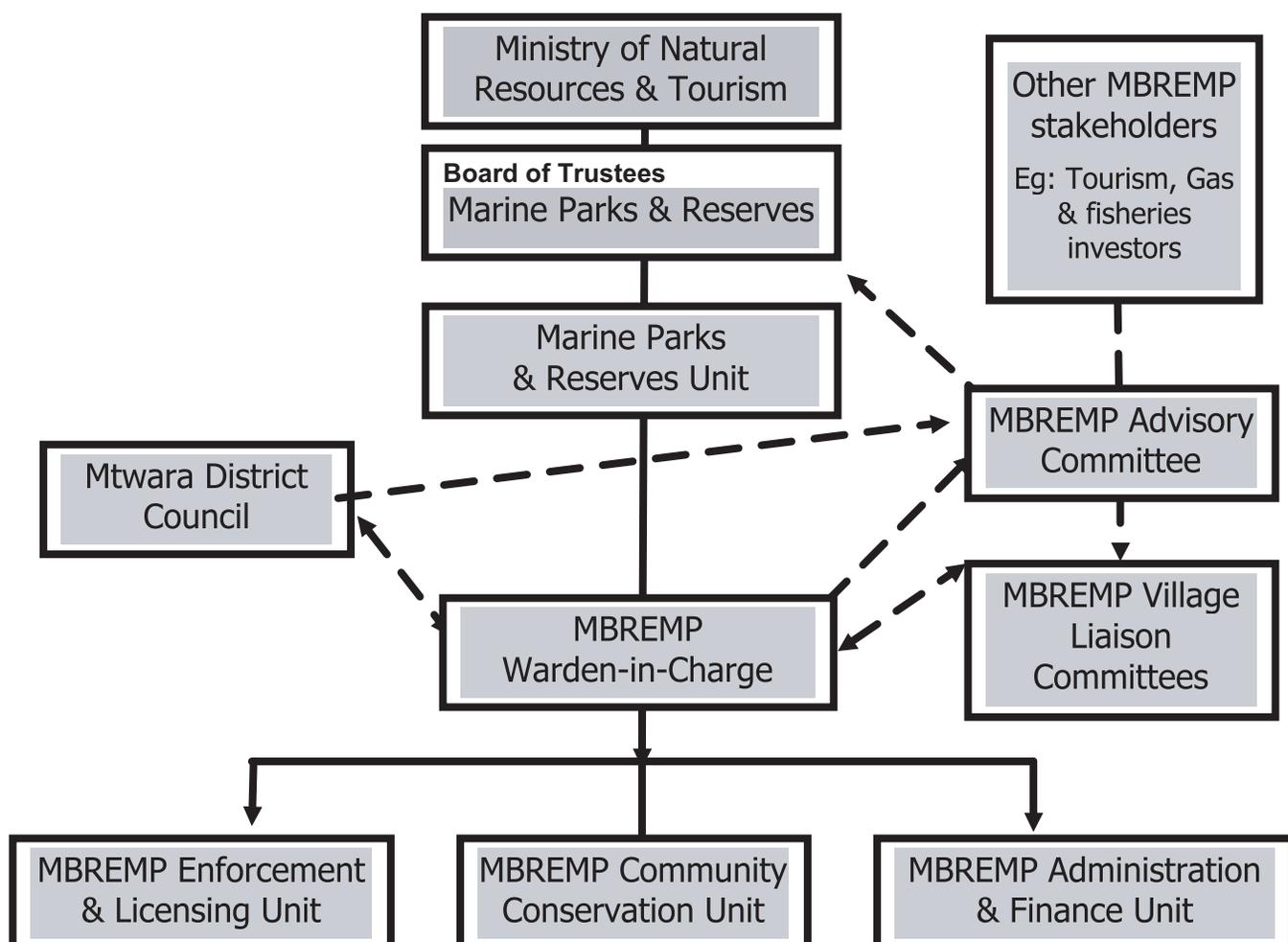
Part V of Act 29 of 1994 provides that each Village Council which "affects or is affected by the marine park, either directly or through a designated committee ... shall participate fully in all aspects of the development of regulations, zoning and the general management plan." Accordingly, the committees shall continue to serve as the primary interface between the communities and the Marine Park.

8.1.5. Key role of the VEMPs

Once they are finalised and approved by the Park authorities, the VEMPs will be collated to ensure that they are compatible with one another, and will then form the basis upon which the Park is managed. Each VEMP contains the following:

- A short description of each village
- An assessment of natural resources, management issues, problems and opportunities
- The rationale for each VEMP
- A village-based zoning scheme
- A management system, including committees with roles and responsibilities and relationships with Park authorities, relations with MBREMP, laws and penalties and financial management issues
- An objective hierarchy of the VEMP
- An action plan for natural resource management, and
- A section on monitoring and evaluation

THE MANAGEMENT STRUCTURE OF MNAZI BAY – RUVUMA ESTUARY MARINE PARK (MBREMP)



8.1.6. Mtwara Rural District Council

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

- EIA requirements for developments outside the boundary of the marine park;
- The issuance of fishing licenses and collaborative patrolling.
- The collection of user fees within the marine park and disbursement of revenue;
- 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, which will ensure that the villages become the on-the-ground implementers of the GMP. 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 29 of 1994.

8.2. Supporting role of other strategic documents

Two very important documents have been commissioned by MBREMP, first, a Strategic Development Framework and, second, a Tourism Investment Framework, both of which provide a roadmap for the development of new activities in the Park. These documents emphasise the importance of taking into account the carrying capacity of the Park, both ecological and socio-economic, when developing new economic activities. Both documents provide clear recommendations on suitable developments for MBREMP and will be used as guidelines for any new developments in the Park.

8.3. Further legislation

The enforcement of the GMP requires the preparation and implementation of subsidiary regulations covering, *inter alia*, the following issues:

- The zoning scheme and resource-use restrictions, as outlined in Chapters four, five and six
- Qualifications for residency in MBREMP
- EIA requirements and procedures

All these implementing regulations will be referred to collectively as the General Regulations for the Mnazi Bay Ruvuma Estuary Marine Park. Sections 13, 18, 19, 20, 21 and 23 of the Marine Parks and Reserves Act No. 29 of 1994 will guide their preparation. The Warden-in-Charge and MREMP field staff will initiate the process of preparing draft regulations under the guidance of MPRU and such drafts will be submitted to the Park Advisory Committee. Following modification and approval, the proposed drafts will then be submitted to MPRU for professional legal drafting and subsequent submission to the Board of Trustees for further modification and approval. The Board will then recommend proposed regulations to the Minister for approval and gazetting.

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 demonstration of its usefulness and appropriateness as a conservation and management tool (Mangubhai and Wells, 2005). In many ways, the effective management of MBREMP will depend on the extent to which this general management plan has assessed the situation and the threats, and how well it has anticipated the issues that will arise in the future. Foresight in this respect is limited, so procedures must be set up to monitor the extent to which the goals of the Park are being met, and if not, what new management measures can be adopted to meet all nine goals of the Park (see the introductory chapter for a list of the nine objectives). One of the guiding principles of this GMP is the reliance on an adaptive management approach, where assessments will be carried out to establish the success of the GMP in meeting the goals of the Park and where the management approaches will be adapted accordingly. In addition, the monitoring of management effectiveness will create a learning environment, which encourages the sharing of knowledge, skills and experience so that lessons are learned and mistakes are not repeated (Mangubhai and Wells, 2005).

9.2. How to assess management effectiveness

In order to assess the effectiveness of the Park, it is necessary to look at changes in biophysical and socioeconomic environment, which will provide indicators that can be monitored and measured. The assessment will cover issues that fall within the responsibilities of the Park managers as well as those that are beyond their control. If changes occur outside the boundaries of the Park but have an impact inside the Park, the managers need to be aware of these changes so that they can modify their management approach to address them.

The assessment of management effectiveness within MBREMP will be carried out using the methodologies and tools developed in two important initiatives: the workbook developed by the Group of Experts on Marine Protected Areas for Eastern Africa (GEMPA), and the Guidebook of Natural and Social Indicators for Evaluating Marine Protected Area Management Effectiveness developed by IUCN's World Commission on Protected Areas (WCPA). Both initiatives provide guidelines and steps that can be followed to ensure that any management assessment is comprehensive and thorough. In addition, however, the following aspects of management assessment must be emphasised in the case of MBREMP:

- The bulk of the assessment will be carried out *in close cooperation with* and, wherever possible, *by* the local community
- The assessment will rely on a combination of biological, socio-economic and governance indicators
- The level of detail of the assessment will depend on the infrastructure and resources in place and may start at a basic level and increase as know-how is acquired, capacity built and resources assigned
- As the level of assessment increases, Park authorities will work with the local community to ensure that their capacity to carry out the assessment increases accordingly
- The results of the assessment(s) will be shared and widely disseminated, with the local community in MBREMP and in other communities affected by marine parks in Tanzania

- The results of the assessment(s) will be incorporated in the further development of the GMP, particularly as it is modified after the initial implementation stage.

9.3. Evaluation and review

This GMP is not a static document and will be reviewed from time to time to reflect resource use trends, new information on the resource 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 interdisciplinary consultative manner to incorporate the views and concern of resource users.

SELECTED BIBLIOGRAPHY

- Baker, N.E. & Baker, E.M. 2002. *Important Bird Areas in Tanzania: A first inventory*. Wildlife Conservation Society of Tanzania, Dar es Salaam, Tanzania. 303 pp.
- Bandeira, S.O., Antonio, C.M. & Critchley, A.T. 2001. A taxonomic listing, including new distribution records, for benthic, intertidal sea-weeds from Mecufi, northern Mozambique. *S. Afr. J. Bot.* 67(3): 492-496.
- Bianchi, G. 1985. *Field Guide to the commercial marine and brackish-water species of Tanzania. FAO Species Identification Sheet for Fishery Purposes*. FAO, Rome. 199 pp.
- Darwall, W. & Guard, M. 2000. Southern Tanzania. p. 131-166. *In: Coral Reefs of the Indian Ocean: Their Ecology and Conservation*. McClanahan, T., Sheppard, C. & Obura, D. (eds.) Oxford University Press. 525 pp.
- Fabricius, K. & Alderslade, P. 2001. *Soft corals and sea fans. A comprehensive guide to the tropical shallow-water genera of the central-west Pacific, the Indian Ocean and Red Sea*. AIMS and Museum and Arts and Gallery of the Northern Territory. 264 pp.
- Guard, M., Muller, C., & Evans, D. 1997. Marine Biological and Marine Resource Use Surveys in the Mtwara District, Tanzania. Surveys of Fringing and Patch Reef within and adjacent to Mnazi Bay Report No. 1 Vols. 1,2. The Society for Environmental Exploration and The University of Dar es Salaam.
- Guard, M., 2004. A Rapid Assessment of Live Coral Mining and Lime Production in Mtwara: Description and socio-economics in the buffer zone of the Mnazi Bay Ruvuma Estuary Marine Park; IUCN, Nairobi.
- Jaasund, E. 1976. *The intertidal seaweeds of Tanzania*. University of Tromso. 160pp.
- Kemp, J. 2000. *East African Marine Ecoregion. Biological Reconnaissance*. Dar es Salaam, WWF East Africa Regional Office.
- Lieske, E. & Myers, R. 2001. *Collins Pocket Guide. Coral Reef Fishes. Indo-Pacific and Caribbean*. HarperCollins, London. 400 pp.
- Luke, W.R.Q., 2004. Rapid Assessment of Terrestrial Plant Diversity of Mnazi Bay Ruvuma Estuary Marine Park, Tanzania; IUCN, Nairobi.
- Malleret, D., 2004. A Socio-economic Baseline Assessment of the Mnazi Bay – Ruvuma Estuary Marine Park; IUCN, Nairobi.
- Malleret, D., and Simbua, J., 2004. The Occupational Structure of the Mnazi Bay-Ruvuma Estuary Marine Park Communities; IUCN, Nairobi.
- Malleret, D., and Simbua, J., 2004. The Occupational Structure of the Mnazi Bay-Ruvuma Estuary Marine Park Communities; IUCN, Nairobi.
- Mangubhai, S. and Wells, S. 2005. *Assessing Management Effectiveness of Marine Protected Areas: A Workbook for the Western Indian Ocean*. IUCN, Nairobi.

Muir, C.E., 2003. An Assessment of the Status of Turtles, Dugongs and Cetaceans in Mnazi Bay-Ruvuma Estuary Marine Park and Recommendations for a Conservation Strategy; IUCN, Nairobi.

McClanahan, T., Sheppard, C. & Obura, D. (eds.) 2000. Coral Reefs of The Indian Ocean: Their Ecology And Conservation. Oxford University Press.

Moorjani, S. & Simpson, B. 1988. *Seaweeds of the Kenya Coast*. Oxford Uni. Press, Nairobi, Kenya. 134 pp.

Muhando, C., Mndeme, Y. & Kamukuru, A. 1999. Mnazi Bay-Ruvuma Estuary Proposed Marine Park: Environmental Assessment Report.

Muir C. E., 2003. *An Assessment of the Status of Turtles, Dugongs and Cetaceans in Mnazi Bay – Ruvuma Estuary Marine Park & Recommendations for a Conservation Strategy*. IUCN/MBREMP Project. 40 pp. + Appendices.

Ngowo, R. 2003. A Review On The Ecological Status Of Coral Reefs And Mangrove Ecosystems Of Mnazi Bay And Ruvuma Estuary, Mtwara – Tanzania.

Obura, D., M. Suleiman, H. Motta, & M. Schleyer 2000. East Africa. p. 65-76. *In: Wilkinson, C. (ed.). Status of Coral Reefs of the World: 2000*. Townsville, Global Coral Reef Monitoring Network. Australian Institute of Marine Science.

Obura, D., 2004: Biodiversity Surveys of the Coral Reefs of the Mnazi Bay Ruvuma Estuary Marine Park, Tanzania; IUCN, Nairobi.

Richmond, M.D. (ed.) 2002. *A Field Guide to the Seashores of Eastern Africa and the western Indian Ocean Islands*. (Second edition) Sida/Department for Research Cooperation, SAREC/University of Dar es Salaam. 461 pp.

Richmond, M.D. & Mohamed, A. 2005: Assessment of marine biodiversity, ecosystem health and resource status of intertidal (non mangrove) and sub-tidal (non-coral) habitats in MBREMP; IUCN, Nairobi.

Salm et al. 2001, Salm et al, (2001) *Marine and Coastal Protected Areas: A guide for Planners and Managers*. IUCN.

Shunula, J. & Whittick, A. 1996. *The Mangroves of Zanzibar*. Institute of Marine Science (Uni. Dar es Salaam). 165 pp.

Spawls, S., Howell, K.M., Drewes, R.C. & Ashe, J. 2002. *Field Guide to the Reptiles of East Africa*. Academic Press.

Stephenson, T. & Fanshawe, J. 2002. *Field Guide to the Birds of East Africa*. T & AD Poyser, London. 602 pp.

Veron, J. 2000. *Corals of the World*. Townsville, Australian Institute of Marine Science.

WWF 2004. Eastern Africa Marine Ecoregion 2050 Vision Report. WWF TZ Office.

APPENDIX I: BOUNDARY DESCRIPTION FOR MNAZIBAY 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

This Order may be cited as the Marine Parks and Reserves (Declaration of Mnazi bay Ruvuma Estuary Marine Park) Order, 2000.

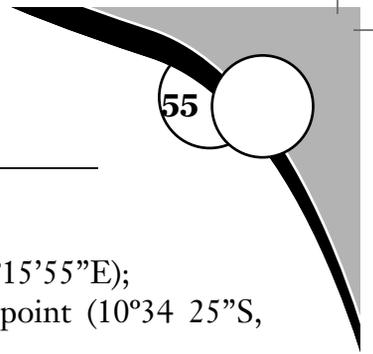
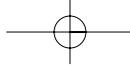
This Order shall come into operation on the First day of July, 2000

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 –

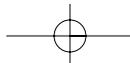
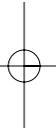
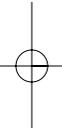
- Commencing at a point (10°34'46"S, 40°16'13"E) on the Ruvuma River and its International Boundary between Tanzania and Mozambique;
- Thence following the Ruvuma River Easterly and Northerly direction to Ras Mwamba; thence Easterly direction to Ras Ruvuma (10°34'40"S, 40°16'13"E);
- Thence in Northerly 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 Ras Msangamkuu (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,

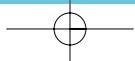
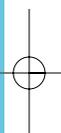
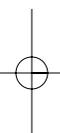
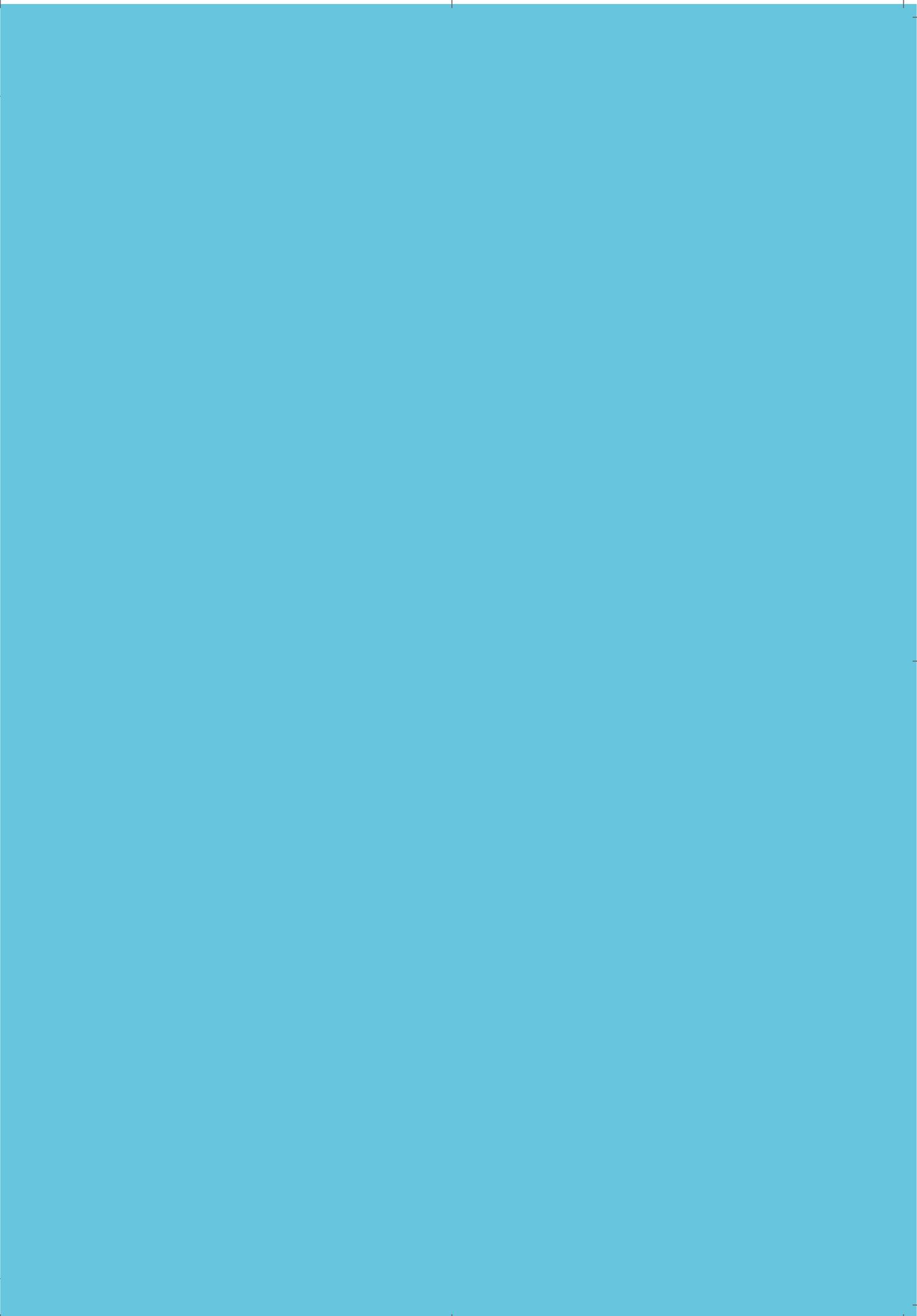


40°16'10"E);

- 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 38M approximately to the point of commencement.

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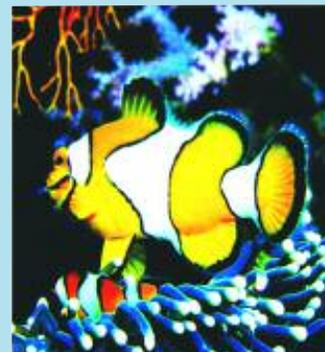


THE UNITED REPUBLIC OF TANZANIA
MINISTRY OF NATURAL RESOURCES AND TOURISM

BOARD OF TRUSTEES
MARINE PARKS AND RESERVES TANZANIA.

GET TO KNOW TANZANIA MAINLAND MARINE HERITAGE

The Marine Parks and Reserves Unit was established by the Act of the Parliament of the United Republic of Tanzania in 1994 to safeguard and sustainably manage the fabrics and integrity of marine resources in partnership with locals and the global fraternity



<p>VISION</p> <p>Marine Protected Areas in Tanzania become the joy and pride for all.</p>	<p>MISSION</p> <p>To establish and manage Tanzania's Marine Protected Areas for sustainable use.</p>
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“Let us share the gift of nature together”