



THE UNITED REPUBLIC OF TANZANIA
MINISTRY OF NATURAL RESOURCES AND TOURISM

Dar es Salaam Marine Reserves

GENERAL MANAGEMENT PLAN

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



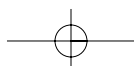
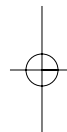
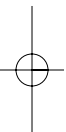
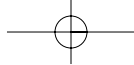


The United Republic of Tanzania
Ministry Of Natural Resources and Tourism

DAR ES SALAAM MARINE RESERVES

GENERAL MANAGEMENT PLAN

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

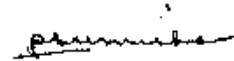


APPROVAL PAGE

Implementation of this plan has been 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 K. 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 Hamdan Meghji (MP)
Minister of Natural Resources & Tourism
United Republic of Tanzania

FOREWORD

The Development of the General Management Plan for the Dar Es Salaam Marine Reserves System (DMRs) should be viewed as the first phase of an all-embracing plan to manage the reserves. 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 DMRs resources, designating resource management areas or “management zones” within the reserves, each having appropriate uses ranging from recreational, research to biodiversity propagation. The zoning of the reserves 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 reserves, the nature and significance of the reserve’s natural and cultural resources, the ability of each reserve to support identified uses, the desired visitor experience and management objectives.

The approved GMP is a comprehensive plan that will vary in detail with the size and complexity of a given reserve, which will guide subsequent planning and implementation. Detailed plans and studies detail specific management practices for each of the respective resource management zones, consistent with the approved GMP. All future plans and projects will be consistent with the direction established in the GMP. The GMP components will be reviewed periodically and revised or amended as necessary to reflect new issues or changes in management objectives.

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 reserves 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.

We again take this opportunity to reiterate and demonstrate our willingness to protect and conserve marine resources for the present and future generations. It is indeed in the fulfilment of this set out objective that we are demarcating the Dar es Salaam Marine Reserves into management zones to ensure that areas demanding protection are left undisturbed, while making maximum use of zones whose utilisation do not impinge conservation.

Welcome aboard,



Hon. Zakia Hamdan Meghji (MP)

Minister of Natural Resources and Tourism.

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EXECUTIVE SUMMARY

The General Management Plan for the Dar es salaam Marine Reserves (DMRs) is a strategy designed to conserve, manage and develop the four marine island reserves of Bongoyo, Pangavini, Fungu Yasin and Mbudya located north of Dar es Salaam harbour that were gazetted in June, 1975.

This plan has come at a time when there is a dire need to protect, rehabilitate and set out use zones. The main objective of the plan is to put into place a guide that would determine the direction for effective conservation of vulnerable areas and at the same time delineate areas in the reserves for economic use. In essence it is the first time in 30 years since the reserves were created that an enforcement of the no take mechanism is put into place.

Act No. 29 of the Marine Parks and Reserves, 1994 places the responsibility of management of the DMRs under the Marine Parks and Reserves Unit (MPRU) and also requires MPRU to come up with a General Management Plan which involves all stakeholders in the conservation of the resources. The GMP for DMRs outlines a strategic framework and guidance for management and conservation of the reserves for the next 5 years. It provides a full description of the unique characteristics of the DMRs and the buffer zones surrounding the reserves;

- Identifies threats to the marine resources and key management issues arising from resources use interactions
- Provide a framework for participation of key stakeholders including local resource users in the vicinity of the reserves, visitors and organizers of recreational activities in the reserves and others with commercial and academic interest in the Dar es Salaam marine reserves

The targeted stakeholders of the GMP are:

- The Marine Parks and Reserves staff and Rangers in Dar es Salaam
- Local communities – fishers (women and men), traditional healers etc.
- Hoteliers, organizers of recreational activities and tourist operators, tourists, visitors and Ferry boat operators
- Tanzania Port Authority
- Investors who may have an interest in developing economic activities in DMRs and in the buffer zone
- International organization working on marine protected areas and Development partners (donor agencies)

The reserves stand as the final outpost for a variety of endangered plants and animals. They offer nestling grounds for turtles, birds, and snakes and because they have not been subjected to pollution, lucky swimmers can site the rare sea horse on the sprawling sea grass beds. Marine mammals such as dolphins and whales are also sited in the DMRs.

All the four islands are uninhabited and are frequently visited by Dar es Salaam residents for leisure, cultural activities and research. Bongoyo, the island visited mostly, comprises small sandy beaches and coral based rocky flats. The algae species includes *Jania spp*, *Codium spp*, *Padina spp*, *Sargassum spp* and *Dictyota spp*. Fishes found in the coral reef and the sea grass beds of the islet includes *Butterfly fish Chaetodontidae*, *Sweet lips Haemulidae*, *Grouper, Serranidae* and *banded coral shrimps Stenopus hispidus*.

Main threats to sea turtle are:

Pangavini Island is a coral rag Island surrounded by steep cliffs which make the island inaccessible. It is a sanctuary for birds and snakes.

Mbudya Island is rocky with coral growth on the protected west. It is covered by tropical coastal forest. The lower intertidal part of this reserve is dominated by sea grass.

Fungu Yasin is an island sand bank, which becomes visible during low tide. Dominant sea grass species are *Thallasodentron ciliatum* and *Thalassia hemprichii*.

Although the DMRS are uninhabited, the stakeholders who reside in their hinterland affect and influence the protected resources. Key stakeholders are fishers, research and academic institutions, tour operators, hoteliers, local government and, visitors to the reserves.

Some 4200 fishermen take on the sea from villages in their vicinity and taking advantage of unmarked boundary and low enforcement capability, fish freely in the reserves. They are mainly from Mbweni, Ununio, Kunduchi, Msasani, and Banda Beach.

The DMRs has sought support from neighbouring local communities and trained them as Honorary Rangers to give a hand in cleaning the beaches and provide services and information to visitors. Visitors from mainland Dar es Salaam however have frequented the reserves for recreational needs and fishing. This unregulated use has resulted in overuse and degradation of the resources:

Virtually all Visitors to DMRs congregate on small sand beaches. Most service providers in DMRs lack capacity thus provide low quality services a factor which can dent the image and popularity of the reserves. Msasani Slipway offer regular boat shuttles to Bongoyo Island only. White Sands Hotel operates shuttle services to Mbudya Island.

The untreated waste that is dumped into the sea eventually finds its way into marine reserves through ocean currents thus littering the beaches and shores of the island reserves. The reserves are facing an acute human resources capability to take up the challenges of conservation. Presently staffs working for the reserves were not recruited solely to work for DMRs. The reserves are administered from the headquarters of MPRU using resources and facilities of the head office.

Though there is resources recovery in the DMRs, which has enabled the sighting of turtle nests, dolphins and sea horses, recent reports have indicated that there were turtle and dolphin butchering in the reserves done by poachers. Studies conducted in 1980s and 1990s reported a general degradation of coral reef ecosystems in the Dar es Salaam Marine Reserves, mainly due to bad fishing practices and over-exploitation of certain key species.

Also coastal development, unplanned tourism as well as lack of awareness, lack of trained and experienced personnel available for reef management and lack of resources have contributed towards coral reef degradation.

The main objectives of the GMP of DMRs are:

- To guide future investments in the reserves to avert negative impact that could change the naturalness of the reserves..
- To promote sustainable collaborative management with communities and institutions dealing with conservation activities of marine and coastal resources and other interested partners.

- To promote community-based resource monitoring and reporting
- To use the obtained information to improve management, conservation and protection of marine and coastal resources.
- To improve regulatory and institutional framework for DMRs management by promoting dialogue among authorities whose mandate and statutes overlaps those of DMRs. These include Tanzania Ports Authority, Kinondoni Municipal Council and The Fisheries Department.

Management Strategies

- Sustainability of non-extractive resource use in the DMRs
- Stakeholders involvement in the management and access to resources
- Community education and dissemination of information
- Improvement of regulatory, institutional framework and management
- Facilitate research and monitoring of resources condition, uses and management
- Maintain effective enforcement of laws; eliminate any form of extractive resource use in the reserves through enforcement.
- Collaborate with concerned agencies to manage and possibly regulate harbour, shipping and marine transport activities that operate within the DMRs or may impact the reserves.
- Amend the law to provide for the involvement of communities close to the reserves in conservation. Identify and collate, in association with local communities, existing information on sites of cultural significance within the marine Reserves.
- Promote low-impact, high value investments in the reserves by ensuring all developments are guided by Investors Guides, EIA and Tourism Management Zones
- Draw resource distribution maps that would designate resource
- Develop mechanisms for sustained habitat/ecological monitoring e.g. development of permanent monitoring sites and standardised methods.
- Improve existing fisheries monitoring

The plan provides for the setting up of Community Conservation teams at each locality within the vicinity of DMRs. The teams will participate in DMRs educational and outreach programme involving them in resource monitoring and will also be allocated funds generated from user fees.

CHAPTER 1: INTRODUCTION

1.1 General background

Dar es salaam Marine Reserves (DMRs) refer to a set of four island reserves of Bongoyo, Pangavini, Fungu Yasin and Mbudya gazetted separately in June 1975, located a few kilometres north of Dar es Salaam harbour. Because they are managed together, in this Management plan, they will be administered together, as DMRs.

Despite being made reserves 30 years ago, little concerted effort was made to develop and implement an effective plan to ensure their conservation and sustainable resource use. The laws that made the islands reserves did not provide for an authority to guide conservation measures. Thus resources in the reserves continued to be depleted by poachers. With the passing of the Marine Parks and Reserves Act no. 29 of 1994, the task to manage the reserves was placed under the Marine Parks and Reserves Unit (MPRU).

MPRU is now evolving a participatory General Management Plan (GMP) that would guide conservation and management of the marine reserve resources.

1.2 Why a General Management Plan

Act No. 29 of 1994 makes it conditional for every gazetted park or reserve to have a General Management Plan detailing conservation and management activities of the area. The GMP for DMRs outlines a strategic framework and guideline for the management and conservation of the reserves for the next 5 years.

Provides a full description of the unique characteristics of the DMRs and the buffer zones surrounding the marine reserves;

Identifies threats to the marine resources and key management issues arising from resources use interactions;

Details the proposed objectives of the DMRs and specifies ways and means through which these objectives will be harmonized and carried out, including proposed activities, development and zoning;

Provide a framework for participation of key stakeholders including local resource users in the vicinity of the reserves, visitors and organizers of recreational activities and others with commercial and academic interest in the reserves;

Provide basis for the development of subsidiary planning document, operational plans and day-to-day management decisions.

The process of preparing this plan involved wide consultations with key stakeholders.

1.3 Target Audience of the General Management Plan

Effectively management of the Dar es Salaam Marine Reserve needs involvement of wide range of stakeholders including:

- Local Government Authorities – Localities, ward Councils and Kinondoni Municipal Council
- The Marine Parks and Reserves staff and Rangers in Dar es Salaam
- Local communities – fishers (women and men), traditional healers etc.
- Hoteliers, organizers of recreational activities and tourist operators
- Tourists and visitors
- Tanzania Port Authority
- Ferryboat operators

- Investors who may have interest in developing economic activities in DMRs and in the buffer zone adjacent to the reserves
- Government staff, projects, NGOs, and CBOs working in the broader field of natural resources management e.g. fisheries, forestry and environment
- Researchers, scientific and other technical experts working in related fields
- Schools and educational and training institutions
- Research and higher learning institutions
- International organization working on marine protected areas
- Development partners (Donor Agencies)

1.4 Unique Characteristics of the DMRs

The DMRs are unique for being a breeding ground of the endangered turtle. Mbudya Island is a home of the endangered coconut crab. Pangavini Island has the splendour of being the nocturnal home of most of the birds that hove over Dar es Salaam city during the day. It is also the nesting sanctuary of the birds.

The reserves also serve as a stopover of migratory birds during their flight from winter.

The reserves are also a sanctuary of a variety of reptiles including python. They are the final outposts of the dwindling coastal forests. They are also a habitat of the rare and endangered species of orchids listed under appendix II of CITES. They are *Eulophia petersii*, *Oeceoclades zanzibarica* and *Vanilla roscheri*.

With crystal clear waters and lying a stone throw from the sprawling capital of Tanzania, the islands are a pull to tourists, who visit them for swimming, diving and snorkelling.

The shark lagoon on Bongoyo hosts seasonal visits of juvenile sharks, which abound the area that is a nursery ground for octopus, squids and fish. Lucky swimmers can also site the rare sea horse on the sprawling sea grass beds, an indicator that the reserves are pristine. Marine mammals such as dolphins and whales are also sighted in the DMRs.

The shores of Bongoyo and Mbudya depict fountains of water during low tide.

DMRs hosts ruins of a German outpost and a tomb, thought to be of the descendant of Prophet Muhammad, the founder of Islam. The tombs have generated myths, and pull visitors who visit them to pay homage and make sacrifices for cleansing and fortune.

1.5 Historical Development of Management Strategies for DMRS

Tanzania embarked on serious marine conservation initiatives in 1994 with the enactment of the Marine Parks and Reserves Act 29. This turn about was a tacit realisation that the laws enacted to conserve the marine resources were inadequate.

Although the Fisheries Act number 6 of 1970 provided for fisheries management, it was in 1975 that 8 marine reserves including DMRs got legal recognition and were placed under administration of the Fisheries Division. The assumption was that they would be managed like any other fisheries undertaking and generate socio-economic benefits mainly tourism and recreation. Because there was no mechanism that was put in place to oversee their realisation, marine resources continued to be depleted through unsustainable harvesting such as dynamiting and seine fishing.

Increased dynamiting and indiscriminate use of corals for lime making in the 1980s and 1990s drew cries from environmentalists and other lobbyists making the Government to act. In 1981, the Ministry of Natural Resources attempted to delegate responsibility of managing the reserves to the Tanzania National Parks (TANAPA), which failed to take it up. In the late 1980s TANAPA in collaboration with Shell Tanzania commissioned studies to assess and recommend ways of integrating the marine reserves to the Tanzania national park system. Though the studies focused on the Mafia area they recommended that areas under marine protection be expanded to accommodate interests of local users.

These recommendations brought a new outlook in the management and operation of marine protected areas (MPAs) advocating for a comprehensive legislation to provide for these needs.

Act, No. 29 enacted in 1994 took two years before an authority to manage marine parks and reserves MPRU was constituted. Until the advent of MPRU, activities on DMRs were “appropriated” by different actors: the Tanzania Tourist Corporation which was operating tourism services to Mbudya Island and Msasani Slipway to Bongoyo and the University of Dar es Salaam conducted ecological courses at Mbudya and Bongoyo.

In 1996 MPRU organised the first stakeholders meeting to discuss the conservation of the reserves. The outcome was: Formation of the Marine Action Tanzania (MACT) an NGO to foster and support government and community efforts to make the “paper reserves” conservation entities. Enforcement of marine reserves regulations began with support of MACT and Hoteliers who provided a speedboat. Youths were engaged to provide tourism services to offset problems of lack of staff at the MPRU and to take up more roles to ensure naturalness of the reserves. Also Procedures and conditions for operating tourism services in the reserves were set out just as much as the conduct and responsibility to tourists, environmental preservation and MPRU utilised Marine Police in patrols and enforcement.

In 1999 two regulations: Marine Parks and Reserves Declaration and User Fees were gazetted to harmonise the Marine Parks and Reserves Act of 1994 with the Fisheries Act of 1970 with regard to the management of marine reserves. These regulations formed the basis for formal transfer of marine reserves (including DMRs) to MPRU. The MPRU initiated proper administrative procedures including the recruitment of staff for the DMRs.

Staffs recruited include a desk officer for management of the DMRs headed by the Chief Warden (for all Reserves), three staff – Conservation Officers (2) and Boatman (1). Support facilities include a Patrol Unit equipped with boats, radio (with support from Private sector e.g. Slipway, the Dar Yatch Club providing radio, fuel etc).

The MPRU has installed mooring buoys and Bandas on the islands for visitors, and for shade. Awareness raising activities to fishermen, tourism service providers - with focus on legal matters has been undertaken. Through community based conservation, MPRU is utilizing the private sector to be the “eye and ear” of the MPRU in enforcement tasks.

To date active control, including enforcement of regulations and regular surveillance are now in place. Involvement of the Marine Police and Kinondoni Police (Kawe, Oysterbay in joint patrols and other enforcement activities. MPRU has involved neighbouring communities in conservation by engaging youths as Honorary Rangers. These young men and women offer services to tourists and visitors. The rangers were given specialised training at the tourism institute in customer care and hospitality services.

MPRU enabled the rangers by providing them with boats, communication gear, life saving facilities and

snorkelling equipment. They have also been taught life saving and rescue techniques at sea.

In 2001 the Marine Parks and Reserves (User Fees) Regulations 1999 were revoked by the Marine Parks and Reserves (User Fees) Regulations.

CHAPTER 2: DESCRIPTION OF RESOURCES AND RESOURCE

2.1 LOCATION AND AREA

2.1.1 Location

The four marine reserves of Bongoyo, Mbudya, Pangavini and Fungu yasini forms the Dar es Salaam Marine Reserves (DMRs). The reserves located 26 kms from the city centre, they fall within the boundary of Dar es Salaam city. They lie between $06^{\circ}35' - 06^{\circ}45' S$ and $39^{\circ}13' - 39^{\circ}17'E$.

2.1.2 Area

The reserves have a total area of 3044.4 ha. The area covered by the islands is approximately 137.2 ha. Mbudya is the largest reserve with about 53 ha of land 788.4 and 330.3 ha of reef and sea grass beds, respectively. Bongoyo reserve has about 80.5 ha of the land, 388.5 and 284.8 ha of reef and sea grass beds. Fungu Yasin is a sand bank with a total area of 943.1 ha, 445.4 ha being an area of a reef and 497.7 is sea grass bed. Pangavini, the smallest reserve has a total area of 175.8 ha, some 3.7 ha are land, 67.8 ha are reef and the remaining 104.3 ha are sea grass beds. The intertidal zones around the reserves are extensive and the largest is around Mbudya with about 211.2 ha. Pangavini being the closest island to the mainland is separated from the shore only by a 1.5 km wide channel.

Table 2.1 Area Covered by Each Islands

Island Name	Islands Area (ha)	Inter tidal area (ha)	Sea grass bed (ha)
Bongoyo	80.5	388.5	284.8
Mbudya	53.0	788.4	330.3
Pangavini	3.7	67.8	104.3
Fungu Yasin	0	445.4	497.7

Source: Mubando, C. A., 2004. *Biophysical Assessment of the DMRS*.

2.2 Biophysical environment

2.2.1 Physical Characteristics

2.2.1.1 Bathymetry

The four islands are found on a shallow continental shelf. Generally shallow waters of less than 20m deep separate the islands and the mainland. The only exception is the area lying between Mbudya and Fungu Yasin.

2.2.1.2 Oceanography

Ocean currents and Tides are important features that strongly influence the distribution of marine organisms and the availability of nutrients. The dominant major current prevailing in the coastal waters of Tanzania are the South Equatorial current, which flows westwards permanently at around $120^{\circ} S$, and the northward flowing East African Coastal Current (EACC). The current is strongest during the southern Monsoon (April-October) with an average speed of about 2 m/s and occasionally reaching 3.5m/s. It

becomes weaker during northern Monsoons (November-March) when it gets an average speed of less than 0.5m/s. At the peak of the South Eastern Monsoons, the velocity of the current reaches 2 m/s.

The northward bound current probably carries the land-based pollutants from Dar-es-Salaam through the DMRs. At the peak of the South Eastern monsoons, the velocity of the current reaches 2 m/s.

The tides along the Tanzanian coast are of semi-diurnal type characterised by two occurrences of both high and low waters within a day. These are the mean spring tide of about 3.5 metres and mean neap tide of about 2.5 metres. The age of the tide (time lag between the new or full moon and the peak of the spring tide) in most of the area range from one to two days.

2.2.1.3 Winds

The wind pattern of the Dar es Salaam Marine Reserves is typical a characteristic of the wind regime of the Western Indian Ocean, the Monsoons. They are the south-easterly winds (SE monsoons) during April and October and the northeasterly winds (NE monsoons) between November and March. The SE monsoons are usually strong; they attain peak speed in April and July. The northern monsoons are lighter and peak speed occurs in February. This wind system is associated with a near clockwise current system that changes character with the changing wind.

2.2.1.4 Waves

Predominant wave height offshore is 1-1.5m and the maximum significant wave height is about 5 m. The swell is predominately from the northeast. Waves are stronger on the exposed east and south sides of the reserves making these sides dangerous to reach during certain periods of the year.

2.2.1.5 Geology and soils

The surface geology of the Dar es Salaam marine reserve Islands is largely composed of coral reef and limestone. The soil cover on the islands is shallow and overlies extensive Pleistocene and recent limestone and coral rag. Some clay and silts associated with mangroves and sands associated with beach ridges are found along the coast.

2.2.1.6 Climate

The climatic conditions of DMRs are tropical with high temperatures, low wind speed, high humidity and the absence of a cold season. Dar es Salaam receives average annual rainfall of over 1000mm in two regimes- short rains during November and December and the long rains between March and May. The period between June and October is dry.

The mean annual temperature is 26°C with a mean daily range of $\pm 4^{\circ}\text{C}$. Seasonal variations are slight with the mean seasonal range being $\pm 4^{\circ}\text{C}$. The humidity of air is related to the rainfall pattern and is highest during the long rains. Daily maximum humidity occurs at dawn, averaging 96% while minimum humidity is experienced in the afternoons, averaging 67%.

2.2.2.1 Bongoyo Island

It lies between 06°43'12" S and 38°16'00"E and is about 8 km north of Dar es Salaam. The island, which is narrow in the southeast, gradually broadening in the northwest is uninhabited. The reef surrounding the islet is very shallow with an intertidal zone comprising small sandy beaches (east beach 500m and northwest beach 300m long) and coral based rocky flats. The mean tidal range is about 3m, while the large spring tide has a slightly larger range. Differences in the terrestrial, intertidal and sub tidal habitats between the north and south sides of the island are influenced by changes in the monsoon winds.

The live coral cover is high (more than 35%) on the sheltered western side and on the northwest of the

islands where it covers an area of 220,299 m² (or 1.8 km extension) and 43,687 m² (0.2 km length), respectively. Coral cover was generally less than 5% on the eastern and southern parts of the Bongoyo Island (Muhando and Francis). The dominant species includes *Montipora aequiturberculata* and species of *Galaxea*, *Fungia*, and *Porites* that survived the 1998-bleaching event. According to Mohammed et al., 2000 dead coral coverage has decreased from 38-52% in 1997 to 3-25% in 1999 while the area with rock, rubble and sand increased from 1-6% in 1997 to 6-12% in 2000. Soft coral and sponge cover contribution remained relatively low, (0-4.5% and 0-2%, respectively).

Sea grasses found along the island include species of *Thallasodendron ciliatum*, *Halophila cuinervis*, *Cymodocea rotundata*, *Halophila ovalis* and *Syringodium isoetifolium*. The algae species includes *Jania* spp, *Codium* spp, *Padina* spp, *Sargassum* spp and *Dictyota* spp. Fishes found in the coral reef and the sea grass beds of Bongoyo Island includes *Butterfly fish* (*Chaetodontidae*) *Sweet lips* (*Haemulidae*) *Grouper*, *Serranidae* and *banded coral shrimps* *Stenopus hispidus*. Other intertidal organisms include Sea urchin (*Diadema* sp), Giant clamps (*Tridacna* sp), Octopus (*Octopodidea*), Tiger cowry, (*Cyprea tigris*), Starfish (*Protoreaster linck*), cushion starts (*Oreasteridae*) Nudibranchia, Hermit crabs (*Anomura*), and edible sea cucumbers (*Holothuridae*)

The vegetation of Bongoyo Island is characterized by dominant species of coastal forest of East Africa. The plant species present at Bongoyo Island include *Asytasia gangentica*, *Casuarina equistifolia*, *Crotolaria laburuodes*, *Cyperus crassipes*, *Ipomoea pesi-caprae*, *Manilkara sulcata*, *Mamusops fruticosa* *Sideroxylon inerme*, *Tephrosia pumila* var *aldabresis*, *T. pumila* var *dumesis*, and *Vitex* spp. Others are orchid species such as *Enlophia petersii*, *Oeceoclades zanzibarica* and *Vanilla roscheri*. *Sideroxylon inerme*, *Manilkara sulcata*, *Mimusops fruticosa*, *Haplocoelum inoploeum* and *Vitex* sp are the most degraded species because of overused for fuel wood and building.

Animals found in the Island include different types of rats, lizards and snakes and different types of birds and butterflies. Others are two species of endangered sea turtles: Hawksbill (*Eretmochely imbricata*) and Green turtles (*Chelonea mydas*). Main threats to sea turtle are:

- Pouching of nests by fishermen
- Turtle nesting below the high water mark. Many nests become infertile if inundated by water. The increasing amount of sea transported pollution, namely the non-biodegradable plastics; obstruct females laying above high water mark
- Turtle caught in the seine nets
- Turtle feeding and breeding are threatened by uncontrolled development activities

2.2.2.2 Pangavini Island

Pangavini a coral Island rag surrounded by steep cliffs that make it inaccessible, lies between 06°40'42" S and 38°14'12 E. The islet has no beaches and visitors generally do not land there. The upper intertidal of the Island is rocky while the lower intertidal on most areas is sandy.

Coral reef around Pangavini Island is patchy without a well-defined reef slope. It grows on the sub tidal areas especially on the west and east of the island. In the most recent assessment by Muhando (2004) coral cover on most of the sub tidal area was estimated at 5-35%. Areas on the west and the northeast sides coral cover of more than 35% were observed. Coral bleaching had decreased live hard coral cover on the island reefs, (from 78.2% in 1998 to 57.1% in 1999 on the southwest: Kamukuru, 1998 and Wagner, 1999). Current studies indicate that there has been poor coral recovery.

The current survey around Pangavini Island also shows that the composition of corals species has changed drastically from an abundance of branching *Acropora* in 1997 to *Montipora aequiturbaculata*. Apart from the coral bleaching, poor survival of *Acropora* on the northwest side is due to breakage by strong wave action

(Mrema, 2001). A manta tow survey around Pangavini island shows that most of the fringing reef consisted of coral rubble, largely covered with turf algae, dead coral, sea grass, macralgae and sand, except for patches of good hard coral growth on the northeast and southwest sides of the Island (Mrema, 2001).

The dominant sub tidal vegetation is sea grass and seaweed grown on sandy patches in the lower intertidal zone. A variety of invertebrates are found in the intertidal flats including shelled molluscs and sponges, octopus, mussels, rock crabs and a variety of bivalves and gastropods.

There are many species of fishes including reef fishes and shellfish ranging from lobsters, squids to crabs.

The rocky cliffs surrounding the island have protected it from human disturbance. Pangavini Island is an important breeding, resting and feeding site to a variety of rats, birds and reptiles (snakes and lizards). There is also an assortment of insects including butterflies.

The natural vegetation of the island is similar to that of Bongoyo and Mbudya.

2.2.2.3 Mbudya Island

Mbudya lies between 06°40' - 06°40'.5 S and 39°15 E to the northwest about 3 km offshore, within easy reach of the hotels on the North coast of Dar es Salaam. This island also is uninhabited. There are sand beaches on the western and eastern sides (east beach 270m and northwest beach 170m). These sand beaches are a tourist attraction. The upper intertidal zone is rocky except at two areas where there are sand beaches. The lower intertidal zone is also rocky with coral growth on the protected west and with a mixture of sea grass, algae and encrusting coral on the sheltered east side of Mbudya.

A study conducted by Kamukuru in 1997 on the fringing reefs at Mbudya Island observed that the dominant benthic category was hard coral, which cover an area of 81.2% on the southwest side of Mbudya. The second category in importance was algae turf, which occupied 6.5% of the area at Mbudya southwest. The third was coral line algae, which was highest (17.4%) at Mbudya northwest. Other benthic categories (calcareous algae, fleshy algae, sand, sea anemones, sea grass, soft coral, sponge, and clams) showed low percent cover (<10%) at all sites. Beyond the coral distribution areas, the bottom is sandy with patchy sea grass beds.

Vegetation on Mbudya Island is tropical coastal forest. The dominant species are *Crotalaria laburuodes*, *Casuarina equisetifolia*, *Cyperus crassipes*, *Asytasia gangentica*, *Manilkara sulcata*, *Mamusops fruticosa*, *Sideroxylon inerme*, *Ipomoea pesi-caprae*, *Tephrosia pumila var aldabresis*, *T. pumila var dumesis*, and *Vitex spp*.

The lower intertidal zone also marks the start of coral reefs on the western sides of Mbudya. About 10% of the coral on the reef flats of Mbudya are exposed during spring low tides. Extensive algae mats and soft corals occur on the lower intertidal zones on the exposed eastern sides of Mbudya, Bongoyo and Fungu Yasin.

Sea grass dominates the sandy lower intertidal area in eastern Mbudya. The dominant species are *Halodule* on the upper intertidal, and *Thallasodentron ciliatum* and *Thalassia hemprichii* on the lower intertidal and sub tidal. The algae found on the rocky intertidal area include *Jania spp*, *Codium spp*, *Padina spp*, *Sargassum spp* and *Dictyota spp*. Fish species reported are powder blue surgeonfish *Acanthurus leucosternon*, butterfly fish *Chaetodontidae*, long nose, exquisite, white browed and threadfin, small wrasse *Labridae*, angelfish including 2 Royals and Yellow bar, *Sweet lips Haemulidae*, *Grouper*, *Serranidae* and *banded coral shrimps Stenopus hispidus*. Animals in the intertidal flats include octopus, sea urchin, giant clamps, rock crabs, tiger cowry, starfish, cushion starts, nudibranchia, hermit crabs, edible sea cucumbers and hawksbill (*Eretmochely imbricata*) and

green turtles (*Chelonea mydas*). Other animals include a variety of rats, lizards, snakes, birds and butterflies.

2.2.2.4 Fungu Yasin Island

This island of sand bank seen only during low tide lies between 06°36'00" S and 39°14'30"E. It is devoid of vegetation. The upper intertidal zone is mostly rocky except at the northwest corner where the sand bank is situated. The lower intertidal zone on the west and north is sandy with abundant sea grass mixed together with coral patches. The southeast lower intertidal areas are rocky.

Coral reefs are found on the western and eastern side of the Island where more than 35% of coral cover are located on two locations: one on the southwest waters of less than 10 m (108,320 m²) and the other on the deeper waters (462,765 m²). Algae and sea grass were reported to dominate most of the sub tidal areas on the north and south with little coral cover (1-5%). It was reported from the study conducted by Mhando and Francis that live coral cover has decreased by 8% - 20% in the southeast reef areas and the hard coral species dominance has changed from *Acropora* to *Montipora* and *Porites*. In addition by observing the dead corals, it was concluded that mortality was much severe in Fungu Yasin than in other reefs in the DMRs. Moreover soft corals were reported to contribute between 22 and 32%, and dominating the biotic reef benthic cover (Muhando and Francis Opcit).

The lower intertidal zone on the west and north of Fungu Yasin is abundant of sea grass. Like other DMRs Islands the dominant sea grass species are *Thalassodendron ciliatum* and *Thalassia hemprichii*. The algae present includes *Jania* spp, *Codium* spp, *Padina* spp, *Sargassum* spp and *Dictyota* spp. Fish species reported are butterfly fish *Chaetodontidae*, Sweet lips *Haemulidae*, Grouper, *Serranidae* and banded coral shrimps *Stenopus hispidus*.

Animals in the intertidal flats include sea cucumbers, octopus, sea urchin, giant clams, rock crabs, tiger cowry, starfish, cushion stars, nudibranchia and crabs

2.2.2.5 Inter-tidal Habitats

The Dar es Salaam Marine Reserves System have several but diverse and unique inter tidal habitats. From the study conducted by NEMC in 1988, sea grass bed systems were found to be the most abundant and ubiquitous in shallow water ecosystem in the Dar es Salaam area. Due to their abundance, and because they have no direct commercial use and are protected by fringing reefs, they provide an excellent habitat for burrowing organisms and support an extensive epifauna and benthic faunal population. The reported dominant species present in Dar es Salaam waters are *Thalassodendron ciliatum* and *Syringodium isoetiplum*.

A number of algae species such as *Sargassum* sp., *Ulva fasciata*, *Padina* sp. and *Dictyota* sp were found growing with sea grass on the reef flat. *Sargassum* sp was reported to be the most conspicuous and abundant in the area and often occupying large areas. Lush growths of the green algae *Enteromorpha* sp were also reported on the northern part of Dar es Salaam. This growth normally is supported by high nutrients loading available in the area by partially treated or untreated sewage from two pipes located on the north side of the harbour entrance.

2.2.2.6 Coral Reefs

Studies conducted in 1980s and 1990s reported a general degradation of coral reef ecosystems in the DMRs, mainly due to bad fishing practices and over-exploitation of certain key species. However, other studies conducted in 1999 and 2000, reported that regardless of the use of destructive fishing methods, coral reefs persisted and in some areas the coral cover had increased, except in Fungu Yasin where bleaching effects were severe. The lower intertidal zone also marks the start of coral reefs on the western sides of Mbudya and Bongoyo. About 10% of the coral on the reef flats of Mbudya and Bongoyo are

exposed during spring low tides (Muhando and Francis 1999).

The coral species reported are *Montipora aequituberculata*, *Acropora*, *Montipora*, *Galaxea*, *Fungia* and *Porites*. Soft coral, *corallimorpharians* and *algae* were more significant in Fungu Yasini than on the more sheltered sides of Mbudya, Pangavini and Bongoyo. Irrespective of the existing threats, the coral reefs and its resources in the Dar-es-salaam Marine Reserve System could recover if proper management strategies are urgently implemented.

In these reserves reefs play an important role in coastal protection, fisheries and tourism.

However, because the majority of the reefs are close to the hinterland are under serious threat from diverse factors including natural forces such as storms, erosion and human activities. Also coastal development, unplanned tourism as well as lack of awareness, lack of trained and experienced personnel available for reef management and lack of resources have contributed towards coral reef degradation.

2.2.2.7 Mangroves

Mangroves flourish along sheltered inter-tidal coastlines on soft saline sediments that are often anaerobic (lacking oxygen). The Mangrove ecosystem includes much more than just the trees and encompasses terrestrials, freshwater, marine and estuarine systems. Mangrove species are found in several spots on the Dar es Salaam coastal areas.

In DMRs there are two species of mangroves found on shark lagoon. They are nevertheless poorly developed. The species are *Sonneratia alba* and *Avicennia marina*.



The protection of mangroves is important because they are feeding, breeding and nursery grounds for a great variety of invertebrates and fish, many of which move out into the ocean during their adult stages.

2.2.2.8 Fish

Fish types found in DMRs include *rock cods*, *jackfish*, *banner fish*, *mackerels*, *barracudas*, *batfish*, *sharks*, *kingfish*, *fusiliers*, *sergeant majors*, *emperors*, *snappers*, and *tuna fish*, among others.

2.2.2.9 Benthic & invertebrate fauna

A study by Muhando and Francis *op cit* reported that the abundance of macro benthic invertebrate in the DMRs was very low. However other studies indicated a relatively consistent assemblage and abundance of macro benthic invertebrates living in sediments. They include lobsters, ornamental shelled gastropods, bivalves, sea cucumbers, crustaceans, echinoderms, sea urchins, and crabs. There are indications that in several areas commercially valuable invertebrate resources are over-exploited, but much of the information is anecdotal.

2.2.2.10 Birds

A diverse assemblage of seabirds is found in the reserves. They include both seasonal migratory and local birds. Common species sighted include:

White reef heron, probably *Egretta dimorpha*, little egret *Egretta garzetta*, Whimbrel *Numenius phaeopus* and Sanderling *Calidris alba*



2.3 Socio-economic and cultural environments

2.3.1 Stakeholders Characteristics

Although the DMRS are uninhabited, the stakeholders who reside in their periphery affect and influence the protected through the actions and decisions they take on the resources.

An assessment of the stakeholders in the DMRs¹ characterized the reserve as a multi-user area consisting of people that depend on it for a livelihood by servicing recreational or commercial service. Key stakeholders are fishers, research and academic institutions, tour operators, hoteliers, local government and, visitors to the reserves.

Local fishing communities in the vicinity of the DMRs

These are mainly involved in the direct extraction of marine resources in the waters adjacent to the reserves. Local fishing communities in the vicinity of the DMRs include Mbweni, Ununio, Kunduchi, Msasani, and Banda Beach.

Tour operators provide ferry service to visitors to the islands (e.g. Slipway ferry service and other operators. The Dar es Salaam Yacht Club (DYC) brings together private boat owners who cruise for leisure. The tour operators and other related users contribute positively to conservation through sharing of information, donation of facilities to MPRU and physical participation.

2.3.2 Economic Activities

The marine environment and resources within the reserves in conjunction with those in adjacent terrestrial and marine areas support economic activities of both local, national and international significance particularly tourism and fish trade.

2.3.2.1 Fishery activities

Fishery adjacent to the DMRs is characterized by traditional artisanal fishery in Mbweni, Ununio, Kunduchi, Kawe and Msasani. The Main landing sites include Mbweni, Ununio, Kunduchi, Msasani village, and Banda Beach.

About 4200 fishermen operate from communities close to the DMRs. They include both resident and non-resident fishers. The Mbweni and Msasani landing sites host the largest number of fishermen. The majority of the non-resident fishermen in Kunduchi are seasonal fishermen who travel from Mafia, Pemba, Tanga, Mtwara between March and November to take advantage of periodic abundance of species such as sardine, fusilier, and kingfish.

Landing sites on the Kunduchi coast are dominated by artisanal fleets, where outriggers is the most common boat type followed by small dugout canoes (*mitumbwi*) and dhows (*madau*). Paddles and sails are the sole means of vessel propulsion. Thus these fishermen do not fish over a much wider area when compared to fishermen operating from Banda Beach where engine-driven boats are the common types of fishing vessels.

A combination of traditional and modern fishing technique is employed to catch various fish species. Lines (esp. hand lines, *Mshipi*) and traps (esp. basket traps (*madema*), are the most common types of gear used in Dar es Salaam, followed by shark nets (*jarife*), and gill nets (*nyavu*). Use of beach seine nets (*kokoro or juya*), is common in the grass beds between Kunduchi and Msasani and in Msasani bay.

Fishing is done all year round although peak time is in October, November and December, while from March to July, the harvest is very poor. The seasonal differences in harvesting are related to changes in wind

¹Roxburgh, T., Morton, I., Rumisha, C. and Francis, J. (Editors), 2002. An Assessment of the Stakeholders and Resources Use in the Dar es Salaam Marine Reserves System. ICRAN/WIOMSA. 102 pp.

direction.

Table 1: The main fish species caught in marine waters of DSM

Common Name	Representative Species	Local Name
Rays	Rhinoptera javanica	Taa
Flat fish	Psettodes	Goyogoyo
Sardine	Sardinella gibbosa	Dagaa
Thread fish	Polynemus spp.	Kupe
Cat fish	Arius spp.	Hongore
Half beaks	Hemiramphus spp.	Chuchunge
Mackerel	Rastrellinger kanagurta	Vibua
Parrot fish	Leptoscarus spp	Pono
Rabbit fish	Siganus spp.	Tasi
Scavenger	Lethrinus spp	Changu
King fish	Scomberomorus commerson	Nguru
Tuna	Auxis thazard	Sehewa
Jacks	Seriola rivoliana	Kolekole
Rock cod	Epinephelus spp	Chewa
Silver Biddies	Gerres spp	Chaa
Mulletts	Mugil cephalus	Mkizi
Milk fish	Chanos chanos	Mwatiko
Cobia	Rachycentron canadum	Songoro
Sword fish	Xiphias gladius	Samsuli
Queen fish	Scomberoides	Pandu

Source: NEMC study, 1995

Problems facing the fishing community whose ramifications are felt in the reserves are the use of destructive fishing gear and techniques - the use of ring and seine nets over coral reef, dynamite fishing and beach seine nets. All these fishing gear are illegal.

2.3.2.2 Tourism and Recreation

For ages on the DMRs have attracted many recreational visitors. Monitored data of the visitors showed a steady increase of visitors to the islands over the years. Many of them use ferry services offered by local operators. Private boat users mainly from Dar Es Salaam Yacht Club also visit the island reserves. The majority of recreational visitors to the Reserve islands tend to visit Bongoyo and Mbudya which have large and easily accessible beaches while some do visit Fungu Yasini with their boats mostly during low tide.



Coastal resort hotels arrange recreational tour visits to the reserves. The MPRU has granted "Agent" status to some of these service providers e.g. the Slipway and White Sands and Silver Sands hotels.

A return ferry ticket to Mbudya is about US \$ 10 or 10,000/- and Tsh. 7500 to Bongoyo. Included is a Tsh



1000 entry fee to the Reserves that the Agents pass over to the MPRU. Extras such as food and rent of Banda are sometimes included.

A number of small Bandas have been put up for shade and catering to guests.

The DMRs has sought support from local communities and trained them as Honorary Rangers. They assist conservation activities by cleaning the beaches and provide services and information to visitors. They also undertake surveillance duties to enforce compliance

2.3.2.3 Scuba Diving

White Sands Hotel and Dar Yatch Club organise dive trips to the Reserve area for qualified divers. Diving in the reserves takes place from rigid inflatable boats - the RIBs (DYC use hard boats) mainly on an area that cover the entire reserves and beyond the reefs - collectively known as "Big T". All the dive centres also offer running pool and open water-based training

2.3.3 Other Activities

2.3.3.1 Agriculture:

Many Dar es Salaam residents are involved in urban agriculture due to the tremendous growth of the urban population and the limited capacity to offer formal employment to most of the urban dwellers. Livestock keeping is relatively low among the urban dwellers.

2.3.3.2 Quarrying and mining:

Dar es Salaam region is not endowed with mineral resources.. Salt is exploited along the seashore while mining and quarrying activities are mainly for sand, stone, limestone and clay, materials used in the construction industry. Stone are mined at Kunduchi, Boko, and Bunju quarries. The same activities are also carried out illegally at Kawe, Mbezi beach, Tegeta Mtongani, and Boko. In additional small-scale extraction is being made in disused quarries in Msasani, Oysterbay and Masaki.

2.3.3.3 Seaweed farming:

Seaweed farming is developed along the ocean shore and most species cultivated are



Eucheuma cottonii and *Eucheuma spinosum*. Seaweed (Mwani) cultivation occurs especially in Mbweni and Ununio villages. Villagers have adopted seaweed farming because of the simple technology required to grow it.

2.3.3.4 Cultural resources:

Ruins of historical buildings, monuments such as caves, a mosque and harbour dating back to the 13th century are found in proximity to the reserves. Coastal peoples value their culture and traditions. There are initiatives by KICAMP to develop these in conjunction with game fishing, diving, sun bathing, and natural scenery of white sand beaches to provide income-generating opportunities for people living along the coast. Other important cultural attractions in the coastal area include local taarab music performances, artisanal fishing and agriculture and traditional handcraft.

CHAPTER 3: KEY MANAGEMENT ISSUES

3.1 Natural Resources Issues

3.1.1 Poaching

Fishers from local communities in the immediate vicinity of the reserves and migrant fishers (Fishing camps) come to the DMRs to take advantage of the near-shore fishery and availability of good market.

Some 4200 fishermen take on the sea from villages in the vicinity of the reserves and taking advantage of unmarked boundary and low enforcement capability, fish freely in the reserves. About (1701 fishermen) or 44% are migrant fishermen operating from the nearby coastline of Kunduchi. They poach sardine, fusilier, and kingfish, which are abundant between the months of March and November.

Commercial fishery of sea cucumbers and crayfish (lobster) has led to severe over fishing of the two species. A typical daily catch is reported to be in the tune of 25 – 30 pieces of lobsters and 20 - 30 sea cucumbers per boat per day. A large number of egg-bearing females and small size Lobsters are taken in the catch.

Pressure on the fisheries resources increases in the near shore areas during the South-east Monsoon period-May-September and during the strong North-East winds which restricts fishing to shallow seas for fear of strong winds. This directly impacts the fish nursery grounds in the grass beds and coral reefs as well as feeding turtles. Thus a combination of high fish demand and strong winds proportionally increases fishing pressure in the near shore waters.

It was recently reported that marine turtle and dolphins had been butchered and that poachers were selling their meat to neighbouring coastal villages of Mbweni and Kunduchi.



The two species which are found in the reserves are endangered animals protected under CITES.

Other resources that are poached in the reserves include shell, seaweed and worms for bait. Trees, herbs and shrubs are also cut for medicinal, poles, fish traps and firewood. Sand mining especially on sandbanks and beaches is illegally carried out a factor that destroys the environment of the reserves.



3.1.2 Encroachment

Fishing in the Dar es Salaam coastal area is highly unregulated providing loopholes for use of unsustainable fishing gears and destructive techniques such as dynamite, beach seines, drag nets, ring nets and spear guns.

Although laws prohibit dynamite and utility of destructive and unsustainable fishing gear, low enforcement capability outside the marine reserve leaves poachers to operate unhindered. The use of beach seines was banned in 1997 under Regulation G.N. 189 (an amendment of the 1970 Fisheries Act). However, fine-mesh fishing nets (i.e. nets with meshes of 1 cm) continue to be manufactured by local industries and are readily available in the shops.



**Dynamite caught adjacent
DMRs**

Other underlying factors include greed, poverty, ignorance and lack of alternative sources of livelihood. A large proportion of fishermen in local communities are aware of the underlying causes of resource degradation². Destructive techniques are used because one wants big catches at a go irrespective of the damage done to the resources.

3.2 Indiscriminate and uncontrolled recreational activities

Besides proximity to the mainland the DMRs offer excellent vintage for tourists in the coastal resorts of Dar es Salaam. The fast expansion of the hospitality industry following liberalisation of the economy has led to an abrupt rise of recreational activities in the

reserves. They include the introduction of indiscriminate and uncontrolled use of jet skis, private motorboats and yachts that cause various damages to the marine resources and environment. There is a congestion of water sports in DMRs and waters in the vicinity. The noise from engines, boats and ferryboats have serious consequences to the natural resources especially coral polyps and fish.

SCUBA diving, snorkelling and windsurfing sports undertaken by amateurs from neighbouring coastal resorts could easily damage the fragile environment of the reserves. Besides there are no mooring facilities in the reserves just as there is the absence of guidelines and regulations to manage those sports. All these activities and sports pose a threat to coral reef especially anchoring and standing on them.

Visitors to DMRs congregate on small sand beaches. This trend can easily lead to over use of the beaches. Moreover no study has been initiated to establish the levels of acceptable limits of change. Overcrowding and trampling of the beaches is known to accelerate erosion. Erosion is a serious concern in the DMRs because of their location close to the Inter Tropical Convergence Zone, which exposes them to the havoc of the Northeast and Southeast Trade winds (Monsoons).

Large numbers of visitors also encourage littering and collection of shells and other organisms for curio.

Most service providers in DMRs lack capacity thus provide low quality services a factor, which can dent the image and popularity of the reserves. This anomaly needs to be addressed immediately.

3.3 Poor accessibility and infrastructure – (Nature trails facilities)

Presently visitors concentrate on beaches especially the western sides of Mbudya and Bongoyo. Msasani Slipway offer regular boat shuttles to Bongoyo Island only. White Sands Hotel operates shuttle services to Mbudya Island. There is no intra-island transport.

Nature trails are not well developed and there is still a need to invent other activities that would catch attraction of visitors and occupy them. Also effort should be made to spread visitation activities to allowable zones.

3.4 Pollution and impact of developments in the vicinity of the reserve

DMRs being close to the mainland are susceptible to pollutants generated from domestic and industrial activities. The pollutants are brought into the sea by the rivers that empty into the Indian Ocean, notably

² Roxburgh, T., Morton, I., Rumisha, C. and Francis, J. (Editors), 2002. An Assessment of the Stakeholders and Resources Use in the Dar es Salaam Marine Reserves System. ICRAN/WIOMSA. 102 pp.

the Msimbazi, Mlalakuwa, Mbezi and Tegeta rivers. The city of Dar es Salaam also discharges untreated sewage directly into the Ocean. Other pollutants are brought into the sea by storm water and affect the reserves.

The untreated waste that is dumped into the sea eventually finds its way into marine reserves through ocean currents littering the beaches and shores of the island reserves. Most annoying hard wastes are plastic bottles, plastic bags, glass bottles, sandals and syringes and needles.

The untreated domestic waste when discharged into the sea increases nutrients load which stimulates algae growth on coral reef eventually killing coral polyps. Effluents emitted by industries notably hydrocarbons, dyes and heavy metals impact negatively on marine life.

3.4.1 Dar es Salaam City urban developments

The fast expansion of the city of Dar es Salaam coupled with the ever-increasing population has put pressure on resource use notably sand, stones, lime, timber and the area for development. Construction activities and the demand for building materials and space has led to land reclamation, sand mining along adjacent streams and rivers and coral mining to meet ever-increasing construction industry.

These activities have accelerated sedimentation load in the marine environment that are felt in the DMRs and could affect coral reef and sea grass beds.

Port and shipping activities

The port of Dar es Salaam, the largest and busiest in the country, serves both Tanzania and landlocked states of Uganda, Rwanda, Burundi, Zambia, Malawi and Democratic Republic of Congo. Many ships call at the port to discharge imports and transport exports.

The port, which is as old as the city of Dar es Salaam, has its areas of operations, which overlap the frontiers of DMRs, especially the area designated as outer anchorage. In this zone, ships anchor for days waiting to be led into the port. While on mooring they could easily discharge bilge water (bathroom and kitchen waste water and/or oil from engine room). Similarly crude oil discharges from tankers at the Kigamboni Oil Jetty as well as transshipments of oil from tanker to tanker could spill crude into the waters and pollute the marine environment. The discharge of crude oil wash and ballast water into the marine environment could also cause pollution. Ballast water harbour alien species of marine organisms that could affect the biodiversity of DMRs.

Uncontrolled marine transport plying in the reserves also poses a big threat to the reserve by causing sedimentation and hence smothering of coral, while noise from engines of ship and speedboats is a source of noise pollution.

Dredging of the harbour mouth is another potential source of pollution.

3.5 Boundary demarcation – *Buoys and beacons*

The gazetted boundaries of DMRs are based on a 5 fathom (about 10 metres) contour depth. Because of the bathymetric characteristics of the area, the edge is convoluted and irregular which makes it difficult to demarcate on a conventional manner. There is a concern that the boundaries of the reserves would be problematic to mark with beacons and buoys. Presently the reserve boundaries are unmarked. The absence of buoys and beacons to show the boundaries of the reserves creates problems for law enforcers, fishermen

and recreational users.

3.6 Species of special concern and their critical habitat

DMRs are famed for being a habitat for the endangered species notably the turtle and dolphin. They are a nesting ground for the threatened turtle, and hordes of dolphin are easily spotted in the reserves.

The reserves also harbour coconut crab and act as stop centres for migratory whales and birds. The unique vegetation of the reserves protects three orchid species - *Enlophia petersii*, *Oeceoclades zanzibarica* and *Vanilla roscheri*, listed as endangered by CITES.

Strict enforcement is needed to protect and conserve the fore mentioned species from poachers and encroachers.

3.7 Natural disasters and hazards

3.7.1 Crown of Thorn Starfish (COTs)

There is an infestation of Crown of Thorn (COTs) in DMRs. Field observation during biophysical monitoring conducted in May 2004 showed that all reefs around the islands of Mbudya, Pangavini and Bongoyo are infested by coral predators mainly species of COTs and algae competition. This trend could be attributed to natural factor, pollution or it could be an indicator that the natural predators of these organisms have been over exploited- large herbivorous animals were over-fished.

3.7.2 El-nino

The coral bleaching event in the DMRs in 1998 has been linked to the effects of El-Nino weather phenomenon. The impact of coral bleaching on the marine life and their adverse effect on socio-economic performance on fishermen is yet to be determined.

3.8 Poor Information dissemination and communication facilities

The majority of local fishermen and recreational users are not aware of the laws and regulations protecting DMRs. At present information for fishermen and visitors is not available except those read on the MPRU newsletter- Dodoji, signboards and ticket messages from ferry agents. There has been little consideration for information needs for local users of the DMRs in Kiswahili, elaborating on the regulations and their roles and responsibilities. However messages are brief and not elaborative to fulfil the needs of all stakeholders.

Publications on the reserves have not been widely distributed. Sustainable management is possible when appropriate data and information regarding the managed environment and resources is available, easily accessible and utilized for planning and implementation.

There is a need for a comprehensive awareness campaign for stakeholders through publications of brochures, newsletters, meetings, website, radio and TV programmes. Drama and film documentaries on pertinent issues.

Presently there is inadequate communication link between DMRs, the headquarters and neighbouring coastal communities. The existing communication channel is the VHF radio. However the radio coverage is limited by distance, thus does not cover the wide area of the reserve. Another way available is the use of mobile handsets whose operation cost is expensive. In order to monitor compliance and conservation activities there is a need for improved communication.

3.8.1 Cultural and Socio-economic issues

Fishing communities living in the vicinity of DMRS earn their living from the sea and smallholder farming. Their traditional rich fishing ground was the sea, which has since been declared a no take area. These communities have been deprived their economic backyard. The expectation of the closure of the reserve area is to enhance fisheries productivity through spill over effect. The issue here is the impact of enforcing the regulations and restrictions on the communities. Free access to fisheries resources for over 50 years within DMRs, has resulted in increasing concern about the recent Marine Parks and Reserves involvement in the reserves. Many fear that MPRU will restrict use of the reserves as a result of strict preservation measures. Findings have shown that this issue is heightened by lack of information and at times misinformation from people with self-interest and hidden agenda.

3.8.2 Cultural beliefs, Cults and sacrifices

DMRs have sites revered by local communities and used for rituals and sacrifice offering. These include ancient graves on the Mbudya Island. The visitors of the sites however do it secretly at night and involves rituals and sacrifices. There is a need for DMRs management to recognise and respect this cultural ritual by putting in place a mechanism to provide for such activity without jeopardising conservation.

3.9 Potential investment in the Reserves

Currently there is little infrastructural development in the reserves except for a few existing “bandas” that provide shelter to visitors and service providers. The stakeholder study found out that this state of undisturbed naturalness is approved and accepted by visitors. There is however a need to improve infrastructure and services rendered.

A mechanism should be put in place to guide future development partners in the reserves to complement the existing services available and chip in skills to exploit untapped potentials. Future investments in the reserves must be guided to avert negative impact that could change the naturalness of the reserves, interfere with the objectives of conservation.

3.10 Overlapping boundaries with harbours authority

The boundaries of Tanzania Ports Authority traverses areas designated for conservation in the DMRs. Moreover the ports’ outer anchorage is in the DMRs areas. This calls for consultations and cooperation between DMRs and port authorities to monitor ship activities to enforce conservation compliance.

3.11 Overlapping mandate

Because of overlapping jurisdiction, several institutions and agencies have interests and implement activities that affect DMRs. These include the MPRU, the Fisheries Division, the Vice Presidents Office (VPO) in case of environment, and Forestry and Beekeeping Division (FoB) for forestry management, the Tanzania Port Authority, and Local Government Authorities through issuance of fishing licenses. All these interests and activities need to be harmonised in order to avoid conflicts and duplication of efforts.

3.12 Lack of effective mechanism for community involvement (local, national, international, fisher, hotelier, diver, tour operators etc)

While Act 29 of 1994 that established MPRs is explicit on community involvement in the management of Marine Parks, it is silent on marine reserves. In the process of developing the GMP, communities have shown enthusiasm and interest to participate in conservation. Besides they have volunteered to be honorary

rangers and they are now eyes and ears to the conservation authority. There is a need to put a mechanism that would provide for their active participation in the conservation process of DMRs.

3.13 Low capacity for management (staff, infrastructure and facilities)

DMRs lack adequate human resources capability to take up the challenges of conservation. Presently staffs working for the reserves were not recruited solely to work for DMRs. The reserves are administered from the MPRU headquarters using resources and facilities of the head office. In essence the activities of the reserves are always overshadowed by the needs of the MPRU headquarters. There is no office in close proximity to the reserves and infrastructures are rudimentary.

Low capacity coupled with undefined organisational structure has adversely affected the management of the DMRs.

3.14 Financing

The mere fact that the territories of the DMRs are close to Dar es Salaam and provide recreational outlets for tourists residing in the costal resort hotels is a plus on the part of the reserves with regard to possible sources of financing. Currently the reserves operations are constrained because of inadequate funding. Treasury and entry fees are the only source of funding. However no initiative has been taken to explore the avenues of raising funds for enhancing conservation of DMRs.

The challenge is to identify possible sources of funding, reach out and mobilise them. Initiatives should be taken to entice individuals and institutions to become friends of conservation and contribute both materially and in kind towards the sustainability of DMRs. There is a need to look into possibilities of expanding the revenue base from the emerging investment opportunities within DMRs e.g. royalties, rentals etc.

CHAPTER 4: AIM AND GOALS OF THE GMP OF THE DMRs

The overall aim and objectives of enacting Act no. 29 of 1994 was to conserve marine resources in protected areas. Within the framework of the Act, Mafia Island and the five islands of Bongoyo, Pangavini, Fungu Yasin, Mbudya and Maziwe Islands were made protected areas. Mnazi Bay- Ruvuma Estuary Marine Park was later added in the list.

4.1 Goal and Objectives

Protection and conservation of marine and coastal environment of the four islands: Bongoyo, Pangavini, Fungu Yasin and Mbudya Island (DMRs) for the benefits of present and future generations.

The goal of the GMP of DMRs would be realised by adopting wholly the purposes of conservation clearly stated in Section 10 of the Marine Parks and Reserves Act 29 of 1994:

- 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;
- 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;
- To ensure that villages and other local resident users in the vicinity of, or dependants on marine reserves are involved in all phases of the planning, development and management of the reserves, 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 protected marine area;
- To stimulate the rational development of under utilised natural resources;
- To promote community oriented education and dissemination of information concerning conservation and sustainable use of aquatic resources in the marine park; and
- To facilitate research and monitor resource conditions and uses within the marine park.

Objectives

The GMP is a tool to effect the protection and conservation of the resources in the reserves to ensure their sustainable utilisation. The objectives of the plan is:

- To protect, conserve and restore the Dar es Salaam marine reserve's species and genetic diversity, living and non living marine resources, cultural and ecosystem processes.
- To promote sustainability of non-extractive resource use and activities in the DMRs
- To ensure that all stakeholders are involved in all phases of planning, development and management of the DMRs.
- To promote community oriented education and information dissemination concerning conservation and sustainable non-extractive use of marine and coastal resources in DMRs.
- To facilitate participatory research and to monitor resources conditions and uses within DMRs.
- To improve the regulatory and institutional framework for management of coastal and marine resources in the DMRs, their buffer zones and immediate vicinity.

4.3. Management Objectives

Objectives for conservation of biodiversity and ecosystem processes

The main reason for declaring the four islands marine reserves was to protect their unique biophysical characteristics including coral reefs, sea grass beds, rocky intertidal areas, sand beaches and island vegetation important for fisheries, tourism and recreational activities.

The management goals and objectives are:

- To build on and complement existing knowledge and understanding of the critical aspects of biodiversity and ecosystems that include:

The distribution of marine and terrestrial biodiversity within the DMRs

The status and distribution of species and habitats considered threatened or endangered. They include turtles, coconut crab, 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 island resources, including, but not limited to, spawning areas, other aggregation areas, current patterns, seed and larvae dispersal and recruitment, and reproductive cycles

- To collect all information on the species, habitats and ecosystem processes in GIS format, by establishing the database.
- To identify threats to critical and threatened habitats, species and ecosystems, as they evolve
- To prohibit all resource-use practices damaging DMRs habitats and/or species
- To step up enforcement capability
- To promote compliance through patrolling and self-enforcement
- To develop species specific conservation plan for endangered species of marine turtles, including protection of nesting sites (with financial incentives if necessary) and impose a ban on the slaughter of nesting turtles and dolphin.
- To undertake regular monitoring and assessment of critical and threatened habitats and species.
- To implement national legislation prohibiting the taking of endangered species, including sea turtles and dolphins, coconut crab and the export of Maori hump head wrasse (*Cheilinus undulatus*) and others listed under the CITES
- To rehabilitate environmentally degraded areas and nurture the growth of endangered species

Objectives for promoting sustainability of non-extractive resource use and activities in the DMRs

To regulate facilities used in recreational tourism such as boating, diving, installations and operation of public services.

To ensure structures erected and the operation of different activities and facilities related to tourism development conform to conservation needs.

Objectives for Stakeholders involvement in management and access to resources of DMRs.

Unlike the other marine protected areas in Tanzania, the DMRs do not have people residing within the reserves boundaries. However, because DMRs are close to Dar es Salaam city, there is a substantial amount of people operating different commercial and livelihood activities within and outside the reserves as well as those with interest in the management of the reserves. There is a spate of poaching in the reserves. Management activities lack coordination. Hence the importance of participation for all key stakeholders and partners i.e. local communities, civil society organisations, the private sector and conservation and

research institutions. In order to attain compliance there is a need to foster collaboration with all key stakeholders in the management and conservation of DMRs.

Although the statute which established DMRs does not contain provision for community involvement in conservation there is a need therefore:

- To promote collaborative data and information management and dissemination.
- To promote sustainable collaborative management with communities and institutions vested with authority to manage marine and coastal resources in the DMRs buffer zone and immediate environs.
- To involve local communities in management decisions.
- To involve local communities and stakeholders in the planning, implementation, monitoring and evaluation and cost and benefit sharing of plans and activities for sustainable management of the reserves

Objectives for community oriented education and information dissemination

While the majority of recreational users and fishers are aware of the status of the reserves, there is a need to involve all stakeholders in conservation activities. It is important to develop and implement a comprehensive programme for education and awareness raising to communities and stakeholders on conservation and management issues. They should also be educated on resource status and threats posed by unsustainable use. This would make them understand the rationale and concept behind various management strategies including prohibitions. The management objectives are:

- To promote sustainable collaborative management with communities, partners and institutions dealing with conservation activities of marine and coastal resources.
- To continue building awareness in order to engage stakeholders in conservation and creating stewardship in collaborative management.

Objectives for research, monitoring and reporting of resources condition and uses

In order to gather data and information for use in sustainable management and conservation of the DMRs the overriding principle would be “research for management” with objectives:

- To develop the scientific understanding of the status and trends of the resources and major threats to them.
- To promote community-based resource monitoring and reporting
- To use the obtained information to improve regulatory, management, conservation and protection of marine and coastal resources.

Objectives for improving regulatory and institutional framework for DMRs management

Studies conducted in and outside the reserves show the existence of overlapping jurisdictions, functions and activities. The overlapping mandate exerts pressure on the resources of the reserves. There are many institutions with related activities in the same area but with no collaboration with reserves authority. There is a need to address the overlapping mandate and difficulties in management:

The law treats each island as a separate reserve, but it has been proved difficult to manage them separately due to their closeness and similarities of habitats and biodiversity. Thus for effectiveness, efficiency and sustainability purpose, a longer-term strategy should be to manage the reserves and related areas as a single system of Dar es Salaam Marine Reserves system (DMRs) and to provide for multiple use as well as for

fisher interest by allowing fishing activities as the case with the marine park.

The objectives are:

- To cooperate with other institutions whose mandate and activities fall under the area demarcated as the DMRs
- To promote the adoption of an ecosystem approach for management of the Dar es Salaam Marine Reserves as a single system of DMRs which can later be gazetted as a marine park.

CHAPTER 5: MANAGEMENT PRINCIPLES AND STRATEGIES

The purpose of this chapter 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 will guide the management of the DMRs.

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 that are key to the conservation of marine biodiversity. Further, adaptive management is now widely recognised as an essential element of natural resource management.

5.1.2 *Adoption of an ecosystem approach*

The law that set up the DMRs is silent on mangroves located on coastal areas. Mangroves are filters of the sea just as corals play the role of rainforests of the sea. The principle of ecological connectivity demands that mangroves, sea grass and corals maintain interdependent relationship. Mangroves play a key role of protecting sea grass beds from excessive sedimentation and pollution from land based sources and also act as a refuge for reef and sea grass species during certain times of the year. The area of the current reserve provides for the conservation of coral reef and sea grass beds in the reserves. Thus the law should be amended to bring the mangroves in the area of conservation of the DMRs.

5.1.3 *Rehabilitate damaged areas*

Well-guided initiatives should be undertaken to rehabilitate damaged resources such as coral reefs using best available methods and technique e.g. physical removal of crown-of thorns and fresh algae; enhanced coral larval settlement and transplantation, temporary closure etc.

5.1.4 *Incorporation of the precautionary principle*

A precautionary approach is to be adopted to balance conservation needs and promotion of tourism to avoid alteration of the fundamental character of the reserve. Tourism should be regulated to avoid overloading of reserves. A study should be undertaken to establish the holding capacity of the islands and also determine the type and nature of structures that could be built to cater the basic needs of the visitors such as information centres, restaurants, bathing facilities and toilets. Also nature trails should be properly developed to save the fragile environment from trampling.

5.1.5 *Adoption of an integrated management approach for multiple uses*

Integration of a variety of interest within marine protected areas is usually achieved in practice through application of user zones aiming at integrating potentially conflicting uses by separating them spatially. A zoning scheme is not applicable because DMRs have a core zone status. The viable approach is to develop a management zone to guide *placement* of different facilities and activities in the reserves. These guidelines are elaborated in Chapter 6.

5.2. Management Strategies

5.2.1 Introduction

The 1994 Act and the 1999 Regulations prohibit extractive resources use in the reserves. The law provides only for controlled recreational, tourism, scientific research and other non-extractive resources use activities.

There is poaching of marine resources in the DMRs. Funds should be set aside to allow recruitment and purchase of equipment and facilities to enhance enforcement. The management strategies outlined here under are intended to strengthen enforcement measures, capacity building and financial sustainability of DMRs and are summarised as follows:

- Conservation of biodiversity and ecosystem processes
- Conservation of cultural and historical sites
- Sustainability of non-extractive resource use in the DMRs
- Stakeholders involvement in the management and access to resources
- Community education and dissemination of information
- Improving regulatory, institutional framework and management
- Sustainable financing
- Facilitate research and monitoring of resources condition, uses and management

5.2.1 Strategy to Conserve of Biodiversity and Ecosystem Processes

- Maintain effective enforcement of laws eliminating any form of extractive resource use in the reserves through patrolling.
- Collaborate with research institutions to develop stock enhancement mechanisms involving modification/improvement of habitat or introduction of artificial substrates to improve productivity of the stock.
- Issue permits for provision of services within the reserves. Permits should include provisions for management of waste (regular/daily clean up and litter collection, mechanism for solid and liquid waste disposal within the reserves) and on the mainland and routine maintenance of the facilities.
- Collaborate with research institutions to assess the extent of pollution and sedimentation from land base activities that impact the reserves and develop mechanism to reach out to responsible agencies for developing and implementing strategies to eliminate the impacts.
- Collaborate with concerned Agencies to manage and possibly regulate harbour, shipping and marine transport activities that operate within the DMRs or may impact the reserves.
- Amend the law to provide for the involvement of communities close to the reserves in conservation.
- Install beacons and buoys to mark the reserve boundaries.

5.2.2 Strategy to Conserve cultural and historical sites

- Identify and collect in association with local communities, existing information on sites of cultural significance within the marine park.
- Collaborate with communities and mandated institutions to formulate appropriate management measures to preserve and restore historical and sacred sites.
- Facilitate implementation of appropriate management measures in collaboration with communities, tourism operators and where appropriate, institutions and donors.
- Encourage new innovations in the restoration of historical and cultural resources.
- Train staff on the importance and management requirements of sites and relics.

5.2.3 Strategy to promote Sustainability of Non-Extractive Resource Use and Activities in the DMRS

- Maintain effective enforcement of laws regulating non-extractive resource use in the reserves through patrolling; marking boundaries, installation of mooring buoys in sites that receive large numbers of visitors (Bongoyo and Mbudya).
- Undertake comprehensive habitat surveys (terrestrial and marine) and reassessment of the visitor and diver carrying capacity and levels of acceptable change of the islands and reefs.
- Limit pressure on islands through the permit system and guided access to certain areas of the reserves e.g. nature trails on the islands. These should also form the basis for legislated regulations (see chapter 6).
- Promote low-environmental impact, high value investments in the reserves by ensuring all developments are guided by Investors Guides, EIA and Management Zones.
- Collaborate with tourism operators where appropriate to stimulate increased private investment into marine and coastal areas; promote tourism-related enterprises
- Harness under-utilised opportunities such as establishment of tourist and educational nature trails through the island vegetation, bird and reptile sanctuary etc.
- Ensure visitor's security, safety and emergency services are in place and functioning according to standards, through monitoring and training of staff and service providers.

5.2.4 Strategy to ensure Stakeholders Participation in Management and Access to Resources

- Engage different stakeholders to carry out certain management functions e.g. use divers and local fishers in the restoration of damaged resources; hotels and DYCs to assist with conservation initiatives, peer education and dissemination of information.
- Encourage and facilitate local resource user to engage in stock enhancement and guided extractive resources use within the reserves buffer zone e.g. aquaculture of algae (involving vertical set up), commercial macro-invertebrates (e.g. octopus, ornamental shelled molluscs, sea cucumbers, lobsters and giant clams) as a way to broaden their income base and relieve pressure on the over-exploited stocks.
- Establish mechanism for sharing the costs and benefits from collaborative management efforts.
- Enable stakeholders participate in the enforcement:
- Capacity building: training and providing means (e.g. telephone services) for apprehending culprits and reporting illegal activities in the reserves.
- Provide incentives to those who report the incidences which lead to apprehending of the illegal fishers
- Marine Reserves Authority participates in different fora that are initiated by community concerning resources use and management as appropriate.
- Establish Community Liaison Committees to promote dialogue, understanding and active cooperation between stakeholders and the marine reserves authority.
- Support community development activities that enhance the status of DMRS marine and coastal resources as incentive for stakeholders to participate e.g. through award schemes

5.2.5 Strategy to promote Community Education and Dissemination of Information

- Identify information need for different stakeholders
- Produce and disseminate targeted public awareness/outreach/education materials (e.g. about code of conduct, GMP contents) in the form of e.g. fact sheets, leaflets / brochures, calendars, newsletters/magazines, website, maps, books, documentaries etc.
- Support tourism operators and service providers in the promotion and marketing of the reserves attractions such as dive sites.
- Set up interpretation centres on visited islands (Bongoyo and Mbudya).
- Organise regular stakeholders meetings and workshops for e.g. Law Makers, Politicians, and Mass Media etc.
- Support formation of Environmental Conservation Committees in fisher communities around DMRS. Use the committees to reach other members of the community.

- Target key schools to initiate awareness on DMRs and support introduction of student's conservation clubs in school
- Encourage schools to visit and assist with conservation activities
- Link with other information centres for networking and dissemination of material

5.2.6 Strategy to facilitate Research, Monitoring and Reporting of Resource Condition and Use

- Identify, prioritise and support scientific and technical ecological, social and economic research and monitoring activities in such areas as:
- Studies and continued monitoring to quantify and qualify changes in fish species abundance, species composition and size distribution, and coral taxonomy to determine coral biodiversity and species composition (a measure of the success of enforcement and other management efforts)
- Study of natural and anthropogenic threats to the reserves biological resources particularly to corals and sea grass beds. e.g. coral bleaching, coral predation and competition patterns (crown-of-thorn starfish); sediment, silt deposition and pollution patterns (sand mining on river bed emptying in the DMRs, waste management systems along the Dar es Salaam coast e.g. tourist hotels).
- Biodiversity surveys (types and abundance) of intertidal communities (e.g. mapping of distribution of sea grass beds to identify spawning areas and seasons) for developing effective management strategies, enforcement mechanisms as well as for aquaculture potential or stock enhancement mechanisms.
- Ecological and resources use connectivity assessments among key ecosystems within the general Dar es Salaam marine and coastal area.
- Develop systems for collaborative collection, analysis, linkage, storage and dissemination already available information and data and information generated through new research and monitoring programmes.
- Establish database and a central metadata base for information under management of one organization with all research proposals registered there. There should be cooperation between parties (e.g. KICAMP and MACT) to avoid duplication of efforts.
- Resource distribution maps
- Develop mechanisms for sustained habitat/ecological monitoring e.g. development of permanent monitoring sites and standardised methods.
- Develop and implement a programme for monitoring all prohibited and regulated recreational activities in the reserves (e.g. boating and diving) and ensure their performance is in accordance with designated standards.
- Improve existing fisheries monitoring
- Fisheries data incorporated into habitat monitoring
- Standardise and validate data collection procedures
- Extend range of data collected (e.g. site fished)
- Engage fisheries officers in fisheries data collection
- Standardise format of reports
- Maintain availability of records per landing site

5.2.7 Improving Regulatory and Institutional Framework For Management of DMRs

Develop and implement structure for payment and collection of entry fees:

- Use tiered structure based on residency status for visitors to the island, Explore other types of fees in consultation with hotels, divers, and boat owners
- Develop efficient method of advertisement of fee structure rationale and collection methods.
- Collaborate with other institutions with mandate over the Dar es Salaam coastal and marine area to harmonise the existing laws over the area and support local councils to enforce relevant legislations, the Fisheries Acts and Municipal by-laws that:

- Prohibit development of fishing camps in the area. Visiting fishermen should be allowed to rent house in the villages so that the villagers can monitor them easily.
- Authorise use of *buffer zones* by locals living around the DMRs.
- Demand visiting fishers to pay camping fees to localities government.
- Collaborate with other institutions to promote sustainable resource use in the DMRs buffer zones and immediate vicinity to sustain resource abundance and diversity.
- Enforce regulations with participation of fisher communities in the total ban use of destructive fishing methods - prohibit improper use of small mesh size nets and purchase and sale of fine mesh fishing nets; strict controls and accountability of users of dynamite (mining and construction operations).
- Control land based sources of pollution and physical alteration and destruction of habitats
- Undertake habitat and resources use assessments i.e. ecological importance of habitat and importance of particular reefs/habitat to local communities as basis to facilitate relevant institutions to in-act/enforce regulations to reduce fishing intensity in buffer zone and vicinity of reserves through e.g. restricted fishing areas and/or seasons, restriction of gear type etc.
- Undertake assessment of the feasibility of alternative fishing grounds. Work with relevant institution to promote initiatives for compensation to fishermen dependent on the restricted areas who do not have suitable boats and gear to reach alternative fishing grounds or comply with gear restrictions through:
- Provision of gear exchange and improvement schemes
- Introduction of loan schemes
- Stimulate increased private investment into marine and coastal areas for rational development of under-utilized opportunities.

CHAPTER 6: PROHIBITED AND REGULATED ACTIVITIES

6.1. PROHIBITED ACTIVITIES

The MPRs legislation sets out a schedule of do and do not activities which could be undertaken in the reserves. All activities hindering or jeopardising conservation are prohibited. Specific restriction of certain activities in marine reserves is spelled out in Part X of the Marine Parks and Reserves Act, 29 of 1994. The 1999 Regulations also spell out permissible and non-permissible activities to be conducted in the reserves.

The following are categories of prohibited activities in the DMRs:

6.1.1 Prohibited extraction of living resources and extraction of non-living resources

- All resource, biological, non-biological and ecosystem processes are protected. Therefore extractive resource use of any kind is prohibited in the DMRs. Inclusive in this category are:
- Fishing activities
- Collection of fishing bites in the reserve areas on inter-tidal zone
- Cutting of trees
- Collection of inter-tidal and sub tidal organisms
- Coral mining
- Killing and collecting of terrestrial animals and birds
- Sand nursing
- Littering

6.1.2 prohibited recreational/tourism activities

- Jet skiing
- Seaplanes
- Sport fishing
- Sale and buying of marine curios in the reserves
- Entering the Reserve areas with Pets

6.1.3 Introduction of alien species of plants and animals

Alien species of flora and fauna are prohibited in the reserves

6.1.4 Prohibited marine transportation and shipping activities

Shipping activities

Speeding of commercial marine vessels

6.2 Guide to regulated activities

Regulated activities include all activities that demand authorisation before use. They include recreational, tourism, scientific research, and education/training and cultural activities.

The following guidelines outline conditions of use.

6.2.1 Regulated Activities

SCUBA diving

SCUBA Divers will be required to obtain a permit.

Snorkelling, swimming

Snorkelling and swimming within the marine reserves will be freely allowed.

Windsurfing, sailing

Windsurfing and sailing within the marine reserves will be freely allowed.

Boat racing

Organisers of boat racing will be required to obtain a permit.

Overnight mooring

Overnight mooring within the marine reserves will need a permit.

Camping

All camping activities in the marine reserves will be done by a permit.

A fee will be charged for all campers within the marine reserves.

Operation of Public services (hotel, restaurant etc.)

License issued by the relevant authority/Municipal Council

Permit (note: includes conditions on management of waste)

Operators of public services in the Marine Reserves will be required to pay a concession fee.

Operation of glass- bottom boats

Operators of glass- bottom boats will be required to obtain a permit

Operation of passenger boats and leisure boats

Operators of passenger boats with a carrying capacity of 15 passengers and above will be required to register with the Marine Parks and Reserves Unit.

Operators of passenger boats with a carrying capacity of 15 passengers and above and leisure boats (yachts etc.) will be required to obtain a boat license in accordance with the Marine Parks and Reserves (User Fees) Regulations, 2001, Schedule, Item D or subsequent amendment.

Operators of passenger boats with a carrying capacity of less than 15 passengers should also have permits. An entrance fee in accordance with the Marine Parks and Reserves (User Fees) Regulations, 2001, Schedule, Item B will be charged for all passengers on visiting boats/ships.

6.2.2 Tourism-related construction and installation

These include accommodation buildings, shops, restaurant, shelters, water-sport related structures and structures providing utility functions such as waste disposals, water and electricity.

Tourism operators will be required to obtain a permit issued by the Marine Parks and Reserves Unit for installation of all kinds of tourism-related facilities.

Placement, construction and operation of facilities will be in accordance with Investors Guide

Carry out EIA in accordance with Marine Parks and Reserves EIA guidelines

6.2.3 Commercial filming

Image capture of any type, i.e. still photography, motion picture photography, still or conventional video imaging, for commercial purpose in the Marine reserves will be subject to a permit issued at the discretion of the officer in charge

A fee will be charged for all people undertaking commercial filming within the marine reserves.

6.2.4 Scientific research

All scientific research within the marine reserves will be subject to a permit

A fee (based on residence status, objective of research) will be charged for all researchers who conduct research within the marine reserves.

SUMMARY OF REGULATIONS

Key: *P = Permitted; X = Not Permitted*

Activity	Regulations
Tourism/Recreation Regulations	
SCUBA diving	P
Snorkelling, swimming	Freely allowed
Windsurfing, sailing	Freely allowed
Overnight boat mooring	P
Camping	P
Boat racing	P
Operation of Public services (hotel, restaurant etc.)	P
Operation of glass- bottom boats	P
Operation of passenger boats and leisure boats	P
Tourism-related construction	P
Other Regulations	
Commercial filming	P
Scientific research	P
Jet skiing	X
Sea plane landing	X
Sport fishing	X

6.3. Management Zones

Preamble:

A Guide to Placement of Different Activities and Facilities (*See maps*)

Mbudya Island Marine Reserve

The reserve have been zoned for economic use as follows:

1. North and southwest zone: Is a fragile zone with a luxurious coral growth, sea grass beds, sandy beach, and nesting site for turtle.

Permitted Use: Area for research/ educational activities, sunbathing, bandas for meals and refreshments and guided recreational activities. Underwater and land nature trails will be developed, buoys installed to mark the zone and provide for anchorage.

2. East and Southeast zone – High waves and strong winds area, with sand beach, Sea grasses beds and seaweeds. Nursery ground for octopus, sea horse, clams and other ornamental shelled molluscs.

Use: guided recreational activities, camping sites, sunbathing, bandas for meals and refreshments research/ educational activities and information centre.

3. Western zone – Sand beach area between the fragile zones. Habitat of coconut crabs and a cultural site. Turtles often come on shore for nesting.

Use: Mooring facilities. West to East nature trail and a nature trail to the tombs will be developed. Zone for guided tourism as well as research/ educational activities

4. South Zone: Rocky inter-tidal zone.

Use: Research, educational tours, and guided inter-tidal walk.

Nature trail

Nature trail should be marked from the Northwest beach to Northeast beach so that all visitors wishing to walk from one side of the island to the other use them. This will allow the visitors and other users to enjoy the diverse resources available on the island.

6.3.2 Bongoyo Island Marine Reserve

1. North and West zone

Has a healthy stand of coral reef and sea grass beds. It has a sandy beach on the northwest and an inter-tidal rocky shore. There are also inter-tidal springs and a pond with sea eels. The shipwreck and shark lagoon, which are a breeding ground for fish and octopus, are found on this zone. The sprawling island forest harbours a bird sanctuary.

Permitted Use:

Research / educational activities, sunbathing, bandas for meals and refreshments and guided recreational activities. Underwater and land nature trails will be developed, buoys installations to mark the zone and provide for anchorage. Vessels shall anchor at the buoy and passengers will disembark into dingy boats which will ferry them to the island. Nature trails are developed from the point of anchorage to the bird sanctuary, shark lagoon, German sentry ruins and that leading to the East and Southern zone. The existing information centre will be improved.

2. East and Southern zone

High waves and strong winds area characterised by unbroken shallow flat reef extending for a kilometre seaward, which give way to shallow outgrowths of coral reef. A cliff, which traverses the island northwards interspersed by a small sand beach, marks the east end of the island. The area has a healthy stand of coastal vegetation. There are also ruins of a German sentry.

Use: guided recreational activities, camping sites and research.

6.3.3 Fungu Yasin Island Marine Reserve

The rocky island appears during low tide. The upper inter-tidal zone is mostly rocky except the northwest corner where the sand bank is situated. There is a high coral cover on the west and south east of the island. Sea grass beds dominate most of the sub tidal area beyond the coral reef

The area offers vintage point to observe birds, dolphins and sunset.

Use: Research, educational tours, sunbathing and guided recreational activities. Mooring buoys should be provided in the area close to the northeast beach.

6.3.4 Pangavini Island Marine Reserve

A rocky cliff without a sandy beach that has protected it from human disturbances surrounds the island. This natural cover has turned the island into an important bird sanctuary. It acts as breeding, resting and feeding site for many varieties of birds and reptiles. The upper tidal area is rocky while most of the lower inter-tidal area is sandy. Sea grass and seaweeds abound this part of the island. Patchy reefs grow on the sub tidal areas on the east and west of the island.

The area offers vintage point to observe birds and sunset.

Use: Research, educational tours and bird watching on vessels.

6.3.5 Buffer Zones

The buffer zone is an area outside and adjacent to the marine reserves boundary that services as a cushion against activities outside the marine reserves. The marine reserves management have no other direct jurisdiction over activities in the buffer zone.

The DMRs buffer zones boundaries have been set at 800 meters in all directions outwards from the reserve's outer boundaries. It is recognized that the marine reserve environment could be affected by activities in a wider area within the Dares salaam marine and costal area. It is intended therefore that following the implementation of this plan negotiations will be held with relevant authorities mentioned above.

CHAPTER 7: MANAGEMENT AND OPERATIONAL FRAMEWORK

7.1 Organisational structure

- Roles and Responsibilities
- Operations of the marine reserves

The Board of Trustees, through the Marine Parks and Reserve Unit (MPRU), is responsible for the management of Dar es Salaam Marine Reserves (DMRs). The day to day operations of the reserves are done by the Officer in-charge, supported by a team of professional and support staff in the field. The plan envisages putting into place a mechanism that will involve all stakeholders in the management of the reserves at a later stage.

7.1.1 *The Board of Trustees and the Marine Parks and Reserve Unit*

The Board of Trustees formulates policies on all marine parks and reserves in Tanzania and directs the MPRU on all matters regarding the designation and management of the marine protected areas.

7.1.2 *The MPRU management*

The execution of the day-to-day activities of MPRU is done by the Manager who is supported by a team of professionals at the headquarters of MPRU. The Officer in charge who is responsible to the manager of MPRU oversees day to day activities of DMRs. Professional staff at the headquarters provides technical back up to DMRs.

7.1.3 *The Officer-in-Charge*

The Officer in-charge is responsible for all matters concerning the DMRs' administration and reports directly to the manager. The Officer will be responsible for the day to day running of the affairs of the reserves and has 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. A technical team and honorary rangers who will deal with law enforcement, monitoring and community conservation are a part of the back-up team.

7.1.4 *Community Conservation teams*

Communities affected by the establishment of DMRs either directly or through a designated role shall participate fully in all aspects of marine conservation. Community Conservation teams will be established at each locality within the vicinity of DMRs. These teams, co-opted to win support of the community shall continue to serve as the primary interface between the communities and the DMRs.

They shall collaborate in building a well informed and support constituents for the DMRs through proactive education, organisation membership, public and media outreach.

Other roles of the CCT include:

- Support in surveillance / act as eyes and ears
- Participate in DMRs educational and outreach programmes
- Assist in entry fees collection (agents)

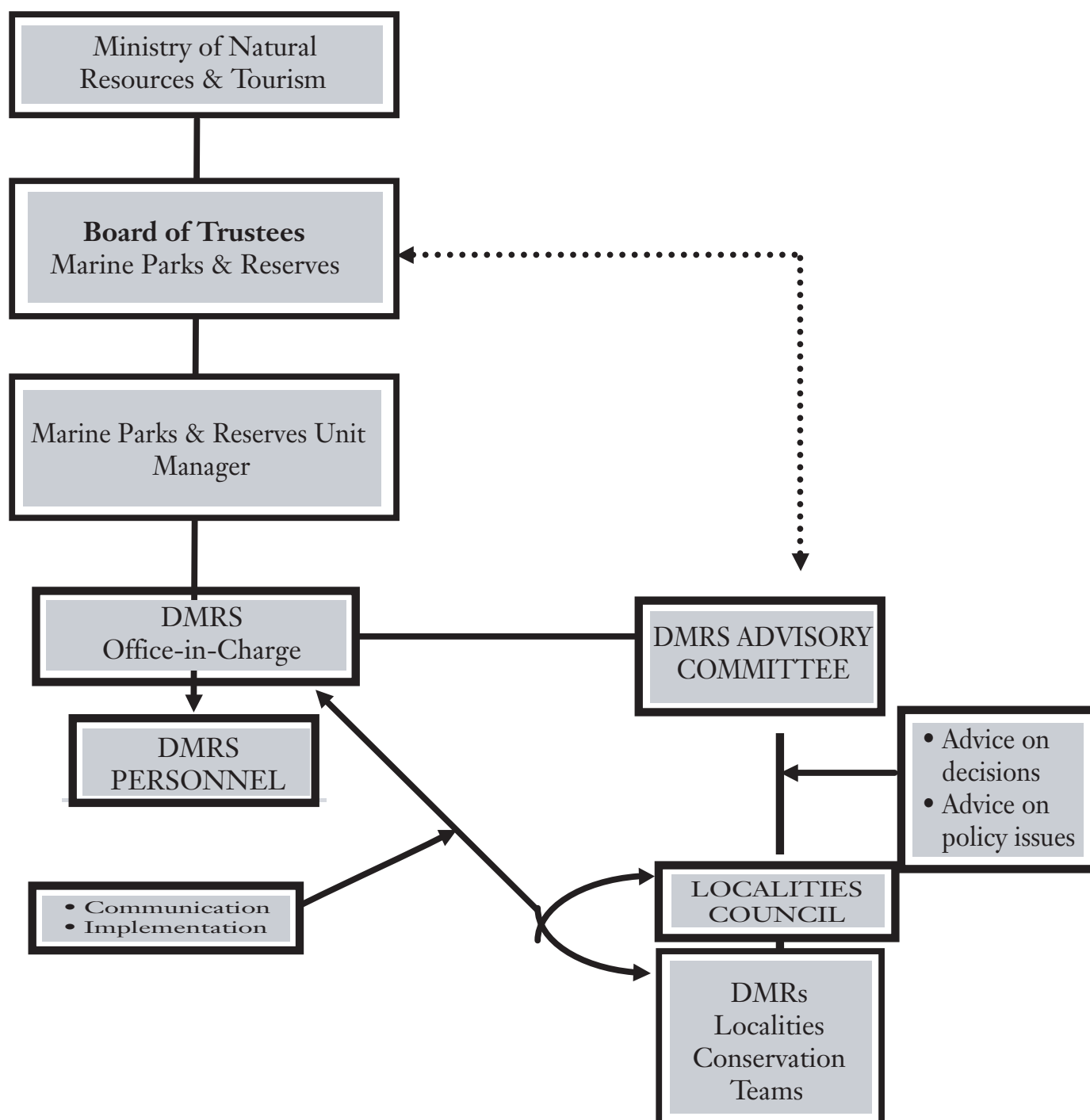
- Advise on the ways to improve quality of the environment
- Participate in resource monitoring

7.1.5 *Kinondoni District Council*

There are a number of important issues in the management of the DMRs that require collaboration and agreement with the Kinondoni 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 reserves and disbursement of revenue and issues relating to land title and concession fees within the marine reserves boundary

7.2 THE MANAGEMENT STRUCTURE OF DAR ES SALAAM MARINE RESERVES SYSTEM (DMRs)



The enforcement of the GMP requires the preparation and implementation of subsidiary regulations covering the following issues:

- Amendment of the law to provide for community involvement in conservation
- Regulating activities within the management zones
- Permit and user fees

7.3. Operations and Enforcement

7.3.1 Infrastructure

The DMRs will have a well-equipped office base close to the reserves where field operations will be launched. The base will be located strategically to provide a gateway to the reserves. Temporary camps, particularly on the islands, may also be established if need arises. Additionally, the DMRs will support the establishment of an office in each locality for the conservation teams. The provision of such facilities and sensitive behaviour especially by enforcement staff, will be essential to convince user groups that the reserves are part of the local establishment designed to work with them to address some of their concerns.

7.3.2 Manpower

The operational staff structure for the marine park and reserves unit is provided in the *Scheme of Service* for Marine Parks and Reserves of 1999. The Board's employment policy is to engage a lean team of highly motivated staff that is relatively well compensated. This notwithstanding, the overall staffing strategy for MPRU will evolve on a need basis depending on the availability of financial resources. Job descriptions and staff responsibilities will be defined and ongoing training undertaken as need arises.

A 5-year Strategic Plan for MPRU will be the guiding tool in the implementation of this General management plan. The annual operation plan will be prepared to achieve the reserve's long-term goals and objectives set out herein, and the activities of all reserve staff will be guided by these plans.

Finance and personnel affairs shall be handled at the MPRU headquarters. The DMRs shall receive back up from technical staff at the headquarters.

Law Enforcement & Community Involvement

Effective enforcement of DMRs regulations will be necessary to obtain cooperation from affected user groups and to realise the potential economic and ecological benefits. Also, coordination among agencies with different jurisdictions will improve the representation of on-site and off-site user groups so that the general public's cultural and conservation values, as well as commercial and recreational activities, receive consideration.

Under the current management approach, these interests are often addressed by different agencies independent of each other and may result in short-term policies that are inconsistent with the nation's long-term goals.

Law enforcement will be a co-operative venture between DMRs staff, Fisheries Division, Marine Police, Navy and local communities through Honorary Rangers who will be encouraged to act as the "eyes and ears" of the enforcing authorities. An important component of the enforcement regime will be the VHF radio network connecting the DMRs to the marine park headquarters and Marine police. DMRs staff will react solely or jointly with the other National enforcing agencies (Fisheries, Marine Police and Navy) to any such call as well as mounting patrols within the DMRs area.

A co-operative enforcement programme ensures an easy flow of intelligence, efficient use of equipment and prompt attention to call of duty. Falling within the scope of the programme will be:

- Consistent training of enforcement personnel;
- Agreement on priority sites for patrols;
- Enforcement strategies;
- Interpretation of regulations;
- Consistent and prompt reporting requirements;
- Formal patrol procedures and schedules;
- Mode of patrols: land or sea or both

The of Licensing and Enforcement team in collaboration with Honorary Rangers would do Law enforcement within the DMRs boundary by using boats capable of mounting a fast response. Enforcement outside the DMRs boundary will be carried out in collaboration with Marine Police, Fisheries and Navy. DMRs staff do not have jurisdiction outside the boundaries of the reserves except when an offence is committed inside the reserves boundary and the response was in pursuit of culprits.

Any contravention of the rules and regulations in DMRs shall be liable to prosecution in the Resident/District Magistrate Court.

All suspects apprehended by enforcers will be handed over to the police for consequent suing and prosecution in the court of law. This procedure will require the enforcement officers and collaborating police to undergo some legal training.

Demarcation of Boundary

The geographical description of the DMRs boundary is given in Appendix I and is in accordance with Government Notice No. 84 published on 26th, March 1999.

Emphasis on demarcation will be given in practice for facilitation of patrolling and guidance of visitors, fishers and other resource-users. On this basis, the demarcation of the reserves boundary will be treated as a priority. It will be marked with signpost and strategically located at access points to give information and awareness to the exact location of the boundary.

CHAPTER 8: SUSTAINABLE FINANCING

8.1 Financing strategy

The goal will be to spend less and attain multiple successes. This would entail: (i) balancing budget to eliminate non-essential expenditure; (ii) sharing the costs and benefits of management with local stakeholders; (iii) putting in place incentives mechanisms for operators and local communities to reduce over-use and encourage protection; (iv) involving stakeholders in the direct management of the DMRs through co-management with local communities, the private sector, NGOs and local government; (v) encouraging these groups to invest in and meet some of the costs; (vi) making use of volunteers; and (vii) promoting biodiversity enterprise. This may also include compensating resource users for not exploiting the resource – in anticipation that in the long term it would be a more cost-efficient option than regulation and enforcement or rehabilitation.

8.1.1 Business plan

Within the business plan, a diverse portfolio of income is optimal. Reliance on one single source of income, such as entrance fees or donor funding can subject the MPA to financial risk. Tourism in particular is subject to political, economic and weather fluctuations. Donor funding is also likely to change with economic and political variations and usually is short-term (one to three years). The business plan identifies the potential revenue earning options including entrance fees, government revenues, trust funds, biodiversity enterprise funds, donor funds, licenses and other mechanisms.

8.1.2 Incentive mechanisms

Although command and control mechanisms are often necessary in protected areas, positive incentive mechanisms such as licenses and new markets are more efficient ways to move resource users to more sustainable use of the resource. People are far more likely to conserve a resource if it is profitable for them to do so or if they directly bear the costs of degrading the environment. Incentive mechanisms should encourage positive reinforcement – in the case of MPAs, they should entice stakeholders (government, business, NGOs, local communities) to conserve marine ecosystems. Such mechanisms can be in the form of economic instruments or property rights, giving individuals or groups a sense of ownership over a resource – or clear responsibility for the exploitation of the resource itself. Property rights are one way of enabling stakeholders to directly bear the costs, as well as receive the benefits associated with the exploitation of the resource.

8.2 Management of Finance

The principle of sustainability, as applied to the use of the DMRs natural resources, should ideally extend to the financing of the reserves themselves. The financing plan will be designed to fund long term operating costs from the collection of permit, entrance and user fees.

8.2.1 Collection of user fees

Fees will be efficiently collected to ensure that the efforts of DMRs staff are not unduly weighted towards fee collection but rather the enforcement of regulations governing sustainable resource use.

The Dar es Salaam Yacht Club, Hotels, the service providers, within the reserves will continue to assist collect visitor entry fees as agents of the DMRs. Formal agreements will be entered with these agents. Vouchers for the collection of the entry fees will be provided to each agent. They will then be required to

account for the revenues received, against the counter leaf and remit funds received to the accountant of the MPRU each week.

All user tariffs will be charged in accordance with Government Notice No. 84 published on 2nd March 2001. The reserve management will not be involved in issuing licenses or collecting revenues from fishing licenses.

8.2.2 Accounts system

All revenues accruing from the DMRs like all funds generated by other parks will be held in the account of Marine Parks and Reserves Conservation and Development Fund as provided for in the Marine Parks and Reserves Act 1994 [section 7]. The terms and conditions for operation of the Conservation and Development Fund (CDF) will be in accordance with the MPRU financial guidelines for operating the CDF and in accordance with the Government's Finance Act No 6 of 2002. The net revenue, after deducting operating costs will not be subjected to Government taxation. Likewise contribution from outside aid agencies or organizations will not be taxed.

Effective management and control over the use and accounting of funds entrusted to the DMRs is crucial. The most important elements in achieving the required controls are detailed budgeting, clear accounting procedures and transparency of reporting. Budgeting will be undertaken on an annual basis phased in expected quarterly expenditure. The officer in Charge will be responsible for preparing a forecast of revenue and expenditure for the DMRs, based on the level of operations, investments and opportunities available as well as the budget allocation to MPRU from the Government. The budget will then be submitted to the MPRU for comment and inclusion in the consolidated annual budget framework with all Marine Parks and Reserves and referred to the Board of Trustees for approval.

Disbursements of funds from the Conservation and Development Fund will be the responsibility of the Unit Manager after the approval of the Board, and subject to adequate control procedures. Such procedures are detailed in the MPRU Accounting Manual as approved by the Board of Trustees.

8.2.4 Distribution of Net Revenues

The Marine Parks and Reserves Conservation and Development Fund is divided into development and operation fund in accordance with Marine Parks and Reserves Act 29 of 1994.

Section 7 of the Act allows Kinondoni Municipal Council to receive a proceeds from funds generated by the DMRs sub-fund as a contribution to the development and effective administration of the District. Ideally this annual funding contribution to the district is meant to compensate the District for the loss of revenue from the operations of the reserves, such as for the collection of concession fees from public service providers in DMRs boundary. The level of this contribution has yet to be finally negotiated, but for the purposes of financial projections in this section has been assumed to be 10% of net revenues.

Another share of the DMRs sub-fund will be used for the benefit of the localities in the vicinity of the DMRs. In accordance with Section 7 of Act No. 29 of 1994 this share will not be less than 10% of the total DMRs sub-fund. The Act provides that funds disbursed in this way must be used to further the objectives of the Act, as stated in Section 10. This is interpreted to mean, in particular, the development of under-utilised resources and of resource sustainability.

Accordingly, the reserves authority will facilitate the development by each locality of a Natural Resources Development Plan, setting out a framework for expenditure. The DMRs may allocate funds disproportionately to localities whose livelihoods are most affected by the reserves, or whose residents are

most engaged in unsustainable resource-use, if it is in the best interest of furthering the objectives of Act No. 29 of 1994.

CHAPTER 9: MONITORING, EVALUATION AND REVIEW

Monitoring in the DMRs should be subject to the following principles:

Monitoring must take place at multiple stages in the human-environment relationship. While the focus of the monitoring will be on the environment, it is equally important for this programme to monitor resources *in situ* and threats to the environment and resources. In addition, ecological/environmental monitoring should be linked to parallel monitoring programmes on the benefits obtained from the reserves area (e.g. fish catch) and general socio-economic benefits of user communities.

Monitoring sites must cover a representative set of habitats and species assemblages, which can be provisionally identified.

Monitoring sites must cover a representative set of management zones, which will be identified after consultations and planning exercises. In order to deal with the multiple dimensions (ecological, habitats and zones), the monitoring programme should include hierarchical levels of precision, with a smaller number of primary sites where detailed monitoring is conducted and a larger number of secondary and random sites where spot checks and rapid assessment methods are applied to 'ground truth' trends from the primary sites to the rest of the reserves area.

Designed into its hierarchical structure, the monitoring programme should incorporate contributions from user groups, DMRs staff, other government officials and scientists, at relevant levels of detail, precision and repetition, all managed under the direction of a joint scientific and management team. The monitoring programme should be compatible with past information and monitoring from the area, in particular building on methods and sites used by Tanzania's national coral reef monitoring programme (Mohammed *et al.*, 2000, 2002) and establishing community participation monitoring programme

The monitoring programme should be based on international best practice methods, as found in several reference sources (English *et al.*, 1997, Samoilys, 1997, Pomeroy *et al.*, 2003, FAO 2002, Obura *et al.*, 2003,) and from organisations such as CORDIO and Reef Check.

The monitoring programme should be compatible with, and results integrated into, broader scale programmes at the national and regional levels.

9.1. Why monitoring

Monitoring plays a critical role in the management of DMRs through the provision of essential information required to make informed management decisions and evaluate the implementation of decisions made. Marine protected areas in the country and around the world are at risk from many threats including over-fishing or destructive fishing techniques, pollution by sediments, toxic chemicals and nutrients loads, coral mining, shoreline development, unregulated tourism, unregulated resource utilization, and global warming causing coral bleaching. One way to understand the extent, nature and causes of the damage and to identify the ways to address these threats is to conduct ecological and socio-economics monitoring of DMRs.

The long-term success of Dar es Salaam Marine Reserves (DMRs) therefore depends on effective

management and community participation, combined with demonstration of its usefulness and appropriateness as a conservation and management tool for biodiversity and fisheries resources along the Dar es Salaam coast. Ecological and socio-economic monitoring will assist in the effective management of DMRs through provision of information to the following tasks: - (a) Resource assessment and mapping, (b) Resource status and long term-trends, (c) Status and long-term trends of users, d) Impacts of spatial and temporal scale of disturbances, (e) Impacts of human activities, (f) Impact of MPAs governance, (g) Performance evaluation and adaptive management, (h) Education and awareness raising, (i) Building resilience into MPA and (j) Contributing to regional and Global networks of MPAs.

Information of the above tasks can be assessed through a comprehensive approach of assessing management effectiveness of MPA. In many ways, the effective management of DMRs will depend on the extent to which this general management plan (GMP) 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 effectively monitor the extent to which the goals of the reserves are being met, and if not, what new management measures can be adopted to meet all the goals of the Reserves.

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 reserves 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 DMRs, it is necessary to examine changes in biophysical and socio-economic environment, which will provide indicators that can be monitored and measured. The assessment will cover issues that fall within the responsibilities of the reserves authority as well as collaborating with other partners in issues that are beyond their control.

If changes occur outside the boundaries of the reserves but have positive or negative impact in the reserves, the DMRs officials need to be aware of these changes so that they can modify their management approach to address them or develop a mechanism to deal with them.

The assessment of management effectiveness within DMRs 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), NOAA and WWF. 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 DMRs:

The bulk of the assessment will be carried out in close cooperation with and, wherever possible, by the local community, local research and academic institutions.

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, Reserves authorities will work with the local community to ensure that

their capacity to carry out the assessment increases accordingly.

The assessment results will be shared and widely disseminated, with the local community in DMRs, private sector(s) who are operating or have interest with DMRs and in other communities affected by marine parks and reserves in Tanzania, regionally and internationally.

The assessment(s) will be incorporated in the further development and of the GMP, particularly as it is reviewed 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

1. Kamukuru ,A.T (1997)

Assessment of the biological status of the Dar es Salaam Marine Reserves System off the Kunduchi Coast, Tanzania.

Western Indian Ocean Marine Science Association (WIOMSA), Zanzibar and IOC/UNESCO Paris, France.

2. Mangubhai, S. and Wells, S. 2005.

Assessing Management Effectiveness of Marine Protected Areas: A Workbook for the Western Indian Ocean. IUCN, Nairobi.

3. Marine Parks and Reserves Act (1994)

4. Mhando and Francis (2000)

The status of coral reefs in other protected areas in Tanzania.

Institute of Marine Science (IMS), Zanzibar

5. Mohamed et al., (2000)

Assessment of coral reef degradation in Tanzania: Results of Coral reef monitoring in 1999.

6. Obura, D., M. Suleiman, H. Motta, & M. Schleyer (2003.)

Status of Coral Reefs of the World: 2000. Townsville, Global Coral Reef Monitoring Network. Australian Institute of Marine Science.

7. Roxburgh, T., Morton, I., Rumisha, C. and Francis. (2002)

An Assessment of the Stakeholders and Resources Use in the Dar es Salaam Marine Reserves System. ICRAN/WIOMSA

8. Salm, R.V., Muthiga, N. and Muhandu, C.A., (1998.)

Status of coral reefs in the Western Indian Ocean and evolving coral reef programmes. *In:* Wilkinson, C. (ed) 1998

9. Wagner, G.M et, al (1999)

A Preliminary investigation for an integrated, community- based approach to Conservation and restoration on marine ecosystems along the Dar es Salaam Coast. African Development Foundation, Dar es Salaam.

ANNEX 1: MAPS

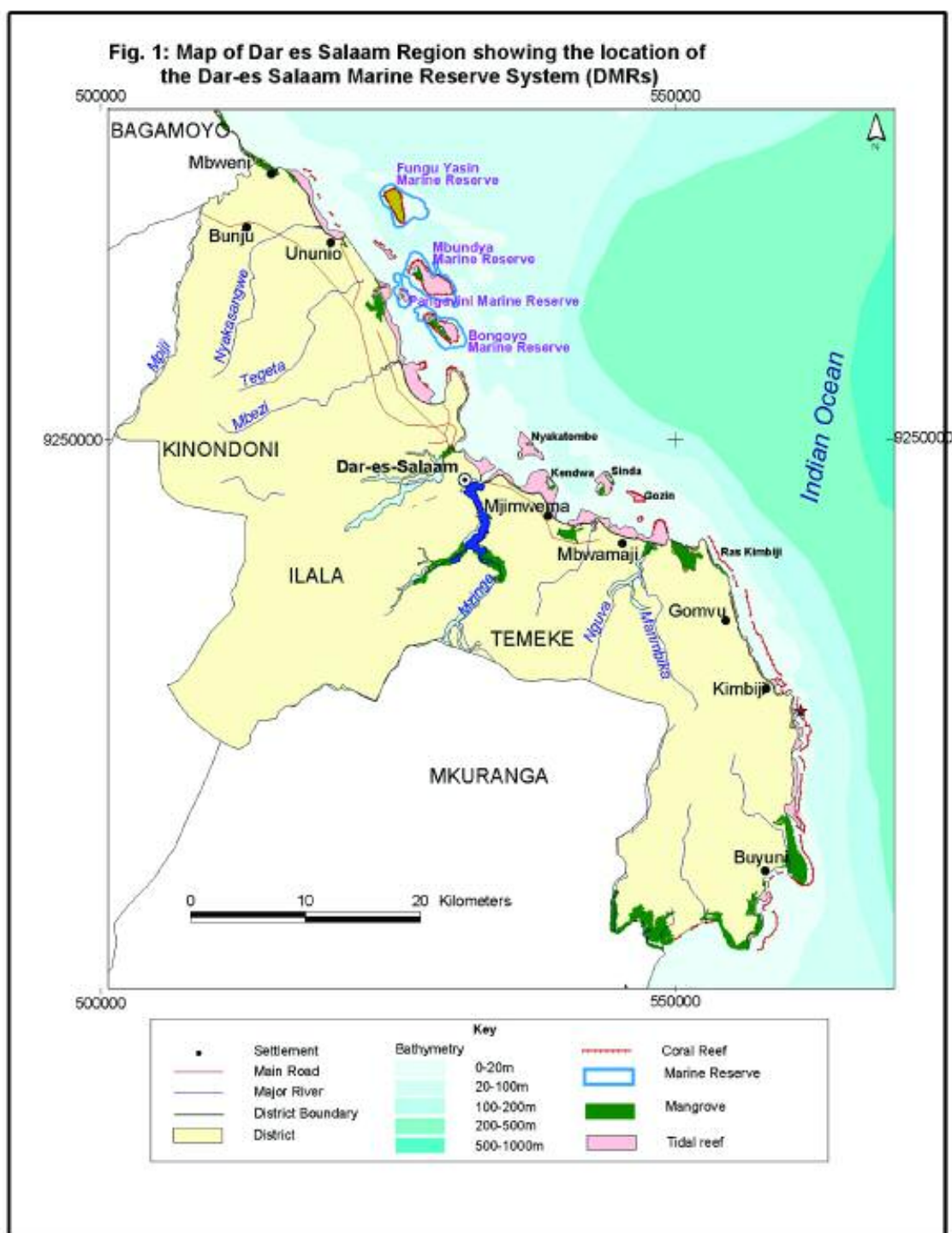


Fig. 2: Map showing the boundaries of the Marine Reserves (10 m contour) and the location of study points.

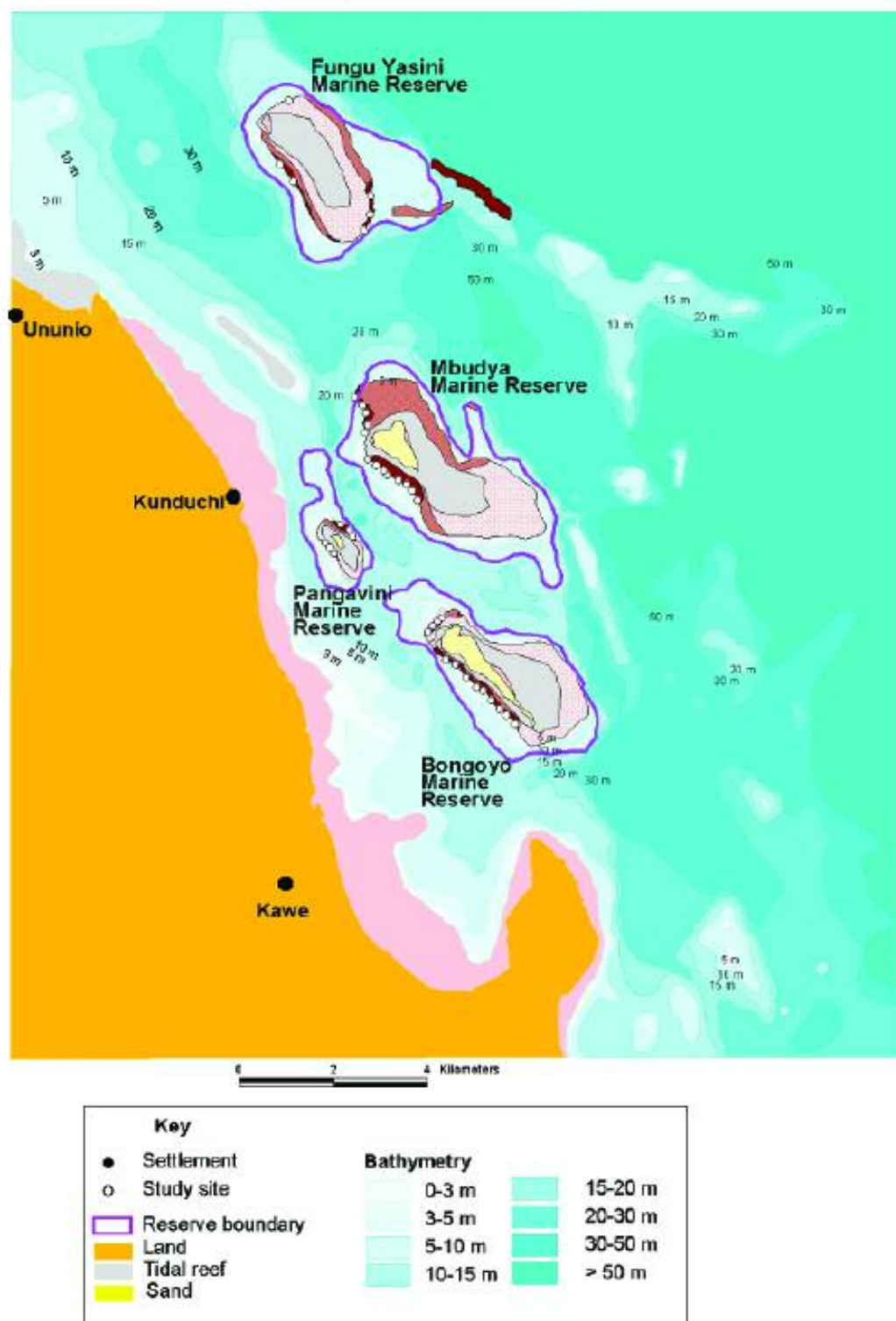


Fig. 3: Map showing the main habitat types in the DMRs

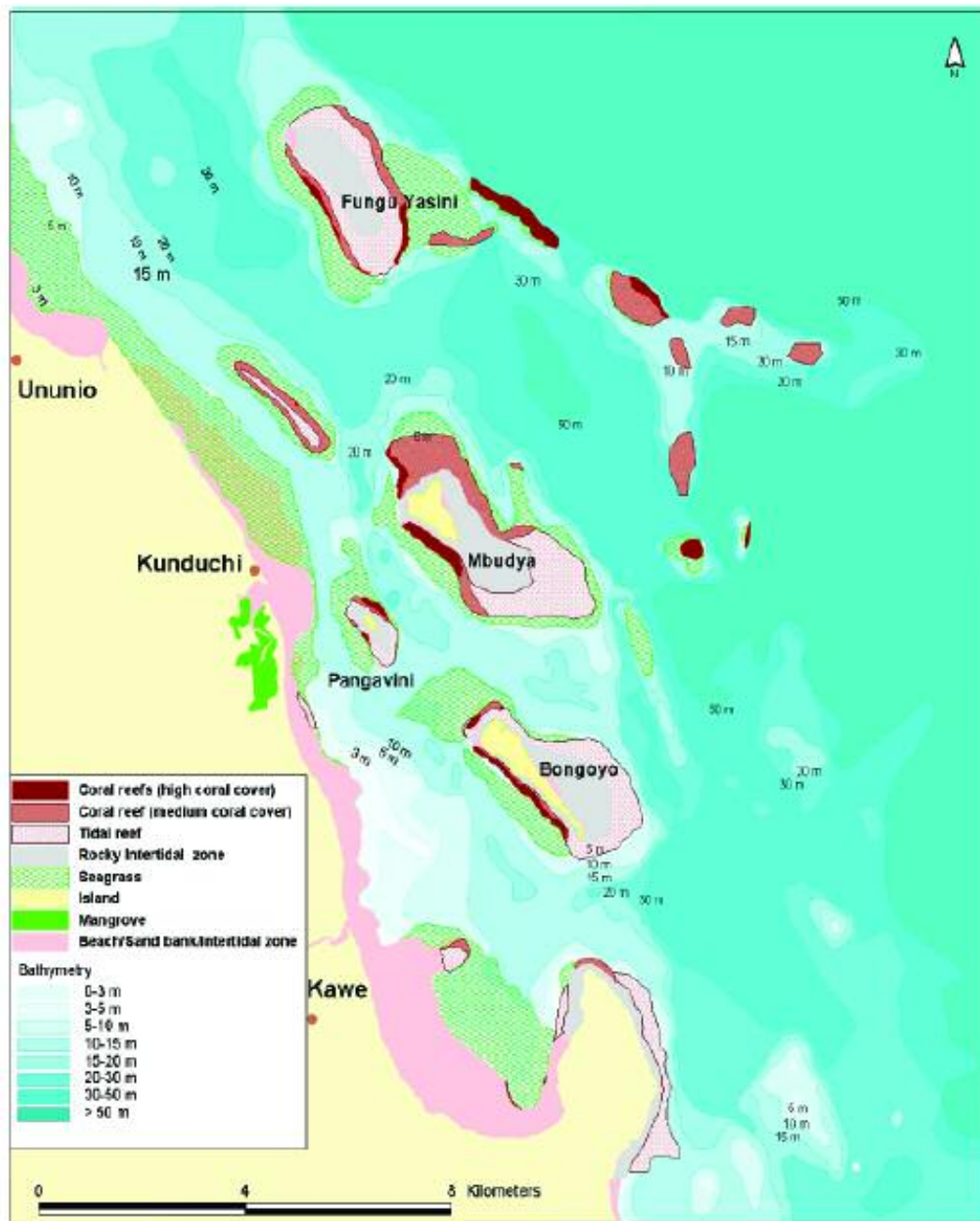


Fig. 4: The main habitats in the Pangavini Marine Reserve

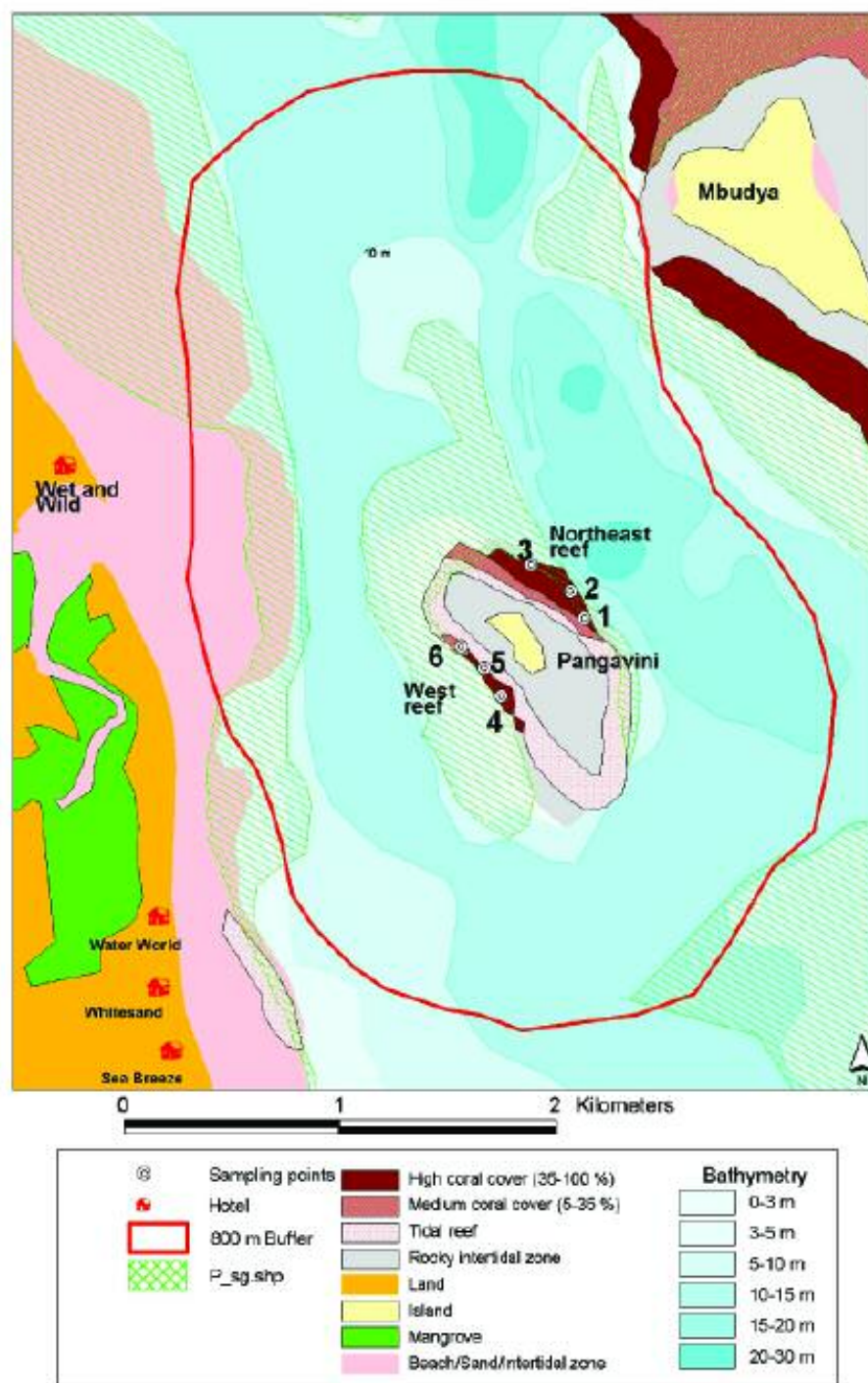


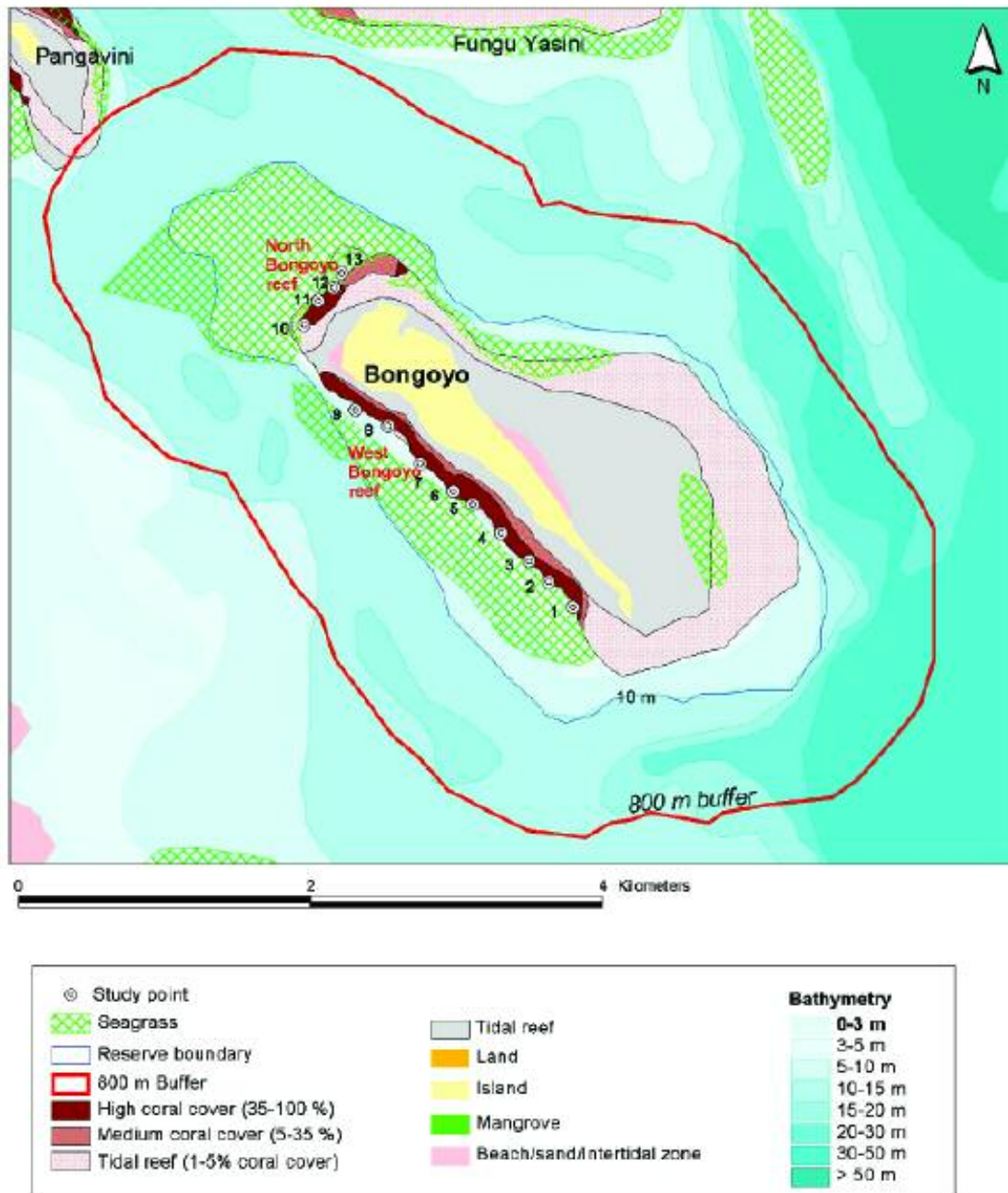
Fig. 5: Main habitats in the Bongoyo Marine Reserve

Fig. 6: The main habitat types in Mbudya Marine Reserve

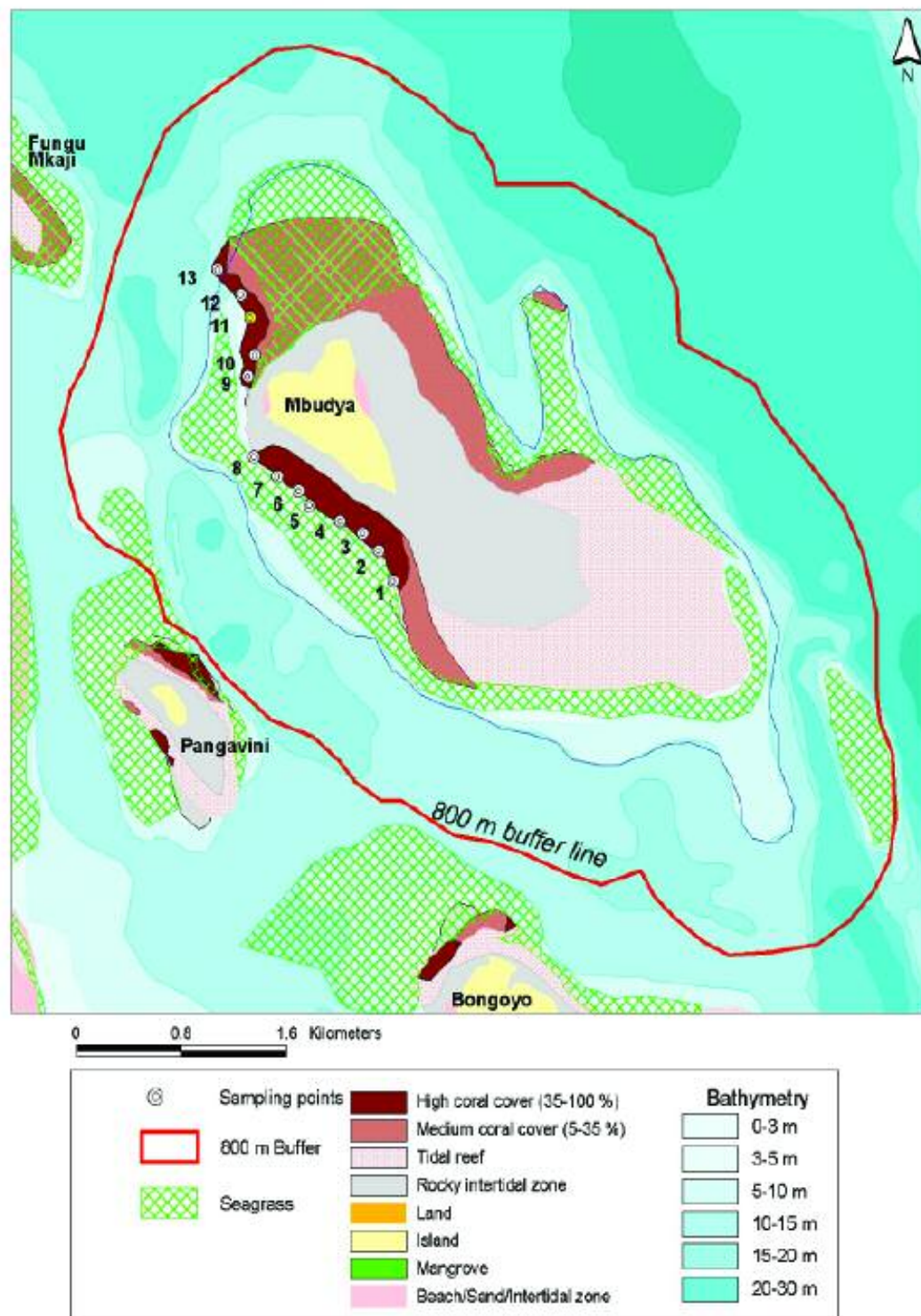


Fig. 7: The main habitat types in the Fungu Yasini Marine Reserve

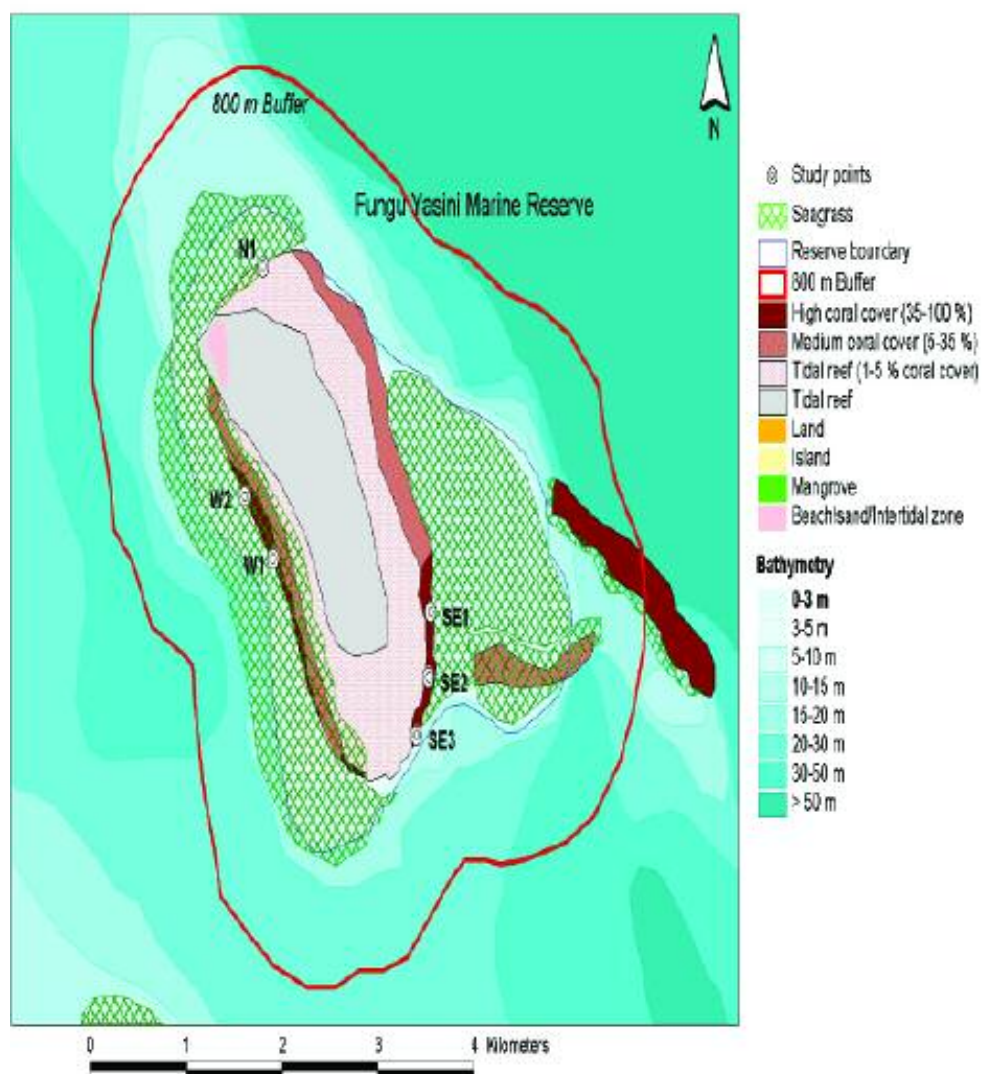


Fig. 8: Map showing the boundaries of the Marine Reserves (10 m contour) and the associated buffer area (800m).

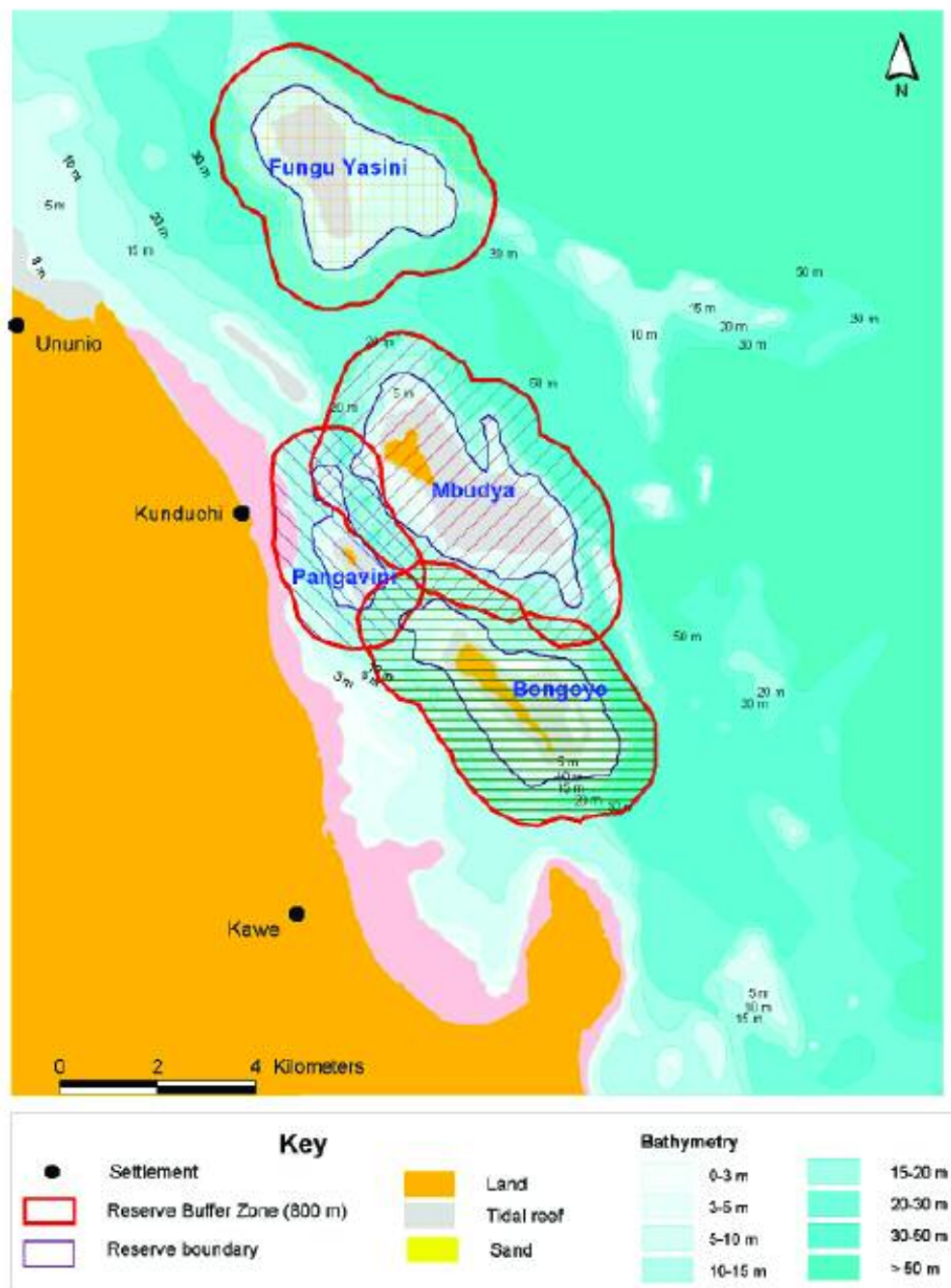
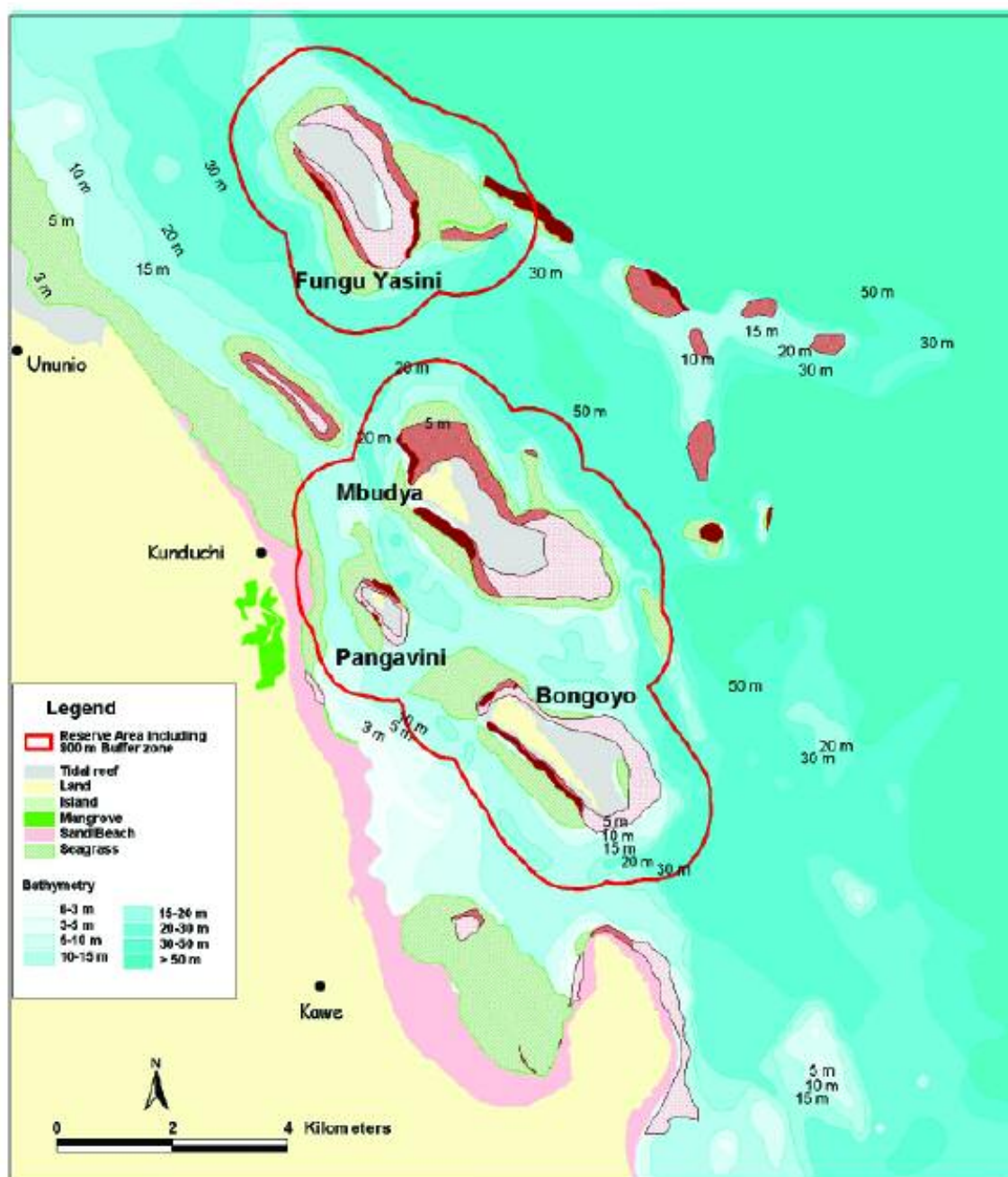


Fig. 9: Map showing the boundaries when 800 m buffer zone is considered applied around the Dar es Salaam Marine Reserve system. Bongoyo, Pangavini and Mbudya could be considered as one management area.



ANNEX 2. GAZETTED BOUNDARIES

Fungu Yasini Marine Reserve:

All that area consisting of land and ocean waters centred at latitude 06 degrees 36 minutes 00 seconds South and Longitude 39 degrees 14 minutes 30 seconds East and extending to a depth of 5 fathoms below the mean low tide mark from the centre point described above.

Mbudya Island Marine Reserve:

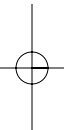
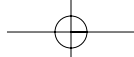
All that area consisting of land and ocean waters centred at Latitude 06 degrees 39 minutes 30 seconds South and Longitude 39 degrees 15 minutes 00 seconds East and extending to a depth of 5 fathoms below the mean low tide mark in all directions from the centre point described above.

Bongoyo Island Marine Reserve:

All that land and ocean waters centred at latitude 6 degrees 43 minutes 12 seconds South and Longitude 38 degrees 16 minutes 00 seconds extending to a depth of 5 fathoms below the mean low tide mark in all directions from the centre point described above.

Pangavini Island Marine Reserve:

All that area consisting of land and ocean waters centred at latitude 6 degrees 40 minutes 42 seconds South and Longitude 38 degrees 14 minutes 12 seconds East and extending to a depth of 5 fathoms below the mean low tide mark from the centred point described above.





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



VISION

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

MISSION

To establish and manage Tanzania's Marine Protected Areas for sustainable use.

“Let us share the gift of nature together”