STATE OF MBEGANI BAY

The Ecosystem, Livelihoods and Future Status

Bagamoyo District

September 2013

Prepared by the USAID/PWANI Project

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Coastal Resources Center
University of Rhode Island

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Citation: Tobey, J., Robadue, D., Shaghude, Y.W., Muhando, C., Kalangahe, B., Mahenge, J., Daffa, J. (2013). State of Mbegani Bay: The Ecosystem, Livelihoods, and Future Status, Tanzania. Coastal Resources Center, Graduate School of Oceanography, University of Rhode Island, Narragansett, RI, 49 pp.

Disclaimer: This report is made possible by the generous support of the American people through the United States Agency for International Development (USAID). The contents are the responsibility of the Coastal Resources Center at the University of Rhode Island as part of the USAID/Pwani Project. Cooperative Agreement No. 621-A-00-10-00012-00.

Cover Photo: Beach resort on Mbegani Bay

Photo Credit: James Tobey

PREFACE

The coastline of Bagamoyo District stretches from Mpiji River in the south that marks a border with Dar es Salaam to Mligaji River in the north bordering Pangani District. This area is endowed with a bounty of diverse natural resources that supports the livelihoods of communities. However, the coastal resources have come under increasing pressure over the past three decades. This has led to a significant decline in the biodiversity and productivity of coastal and marine resources. Pressures are both anthropogenic and non-anthropogenic with leading anthropogenic pressures including population growth, poorly planned development, resource over-exploitation, and destructive fishing practices.

There are hotspots dotting the coastline of Bagamoyo that are of both economic and biological significance. One of these hotspots is Mbegani Bay. The Bay has a number of reefs, estuaries, seagrass beds and mangrove ecosystems that provide important habitat to marine organisms and as a result, it is home to a highly productive fishery. The Bay also includes a lagoon that provides a buffer against ocean surf, protecting the shore and coastal settlements.

The natural endowments have attracted diverse interests, which seek to take advantage of the biological and economic importance of the Bay. At one end of the spectrum are those with an interest to conserve the natural resource base and ecological amenities of the Bay so that the resources are kept in good condition and are sustainably utilized. At the other extreme are interests for turning the Bay and the surrounding area into a satellite industrial center that supports a range of economic investments, including an industrial port.

It is in recognition of this diversity of interests that the Pwani Project has decided to produce this document. It aims to identify pertinent issues related to the Bay and its environs and it seeks to inform all stakeholders on the physical, biological and socio-economic status of the Bay ecosystem. It further presents scenarios of the future status of the bay, policies, and actions to achieve desired future goals and objectives.

It is the hope of the Pwani Project and its partners that the information presented in this document will be used by decision makers in both Central and Local Government (specifically the Bagamoyo District Council) in preparing future development plans and implementing current economic development plans.

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EXECUTIVE SUMMARY

The focus of this report is Mbegani Bay area which is defined as extending northward to Dunda village and southward to Kondo Village. However, understanding the influence of the surrounding ecosystem there is also rich information covering as far as the Ruvu River estuary. This area administratively falls under two administrative Divisions: Yombo and Mwambao. Each of these Divisions has two wards, and thus there are a total of four Wards (Zinga, Kerege, Magomeni and Dunda) that have a direct influence on the Bay area. In this area there are seven coastal villages that frequently use and directly influence the ecosystem: Mlingotini, Kondo, Pande, Kaole, Dunda, Magomeni and Makurunge (through its hamlets of Kitame and Razaba). Adjacent inland villages, including Mapinga and Zinga, also use and influence the Bay.

People in the Mbegani Bay area rely predominantly on natural resources and ecological services for their livelihoods. Thus the ecological integrity and productivity of the marine ecosystem is critical to the resilience of the larger Bay population. Mangroves protect the shoreline from erosion and eliminate contaminants from terrestrial run-off. There are extensive seagrass beds in the Bay area that are highly productive and are high in species diversity and abundance. They are a valuable fish nursery and habitat for numerous marine species. If managed well it has the potential for becoming a fish aggregation site. Coral reefs together with the seagrass beds are very important for the fisheries sub-sector. In terms of preferred fishing locations, most of the fishing (perhaps up to 70%) takes place on seagrass beds located adjacent to coral reefs. Due to the freshwater flow and extensive mangrove areas of the Ruvu and Wami rivers, the second most important prawn fishing ground in Tanzania is found in the Mbegani Bay area and northwards. The condition and status of shorelines, mangroves, seagrass, coral reefs, and estuaries are described in detail in this report.

The livelihoods that these ecosystems support are also described. They include fisheries (about 50% of people in villages are fishers and/or farmers), ecotourism, seaweed farming and fish farming. Ecotourism and beach hotels in Mbegani Bay area rely on the natural endowments of the beach and sea as well as the cultural and historic amenities in this area. These unique and invaluable amenities are historically tied to the natural features of the Mbegani Bay area.

The mangroves, seagrass beds, and ecological functioning of the Ruvu estuary are found to be in relatively good condition. The coral reefs and fisheries are not in good condition and require greater conservation effort, monitoring and surveillance to reverse the trend to further degradation.

There have been many government, civil society and donor project efforts focused on conservation and coastal management around Mbegani Bay. For example, at the District level, in the last decade there have been Intgrated Coastal Mangmeent (ICM) Action Plans, Collaborative Fisheries Management planning and the designation of no-take zones in four reefs in the Mbegani Bay area, Mariculture Zoning at the District level, and Eco-tourism planning both in Dunda and Mlingotini. In addition, in Mlingotini Village, the Msichoke Seaweed Farmers Community Based Organization has been active in seaweed farming planning and management in Mlingotini Bay.

Despite this, there remain weaknesses in the governance of the Mbegani Bay area. Plans do not always result in effective implementation and well intentioned efforts are not always sustained. A specific management plan for the Bay does not exist that would give the District and local stakeholders the legal authority to designate the Bay as an ecologically sensitive

area under special protection from destructive development and uses. Nor does the District have its own spatial zoning plan that defines what local stakeholders would like to see as the road map that puts limits on the location and intensity of future development and mandates conservation areas.

A set of scenarios is presented that can be used to highlight the need to establish a solid, transparent process for development decision making in Bagamoyo so that outcomes in 2030 meet the aspirations of residents while avoiding their fears and allaying their concerns. The four scenarios include:

1. “Business as usual”;

2. “Slow transformation with low port with limited special economic zone investment,”

3. “Rapid transformation with flourishing economic zone.” and

4. “Balanced use bay with strong environmental-social best practices.”

1. INTRODUCTION

The Pwani project is a partnership between the University of Rhode Island, USAID and local and national government and communities in Pangani, Bagamoyo District, and Menai Bay, Zanzibar. The goal of this project is to sustain the flow of environmental goods and services; reverse the trend of environmental destruction of critical coastal habitats; and improve the wellbeing of coastal residents in the Bagamoyo-Pangani and Menai Bay Seascapes. This goal is met by speeding the formation of the enabling conditions for coastal governance, supporting local participation in natural resources management, integrating socio-economic and other cross-cutting issues, and promoting institutional and resource user behaviors that are appropriate for the long-term management of the Northern Tanzania Seascape.

The purpose of this report is to create an accessible baseline of the physical features of Mbegani Bay, the ecosystem characteristics of the Bay and surrounding area, and the livelihoods that are dependent on the Bay's endowments as well as potential future factors of influence on livelihoods and the ecosystem, such as port and industrial development, and climate change. Governance status of the Bay and previous conservation and planning efforts are reviewed.

The report highlights the interconnections between Mbegani Bay and its surrounding area with the well-being and livelihoods of the seven villages surrounding the Bay area. It considers the current ecosystem status, threats, and what it might look like in the medium-term future if proactive action is taken and if nothing is successfully done to halt the trend toward degradation.

This report is meant to raise awareness and to be a basis for discussion, validation and development of recommendations.

2. PHYSICAL FEATURES OF THE BAY

2.1 The Hydrology and Functioning of Mbegani Bay

Mbegani Bay is located about 10 km south of Bagamoyo Town and about 60 km north of Dar es Salaam. The Bay is more precisely a lagoon or a shallow body of water separated from a larger body of water by barrier islands or reefs. The lagoon is roughly rectangular in shape and covers about 15 square kilometers. The landward side of the Lagoon extends for some 10 km between Kondo village located to the south and the Ras Mbegani located to the north. The seaward side of the Bay is bounded by a narrow raised fossil reef platform. This fossil reef platform is responsible for making the bay a lagoon. Within the Bay there are several other raised reef platforms (which include Mapopo Island and Chaza Island).

Bays, embayments and estuaries are common along Tanzania's coastline. They are used by coastal communities for fisheries, transportation, recreation and port development. Bays and lagoons are formed by geological processes such as tidal fluctuations, wind generated waves, air-sea interactions and glacial-interglacial changes.These are the same processes that transport and disperse processes larvae, nutrients, sediments and pollutants. Because bays and estuaries are often shallow and close to land, they are directly exposed to human activities. This makes the environment of bays and estuaries particularly vulnerable (IUCN, 2003; Shaghude, 2006).

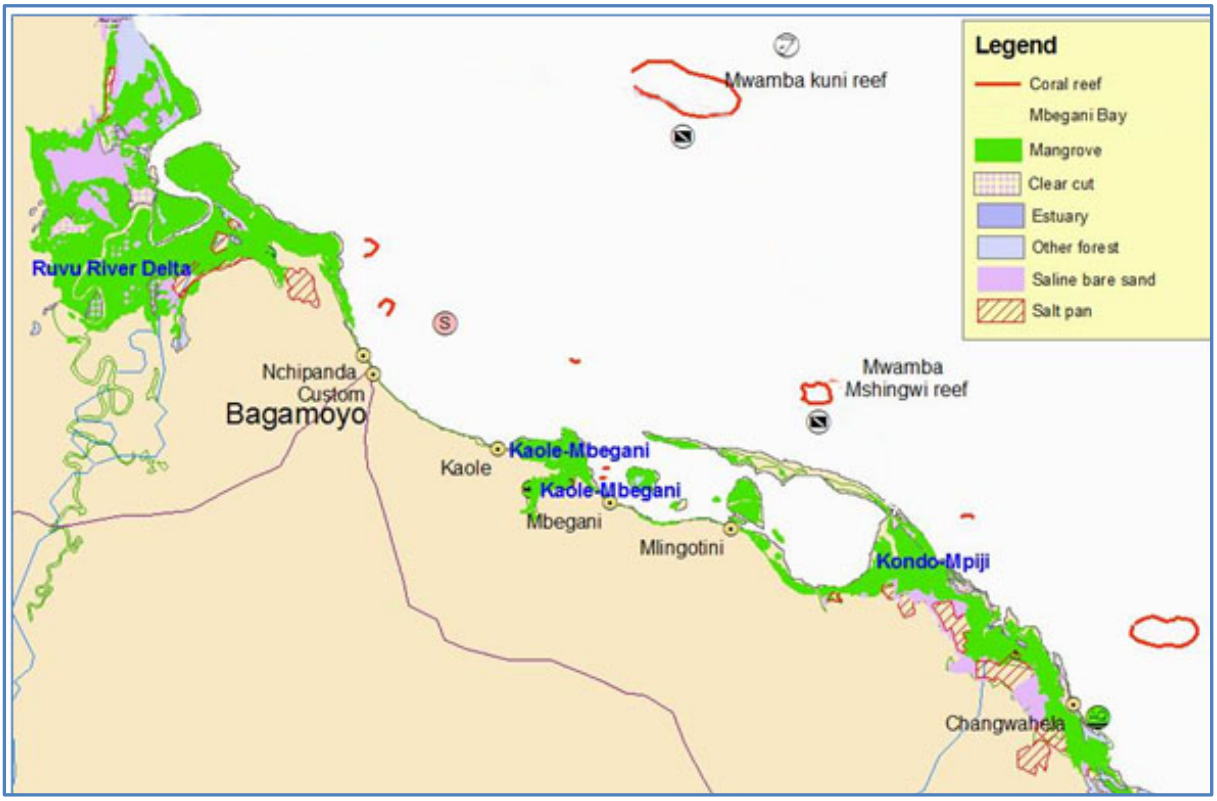

Figure 1 Map showing Mbegani Bay area and mangrove ecosystems

There are plenty of mangrove forests within the Bay. They are generally patchily distributed along the coast, with denser sections around Mbegani and Mlingotini. Dense mangrove thickets are also common along the raised reefs inside the Bay. Mangrove ecosystem and other associated resources provide habitat for wildlife and commercially valuable species (Figure 1).

The lagoon is connected to the Indian Ocean through its northern end (where the Mbegani Fisheries Institute dock and facilities are located) and a tidal creek located on the eastern side of the lagoon in the proximity of Kondo village. The only development on the barrier island (Lazy Lagoon Island) is a private beach hotel (Lazy Lagoon Resort). Because the marine ecosystem of the lagoon is also influenced by the freshwater discharge of the Ruvu River, just to the North of Bagamoyo town, this report focuses on the coastline and nearshore marine area from the Ruvu estuary southward to Kondo village.

The Bay is generally shallow with a maximum depth of about 8 m with two tidal channels (Shaghude, 2011; Fig. 2). The two tidal channels together with the tidal Creek located on the southeastern part of the Bay are responsible for the exchange of water between the Bay and the open ocean. The two tidal channels are also the major conduits of the tidal currents in the Bay. During each tidal cycle the tidal channels modulate the volume of the water in the Bay. The tidal currents together with the waves help to transport and disperse the sediments to different parts of the Bay.

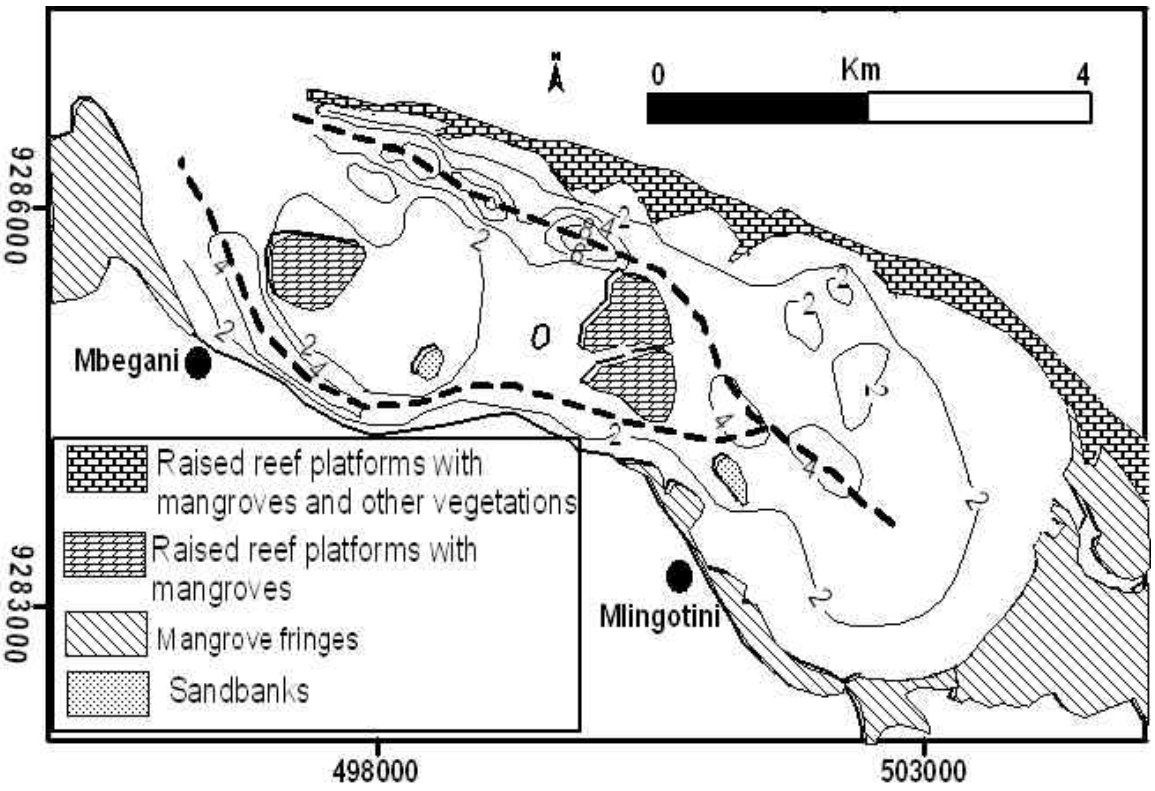

Figure 2 Map showing the bathymetry of the Mbegani Bay. Note the two tidal channels which merge on the southeastern part of the Bay (Source : Shaghude, 2011.)

The tidal currents in the Bay are consistently south-easterly during flood and north-westerly during ebb (Shaghude, 2011). During the flood phase of the tide, most of the sea water enter the Bay through the wider opening located on the northwestern side of the Bay and follows the paths through the two tidal channels which merges towards the upstream side of the Bay (Fig. 2). In addition, a minor fraction of seawater enters the Bay through the tidal Creek located on the southeastern part of the Bay.

2.2 Shoreline Changes and Human Influence

Coastal erosion is currently one of the major environmental issues of concern at Mbegani Bay as well as many other coastal sites in Tanzania (Shaghude et al, 1994, and Shaghude, 2011). Field evidence of wave erosion includes exposure and uprooting of tree roots (particularly mangrove trees), collapse of beach cliffs, and the presence of coastal protection structures (Figure 3).

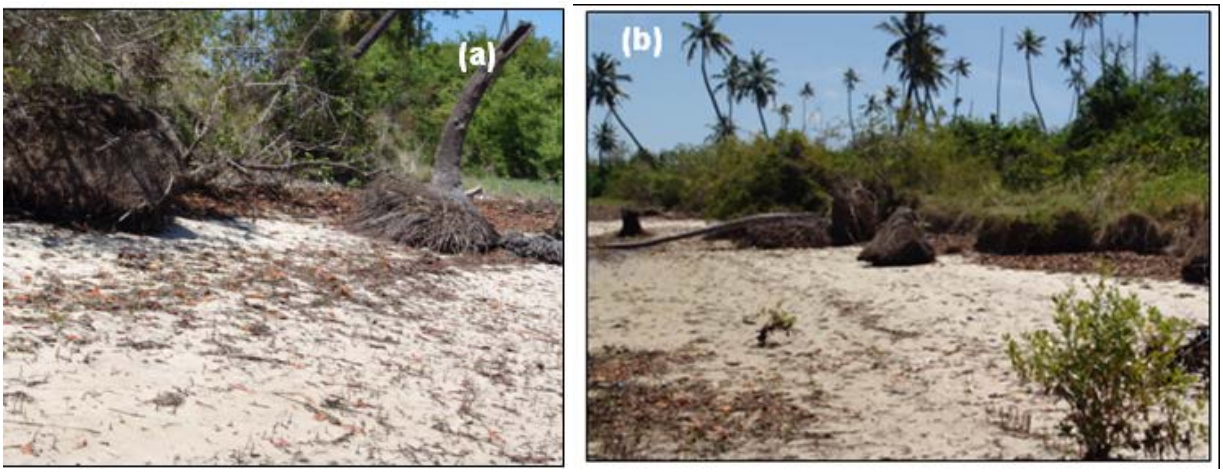

Figure 3 Eroding shore at Mbegani as exemplified by the uprooting of trees and collapse of the beach cliff. (Source: Shaghude 2011)**.**

According to Shaghude (2011) the severity and vulnerability to wave erosion along the coastal section enclosing the Bay is higher on the northwestern part of the Bay, towards the Mbegani Fisheries Training Centre than on the southeastern parts of the Bay towards Kondo village (Fig. 4). The difference in severity to erosion and vulnerability to wave erosion between the northwestern side and the southeastern side had been attributed to the fact that the western coastal stretch is relatively more open towards the ocean waves compared to the eastern coast, which seem to be relatively better protected by the raised reef platforms and the sand banks that are located inside the Bay. Furthermore, because of the northwesterly-southeasterly orientation of the Bay, most of the wave erosion seems to take place during the NE monsoon season.

Alternatively, the difference in the mangrove forest cover along the coastal stretch between Ras Mbegani and the Kondo Village may also contribute to the observed difference in wave erosion. Protection of the mangroves should therefore be sensitized to the coastal communities as their environmental services along the coastal stretch are clearly evident. The environmental services provided by the vegetation cover on the existing raised reef platforms should also be sensitized to coastal communities and to policy makers. The existing raised reef platforms are currently well covered by vegetation. However, with increasing urbanization of the coastline, the vegetation on the raised reef platforms may be threatened. The removal of vegetative cover on these reef platforms will definitely make the platforms more vulnerable against wave erosion as had happened at Maziwe Island, off the Pangani estuary in Tanga Region, during the late 1970s (Shaghude, 2004).

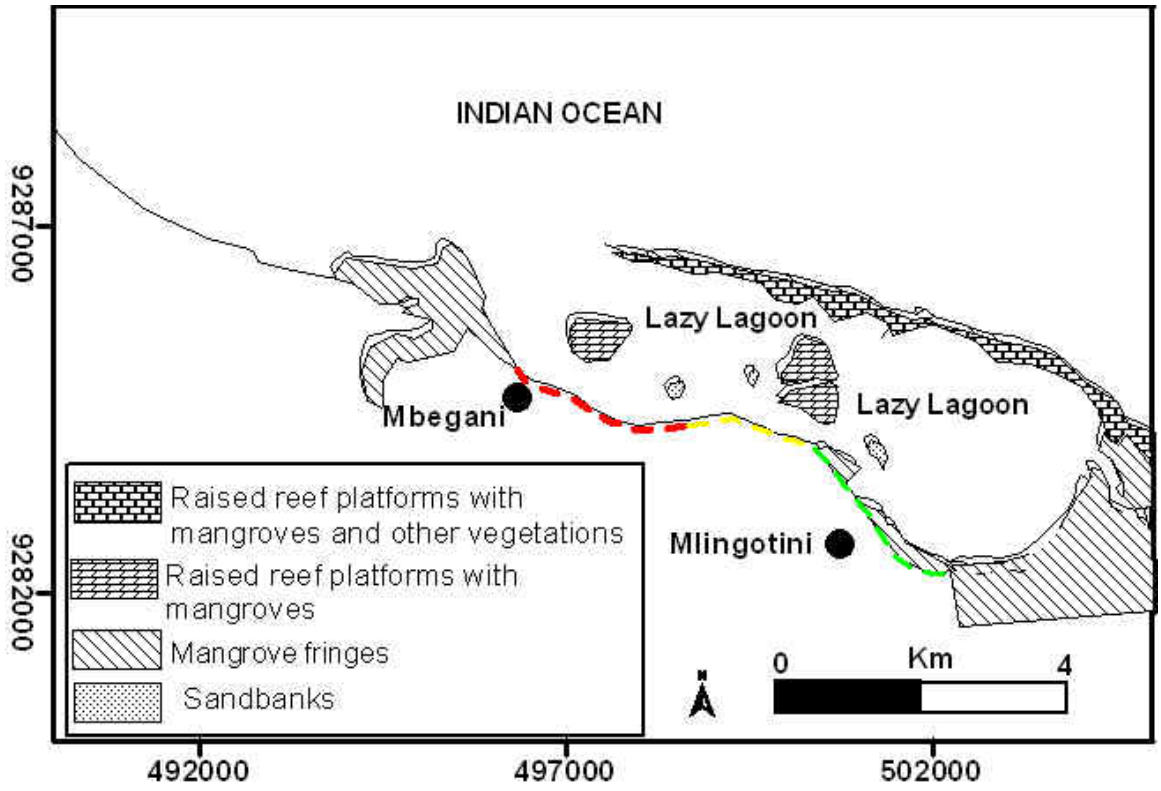

Figure 4 Map showing the status of coastal erosion along the western coastal stretch of Mbegani Bay stretching between Mbegani and Mlingotini

The red dotted line (between 5-10 incidences of eroding coastal sites. encountered), Yellow dotted line (Less than 5 incidences of eroding coastal sites encountered), Green dotted line (No erosion observed). Source: Shaghude (2011).

While most of the observed erosion at Mbegani Bay is attributed to natural causative factors, mainly waves (Shaghude, 2011), accelerated erosion in limited locations of the coastal section are attributable to human influence. The concrete jetty installed at the Old boat yard located 300 m west of Mbegani Fisheries Training Centre, provides a good example. At this site the concrete jetty functions as a groyne which interrupts the longshore sediment drift, thereby promoting erosion on one side of the groyne and accretion on the other side (CIRIA, 1996).

3. ECOSYSTEM CHARACTERISTICS

3.1 Mangroves

Distribution

Mangrove forests occur at the interface of land and sea along tropical and subtropical coastlines. They occur where there is abundant fine-grained sediment (silt and clay) in the upper part of the inter-tidal zone, usually in sheltered bays, lagoons, tidal creeks and inlets and around river mouths. Refering again to Figure 1, mangroves are distributed along the coastal section stretching from Ras Mbegani to Mlingotini where they occur as mangrove fringes with relatively denser thickets at Mbegani and Mlingotini. Dense mangrove thickets are also common on most of the raised reef inside the Bay. Outside the Bay, there are stands of mangroves at Kaole, and Kondo sheltered creeks and lagoons. There is also a narrow band which extents further south to Mbweni, in Kinondoni District.

Mangroves of Bagamoyo district form one of the 10 management blocks (Table 1) designated in the National Mangrove Management Plan (Semesi, 1991, 1992). The major stand units' area cover of the different individual mangrove stands in this management block during development of the plan some two decades ago were estimated as: (a) Wami River, 862 ha, (b) Utondwe creek, 834 ha, (c) Ruvu River, 2,123 ha, and (d) south of Bagamoyo to Mpiji River, 809 ha (Semesi, 1991). Overall the Bagamoyo management block had mangrove coverage of 5,636 ha (Semesi, 1992). Some 10 years later Wang et al. (2003) reported a slight decline in mangrove cover of this management block to 5,051 ha (Table 1).

Table 1. Mangrove forest area cover change in ten blocks along the coast of mainland Tanzania

Management Block	Area (ha) (Semesi, 1991, 1992)	Area (ha) (Wang et al., 2003)
1. Mkinga and Tanga	9,403.3	9,313
2. Pangani	1,755.6	3,879
3. Bagamoyo	5,635.8	5,051
4. Dar es Salaam	2,168.2	2,516
5. Kisarawe	3,858.3	4,092
6. Rufiji	5,3254.8	48,030
7. Mafia	3,472.9	Not assessed
8. Kilwa	2,2438.7	21,755
9. Lindi	4,546.5	4,044
10. Mtwara	8,941.5	9,458
Total Area	**115,475.6**	**108,138**

Apparently there has been no change in spatial location. Although there have been no detailed recent surveys, there are many indications that both the quality (height, density, size) and total area cover of mangroves has substantially continued to declined. In terms of species richness, eight of the 10 mangrove species occurring in Tanzania (Table 2), are found in Mbegani Bay. However, differential climate change impacts and recent human use patterns, which have not been fully investigated, are likely to have resulted in change in species composition as well.

Table 2. Reef benthic variables monitored

English Name	Swahili Name
Hard coral	Matumbawe Hai
Dead coral	Matumbawe Kufa
Bleached coral	Matumbawe Meupe
Rubble	Kokoto
Sand	Mchanga
Rock	Mwamba/Jiwe
Sponge	Sponji
Macroalgae	Mwani
Soft coral	Matumbawe Laini
Sea grasses	Majani
Others	Vinginevyo

Ecological roles of mangroves

Mangroves play an important ecological role by providing habitat for a range of species as well as nursery areas for the juvenile stages of commercially important fishery species, e.g. fish, shellfish, prawn, and crab species (Lugendo et al., 2007). Mangroves are therefore either permanent or temporary habitats for many aquatic organisms. As the tide rises and submerges in the mangrove flats, numerous fish move in to find food and shelter. Yellow fin bream, silver biddy, gobies, mullet and herring are some of the common fish inhabitants (Lugendo et al., 2007). Through the action of its roots, a mangrove forest recycles nutrients and traps land-based debris, sediments, and suspended particulate matter carried to the coast by rivers. In addition, mangroves trees and other primary producers produce large quantities of organic matter. However, most animals do not graze directly on the mangroves; instead they feed on the detritus (decomposing plant material). Microscopic fungi and bacteria first break down the mangrove litter, then detritus feeders such as mullet, prawns and crabs eat this decomposing material.

In the mangroves of the Mbegani Bay area, in addition to crustaceans and molluscs, there are commercially valuable species, e.g. prawns (*Penaeus monodon, P. indicus*), crabs (*Scylla serrata*), milk fish (*Chanos chanos*) and sea catfish (*Arius* spp.). Other organisms such as sesarmid crabs (*Sesarma* spp.) and fiddler crabs (*Uca* spp.), and gastropods are all common in the mangroves of Mbegani Bay. Local women and children in the area collect shellfish and they serve as an important source of protein. Due to the extensive mangrove areas of the the Ruvu and Wami Rivers, the second most important prawn fishing ground in Tanzania is found in the Mbegani Bay area and northwards (Muhando and Rumisha, 2008). Giant tiger prawn (*Penaeus monodon*), Indian white shrimps (*P. Indicus*) are the dominant species caught by trawlers in the open sea and by local fishers on foot with handheld nets in the Ruvu and inside Mbegani – Mpiji mangrove creeks (Semesi et al., 1999).

Mangrove forests serve as a buffer from the direct effect of run-off waters, by filtering pollutants from run-off. Thus mangroves help maintain estuarine water quality and reduce siltation. By stabilizing soils and reducing erosion losses, forests limit sedimentation of streams, reservoirs and the coastal near shore areas. Mangrove forests also play a significant role in stabilizing the local climate, particularly in terms of influencing rainfall patterns, as well as improving air quality and enriching soils through nitrogen fixation. In addition,

mangroves trap sediments, thus playing a vital role in coastal protection by reducing erosion. As such, degradation of mangroves should be viewed as a threat to the Mbegani Bay and surrounding area ecosystem. While the economic importance of mangroves in Mbegani Bay is enormous, poorly controlled human activities through over-exploitation of resources, and clear cutting of substantial areas of mangroves for firewood, charcoal making, solar salt pans, agriculture/aquaculture, industries, urban and hotel developments are major factors that contribute to the degradation of mangroves in the Mbegani Bay area (Francis et al., 2002).

3.2 Seagrass

Sea grasses are marine flowering plants, which occur in shallow waters and estuaries. They grow best in lagoons and protected areas on stable sandy or muddy substrates up to 25 m in depth depending on light penetration to facilitate photosynthesis.

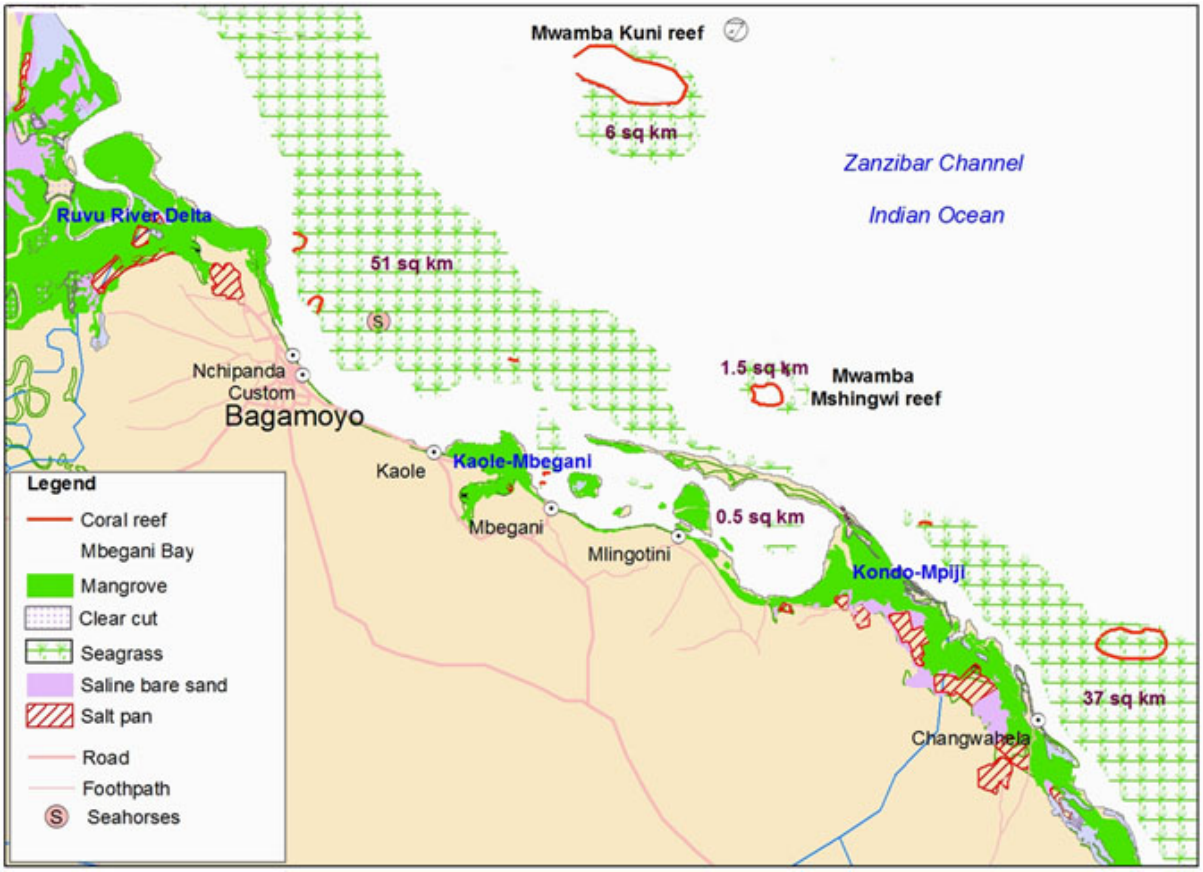

Figure 5 Map showing the distribution and estimated area cover of seagrass in Mbegani Bay area

Seagrass beds are a common feature in Mbegani Bay subtidal and intertidal sand flats, coastal lagoons, and sandy areas around the bases of shallow fringing and patch reefs (Fig 5). In the vicinity of coral reefs, seagrass is linked to reefs physically and in terms of energy flows. On the wave/current protected sides of coral reefs, e.g., Mwamba Kuni and Mwamba Mshingwi reefs (Fig 5) abundant seagrass beds are found. Large areas of seagrass are found along the lower end of intertidal zones, especially along Bagamoyo town, and where bottom substrate is not composed of silt or mud. Only few areas in Mbegani Bay are covered by seagrass

(about 0.5 km^2). Strong tidal currents on the middle part of the channel and mud deposition and resuspension prevent seagrass establishment. There are no seagrass beds in the vicinity of mangroves at the mouth of the Ruvu River, mainly because of turbidity and substrate instability. As sediment type changes from muddy to stable sandy bottom, seagrass start to flourish.

The seagrass beds in the Mbegani Bay area are highly productive areas and are high in species diversity and abundance (Semesi et al., 1999) serving many ecological functions. For example, sea grasses trap the nutrients associated with mangroves converting them into lush plant biomass. Additional ecological functions of sea grass include the trapping of sediments, which reduces sedimentation over coral reefs and the dissipation of wave energy, which also provides protection to the beaches and therefore protects shorelines. Extensive sea grass beds stabilize sediment by the roots thereby reducing the movement of sand and mud. They support complex food webs through living and dead biomass.

Sea grass hosts an animal community that includes sea cucumbers, starfish, sea urchins, plus various buried bivalves and crustaceans such as crabs and shrimps. Bagamoyo Bay is one of the few areas where sea horse fish are abundant (Matthew Richmond pers. Comm.). Many of these animals as well as some fish lay egg masses on the seagrass and algae within seagrass beds. Thus sea grass beds provide breeding, nursery, and feeding areas for many invertebrate and vertebrate species including commercially important species of finfish and shellfish; and shelter and refuge for resident and transient adult animals such as Dugong, green turtles and hawksbill turtles.

Figure 6 Seagrass bed

Seagrass beds are the most extensive benthic cover in the Mbegani Bay area and therefore constitute the most important habitat in terms of the fishery. A combination of low visibility (high turbidity), abundant dissolved and particulate organic matter, and seagrass beds constitute a safe haven for nursing juvenile fish. For this reason, Mbegani Bay is an important fish nursery area. Local fishermen also say that the fishery in the Mbegani Bay area is probably sustained more by seagrass beds than coral reefs. In terms of preferred fishing locations, most of the fishing (perhaps up to 70%) takes place on seagrass beds located adjacent to coral reefs. A combination of seagrass beds, high turbidity, high detritus based organic materials from rivers and mangroves, and the presence of coral reefs make the Mbegani Bay area a unique nursery area for a variety of fish and invertebrates, some of which are of commercial value. If managed well, it has the potential for becoming a fish aggregation site.

Threats to seagrass beds

Because seagrass beds are mainly found in shallow water close to shore, they are very vulnerable to human pressure. Major threats to the survival of sea grass beds come from excessive sedimentation from land based activities and habitat change. In some areas,

concerns have also been expressed about the effects of inshore seine nets and intensive trawling activities on the seabed. For example, in some cases up to 80% of prawn trawl catch is seagrass (Msumi, pers. comm.). Seaweed farming in some areas involves removal of sea grass beds and seaweed produces a growth inhibiting substance that prevent sea grass from growing in farmed areas. Intensive trampling on seaweed farms and adjacent areas (including passages) has been observed to cause physical alteration.

Another threat is destructive fishing practices like dynamite fishing. Healthy seagrass beds are located on the protected sides of coral reefs, e.g., in Mwambakuni and Mwamba Mshingwi, the main fishing zones in the Mbegani Bay area. It is here that the dynamite fishery takes place. It is easy to collect dynamited fish on protected sides, although the loss of uncollected fish is still high (only about 50% of dead fish are collected according to Rumisha and Muhando (2007)).

3.3 Coral Reefs

Distribution of coral reefs

Bright sunlight and clear waters are critical to the development of coral reefs since they derive their food resources from photosynthesis. Consequently, reefs usually occur where the seabed is shallow. The coral reef ecosystem comprises of reef-building corals as well as a vast array of other organisms that depend on habitats provided by the reef. A variety of commercially important fish and invertebrates reside on coral reefs. Reefs protect the inshore areas from wave action and erosion, and therefore play an important role in coastal defense as well as in determining patterns of sediment transport.

When compared with other reef sites in Tanzania, such as SongoSongo, Tanga, Mafia and Unguja, Mbegani Bay has relatively few good coral reef areas. High concentrations of coral reefs in Mbegani Bay are found in Mwamba Kuni and Mwamba Mshingwi. Patchy and sediment stressed coral reefs are found at Mwamba Kati, Mwamba Mjini, Mwamba Poyogo, Mwamba Tekea and Mwamba Chuma (Figure 7). Those reefs that are located further away from the Ruvu River, such as Mwamba Msumeno and Maduga reefs, are in relatively better condition.

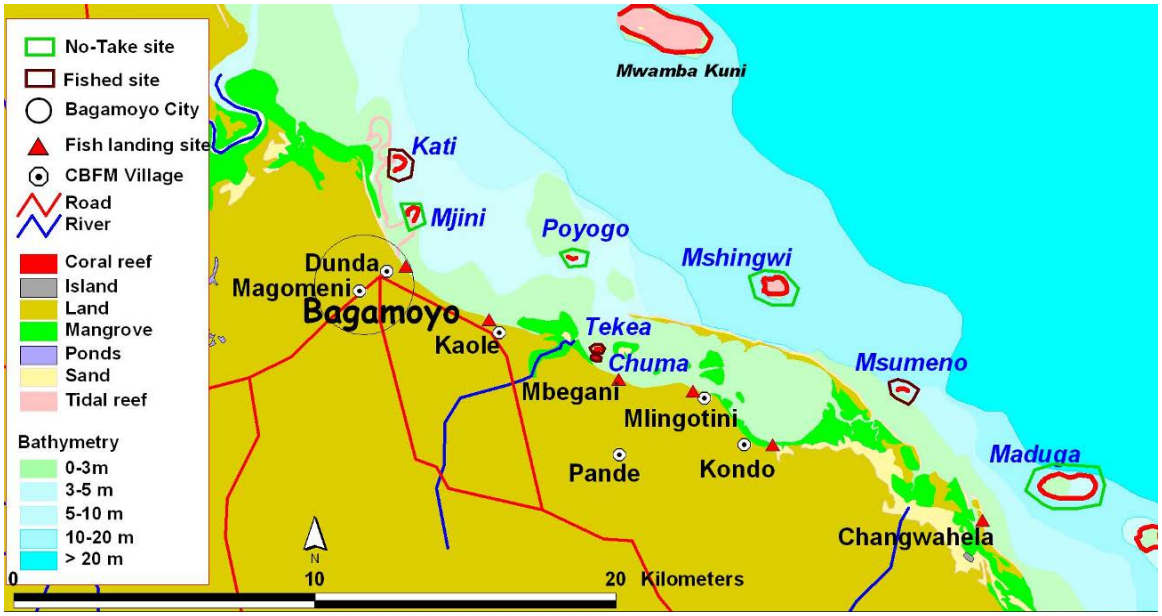

Figure 7 The distribution and management status of coral reefs in the Mbegani Bay area (Source Muhando, 2006)

The health condition of coral reefs and its associated services are influenced by many factors, some are natural and others human induced. Anthropogenic factors influencing the distribution, and abundance as well as causing physical alteration and degradation of habitats on coral reefs in Mbegani Bay include destructive fishing practices, overfishing and to a less extent anchor damage from tourist and fisher's boats. The key destructive fishing practices are those involving the use of dynamite and dragnets (beach seines, and various makes of nets dragged on coral reefs and adjacent seagrass beds). Destructive fishing results in breaking of coral framework, leading to reduced reef complexity, biological productivity, carrying capacity and biodiversity. Commercial trawling for prawns has indirect impact as it facilitates frequent resuspension of sediments which are detrimental to coral reefs.

The natural factor influencing coral reef distribution in the Mbegani Bay area is freshwater from Ruvu River that reduces salinity and carries sediments. Reef coral do not flourish where salinity is less than 20 parts per thousand, or where the substrate is unstable or where the sedimentation rate is high (Rogers, 1990; Muhando, 2003).

In 1998, a massive coral bleaching event caused extensive coral mortality in the Western Indian Ocean, including Tanzania (Muhando, 1999; Wilkinson et al., 1999). Recent analysis of coral reef recovery prospects in Chwaka Bay and adjacent areas (Muhando and Mohammed, 2011) suggests that recovery after the 1998 bleaching event was poorest in areas with chronic sedimentation problems. A similar situation is suspected in Mbegani Bay, especially on the reefs Mwamba Kati, Mwamba Mjini, Mwamba Poyogo, Mwamba Tekea and Mwamba Chuma located near high sediment problem areas.

Ecological roles and status of coral reefs in the Mbegani Bay area

Coral reefs play very significant ecological roles as a habitat, spawning, nursery and feeding sites for a variety of organisms, including commercial fish. Consequently, they are important fishing areas for fish stocks. The demersal fishing in the Bay is to a large extent associated and linked to coral reefs. Unfortunately, the continuing coral reef degradation results in reduced complexity and carrying capacity. Surveys in 1997 and 2008 (pers. obs) clearly suggest massive degradation on Mwambakuni reefs, especially the landward protected side.

The whole of this side was dominated by sub-massive corals, Galaxea astreata, but currently, more than 30 % of reef area is covered by loose rubble, which is progressively getting eroded. Such human influences on coral reefs and associated implications to fisheries were noticed, and alarmed fisheries officers, leading local fishers and the District to support an initiative to protect the reefs.

Through a participation process with communities, coral reef areas that require special conservation attention in the Mbegani Bay area were selected, discussed. These were Mwamba Kati, Mwamba Mjini, Mwamba Poyogo, Mwamba Tekea, Mwamba Chuma, Mwamba Mshingwi, Mwamba Msumeno and Mwamba Maduga. The initial proposal was that all these should be declared as no take zones, and be managed jointly by Community-Based Fisheries Management village committees and Fisheries officers. In order to measure management implications, it was necessary to compose a strong community based coral reef monitoring group, which was actually formed, trained and empowered to record selected reef healthy indicators: reef benthic cover (Table 2) and macro-invertebrate and reef fish (Table 3) The first community based coral reef monitoring was conducted in 2005 (Mbije 2005) and repeated in 2006 (Muhando, 2006). Substantial amount of information was revealed, e.g. coral benthic cover, macro-invertebrates density, and reef fish abundance.

Table 3. Reef macro-invertebrates and reef fish monitored

Macro-invertebrates		**Reef Fish**	
English Name	Swahili Name	English Name	Swahili Name
Sea urchin	Ulumba	Goat fish	Mkundaji
Cypraea	Bunda Chui	Lutjanus fulviflamma, Black spotted snappers	Kelea
Starfish	Kiti cha Pweza	Blacks spotted emperor	Changudoa
Brittle star	Takambe	Black spotted sweetlips	Mwelea
Crown-of-thorns	Kiti cha Pweza	White spotted Rabbitfish	Tasi
Sea cucumber	Jongoo	Parrot fishes	Pono
Other gastropods	Kome	Snappers	Changu
		Sardines	Dagaa
		Others	Wengineo

Relatively higher live coral cover of above 25% was observed in Poyogo, Mshingwi and Mweduga, while live coral cover in Mwamba Mjini and Kati was below 18% (Fig. 8). Poor environmental conditions caused by river sediments and low visibility resulted in low coral cover and high preference of macroalgae and seagrass beds on Mwamba Mjini and Mwamba Kati. It was suggested in 2006 that future conservation efforts be directed to conservation of Mweduga, Mshingwi and probably Poyogo, before the others. After thorough discussions, four reefs were declared as no-take areas: Mwamba Mjini, Mwamba Poyogo, Mwamba Mshingwi, located in Mbegani Bay and Mwamba Maduga. Proper boundaries of the no-take zones are still required.

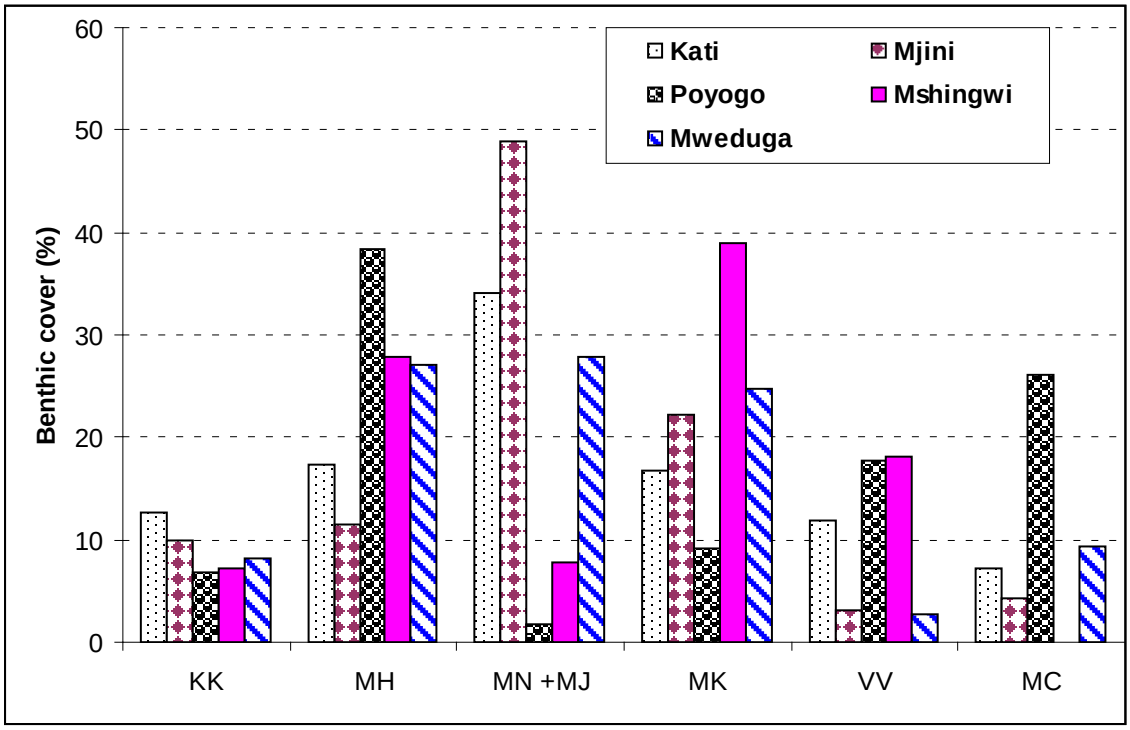

Figure 8 Between site comparison of the main reef benthic categories in 2006

Community-based coral reef monitoring also revealed that most of the reef macro-invertebrates found elsewhere in Tanzania (Mohammed et al., 2002) were also observed in Mbegani Bay, however, at much lower densities (Mbije 2005; Muhando, 2006). As expected, the reef invertebrate density and diversity increased for reefs located far from the Ruvu River estuary and human centers. Mwamba mshingwi had the highest density and diversity of invertebrates.

In conclusion, the condition of coral reefs in the Mbegani Bay area is relatively poor. Coral reef management continues to face many problems related to inadequate funding to monitoring and assessment, continued dynamite fishing, open access and weak enforcement of no-take rules, and lack of education and awareness raising efforts.

3.4 The Ruvu Delta and its influence on Mbegani Bay

The Ruvu River influences the ecology and productivity of the Mbegani Bay area that various livelihoods depend on, so it is important to review this relationship. The drainage basin extends as far as Morogoro Mountains and has many tributaries (Figure 9). Spacious wetlands are found behind Ruvu estuary mangroves. The amount of river water discharged varies from year to year and also seasonally following rainfall patterns. The mean annual discharge rate is estimated at 63 m/s (Shaghude et al. *In press*).

River sedimentation processes directly influences benthic primary productivity by controlling substrate characteristics (stability and quality) and the distribution of benthic organisms, specifically mangroves, seagrass beds, algal mats and coral reefs. There are no healthy seagrass or algal beds around the main sediment deposition areas at the river mouth. Seagrass beds start to establish as sedimentation gets reduced and substrate stabilizes, and reaches optimum growth in the shallow parts in the middle of Mbegani Bay area and towards

Mwambakuni and off Bagamoyo town coast. Seagrass beds cover most of the bay shallow water areas away from the river mouth.

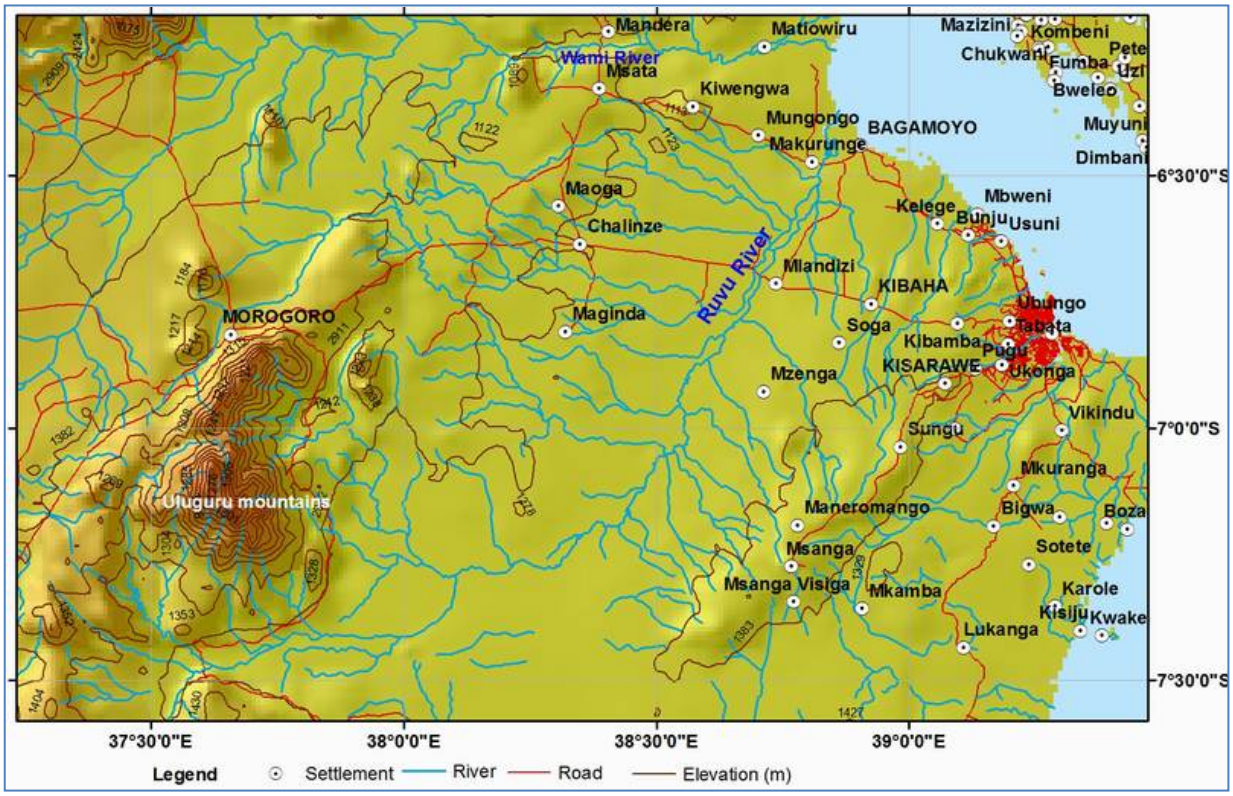

Figure 9 A map showing the Ruvu River drainage basin, which extends as far as Uluguru mountains.

The Ruvu riverine water and associated biota and flora flows northwards, and combines with Wami riverine and Sadani tributaries, where a combination of muddy bottom and sparsely distributed seagrass beds form the main Ruvu-Wami prawn fishing ground (Fig. 10). The prawn fishery in the Mbegani Bay area is maintained and sustained by Ruvu riverine system. Four penaeid species, *Fenneropenaeus indicus*, *Penaeus monodon*, P. *japonicus*, and *Metapenaeus monoceros* are found in the Ruvu estuary and nearshore waters. *Fenneropenaeus indicus* was the most abundant, and more so during the rainy season than in dry season (Teikwa and Mgaya, 2003).

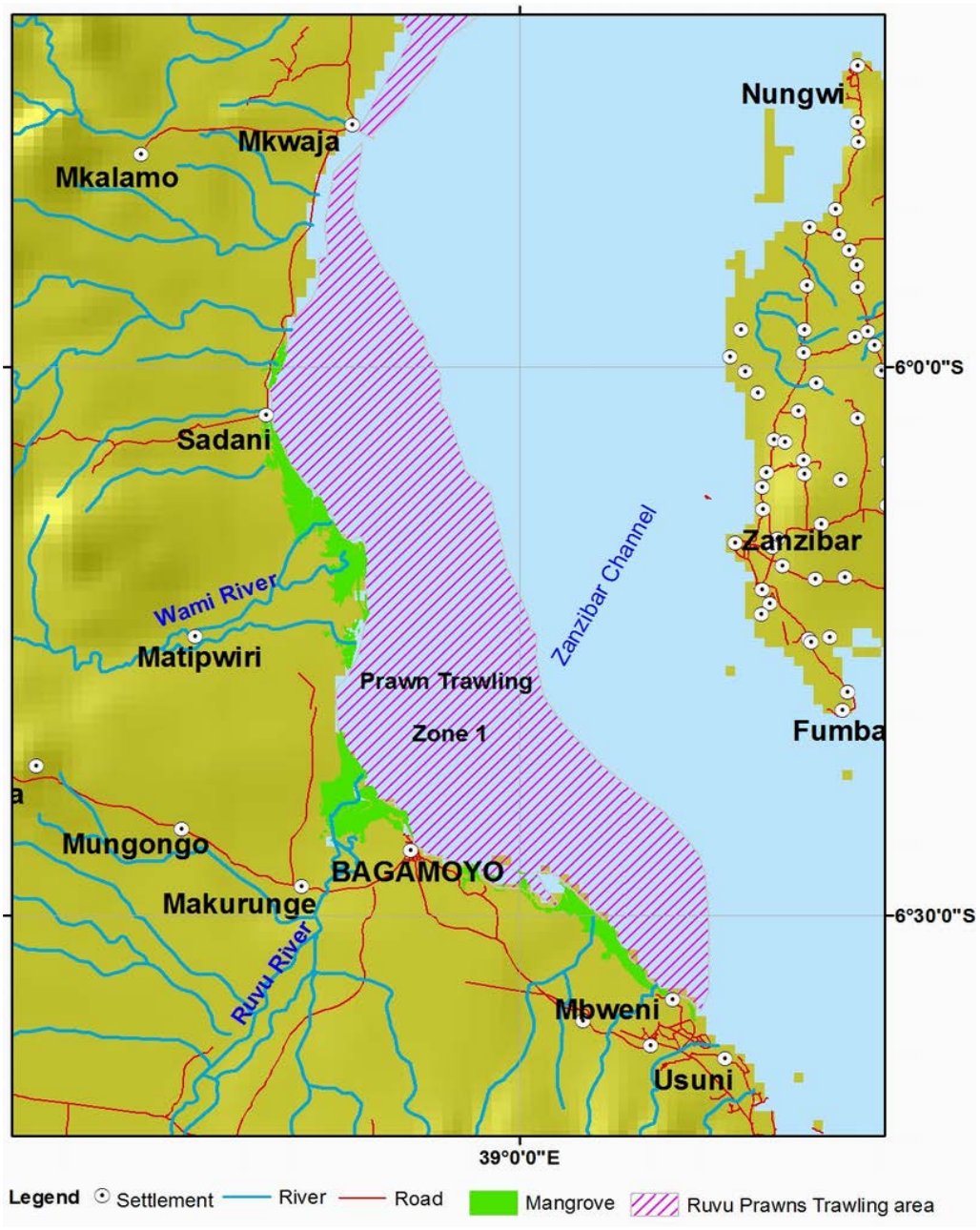

Figure 10 A map showing the Ruvu-Wami prawn trawling area.
(Source: Muhando and Rumisha 2008)

4. LIVELIHOODS THAT DEPEND ON THE MBEGANI BAY MARINE ECOSYSTEM

The population distribution of the Bagamoyo district in 2002 and projected growth by 2011 are shown in Table 4. The population of Dunda and Zinga, highlighted in grey, is about 35,000. These are the wards that cover the Mbegani Bay area.

Table 4. Bagamoyo District population in 2002 and projected growth by 2011

S/N	WARD	SEX		TOTAL	2007	2009	2011
		MALE	FEMALE				
1	Kiwangwa	8,085	8,000	16,094	17,846	18,692	19,542
2	Msata	4,672	4,827	9,499	10,792	11,289	11,795
3	Miono	9,566	10,166	19,732	22,285	23,325	24,402
4	Mkange	4,976	5,047	10,023	11,306	11,856	12,407
5	Magomeni	9,047	8,939	17,986	20,987	21,931	22,912
6	Dunda	6,803	6.434	13,237	15,437	16,124	16,836
7	Kiromo	2,636	2,648	5,284	5,853	6,121	6,397
8	Zinga	8,241	7,484	15,725	17,037	17,827	18,632
9	Yombo	3,529	3,636	7,165	7,827	8,182	8,540
10	Vigwaza	6,796	6,683	13,479	15,163	15,892	16,607
11	Talawanda	4,711	4,827	9,538	10,648	11,156	11,674
12	Chalinze	15,786	16,560	32,346	37,691	39,411	41,135
13	Lugoba	7,834	8,083	15,917	18,200	19,028	19,881
14	Ubena Zomozi	8,124	8,081	16,205	18,102	18,967	19,835
15	Mbwewe	9,080	9,462	18,542	21,030	22,014	22,990
16	Kibindu	4,105	4,090	8,195	9,315	5,650	10,195
DISTRICT TOTAL		**113,991**	**114,976**	**228,967**	**259,519**	**271,669**	**283,777**
Source: Tanzania Bureau of Statistics 2002-2025							

People in the Mbegani Bay area rely predominantly on natural resources for their livelihoods. About 50 percent of the population is either fishers and/or farmers. The remaining 50 percent are involved in small businesses, livestock keeping, publich/private sector employment, and tourism. Many households rely on more than one income generating activity—for example many women supplement agricultural activities with petty trading and small businesses such as cooking food and selling kangas (Coll Besa 2010). Income levels are low and 69 percent of the population makes less than 100,000 Tanzania Shillings per month (equivalent to US $80). Approximately 30 percent of the villagers make less than US $2 per day—which is better than the national average of 47.5%, but the general sense in villages is that it is difficult to cover basic needs. A typical household of six individuals spend on average US $3.11 per day (ranging between US $2.07 and US $4.83) (Coll Besa 2010). When asked what the largest issues are to those living in Mbegani Bay, the majority of respondents stated that low incomes is the biggest problem (64 percent) followed by lack of clean water (12.5percent), environmental degradation (10 percent), diseases (7.5 percent), and food insecurity (6.2 percent) (Kajubili 2012). Most households live in houses made out of mud with a thatched

coconut or corrugated aluminum roof. Very few live in houses made out of brick (Coll Besa, 2010).

The shoreline and the sea have always been and continue to be an important asset and draw to the Mbegani Bay area. Today it provides the natural resources and ecological services for artisanal fisheries, salt making, fish ponds and seaweed farming. It also supports beach hotels and eco-tourism.

4.1 Artisanal Fishing

Bagamoyo District has 10 permanent landing sites (and 1 temporary) and an estimated 1,751 fishers (MLDF, 2010a). The Mlingotini landing site is located in the Mbegani Bay and the Dunda and Changwahela landing sites are nearby in the broader Mbegani Bay area (Table 5).

Like other tropical conditions, the fish catch is composed of multi-species, which varies with season. Previous studies have shown up to 100 species are caught in waters less than 20m in the area (Msumi, 1992; Semesi et al., 1999).

Table 5. Fisheries information relevant to the Mbegani Bay area

Village	Landing sites	Fishing grounds	No. of fishing boats					Common commercial sp.
			Dugout canoes	Outrigger canoes	Dhows	Large boats	Boats with engines	
Mlingotini	Mlingotini	Kiteleke, Mshingwi, Milangoni, Kilwa and Change	100	50	25	6	6	Changu, Kolekole, Karamamba, Tasi, Mkizi and Chaa
Dunda	Dunda	Mwambakuni, Bolibo, Bawe, Mivinje mitoto, Kibanda hodi and Ruvu	10	70	5	5	5	Kolekole, Nguru, Tasi, Vibua, Pono and Saladini
Mapinga	Changwahela	Mwaduga, Dambwe, Kifunguni, Mzimuni and Mbweni	15	15	10	2	5	Nguru, Changu, Kolekole, Swordfish, Tasi and Pweza

Source: VCA Report (2010)

Fishing effort in Bagamoyo District has increased from 1,100 in 1999 (Mgaya et al., 1999) to 1,533 fishers in 2007 (Fisheries, 2008). Both growth overfishing (removal of juveniles) and recruitment overfishing (removal of spawning mothers and keystone species) have been

reported (Sobo, 2012). Based on a 2005 report (TCMP, 2005), fishermen report that daily catch per artisanal fisherman has declined from approximately 75kg in 1985 to 25kg in 2004. At the same time they have noticed a decrease in fish size (pers. comm. with Mlingotini fishers). These are classic symptoms of unsustainable exploitation and over-fishing. Therefore, one of the most important actions that can be taken to benefit fishers is to reduce fishing effort, and to protect and conserve fish resources and habitat to allow fisheries resources to recover.

Fishers and other stakeholders in the communities studied were asked their perception of change over the past decade. Table 6 below show remarkably similar perceptions among the Mbegani Bay communities.

Table 6. Perceptions of change wihtin fisheries among Mbegani Bay communities

Landing site/Village	Perception of change	Reasons perceived
Mlingotini	Decreased level of catch has resulted in worsening economic well-being and increased time at sea	Growing number of fishermen, destructive fishing practices in the past, climate change
Dunda	Decreased level of catch has resulted in worsening economic well-being and increased time at sea	Growing number of fishermen, destructive fishing practices in the past, climate change
Changwahela	Decreased level of catch has resulted in worsening economic well-being and increased time at sea. Problem of Kunduchi fishers intruding on fishing grounds	Growing number of fishermen, destructive fishing practices in the past, climate change

Facility infrastructure and services at the Mbegani Bay landing sites are very limited as shown in Table 7 below. None of the fishing villages in Bagamoyo have facilities for fish handling, cold storage, processing, marketing and sales. The Kastamu landing site in Dunda is the only place used for auctioning fish soon after landing. At some of the landing sites, buyers bring their own small ice containers for keeping fresh fish. In Dunda, a few processors (mostly women) fry fish at the landing site.

Table 7. Services and infrastructure at fish landing sites

Landing site/Village	Off beach market	Cold storage	Electri-city	Fish process-ing	All season roads	Boat repair	Gear repair	Clean water supply
Mlingotini	No	No	Yes	No	Yes	Yes	Yes	Yes
Nchipana/Dunda	No	No	Yes	Fish frying	Yes	Yes	Yes	No
Kastamu/Dunda	Yes	No	Yes	Fish frying	Yes	Yes	Yes	No
Changwahela	No	No	No	No	No	Yes	Yes	No

4.2 Mariculture

Mariculture is defined as '*a type of aquaculture that involves cultivation of marine species in coastal waters under human control (Mutatina, 2008)'*. Mariculture is not a major source of livelihood in Tanzania, but it is growing. Those living in Mbegani Bay have the potential to engage in various forms of mariculture, including fish pond culture, seaweed farming, crab fattening, and shrimp farming. Of these, only fish pond culture and seaweed farming are currently conducted by communities in the Mbegani Bay area.

Fish pond culture

In Bagamoyo District, mariculture has been practiced for a long time, although there are relatively few active ponds. Mariculture activities started in Bagamoyo district before 2004 when farming was done in salt pans and reservoirs used to keep water for salt crystallization. In 2004 demonstration ponds for fish farming were constructed at Mapinga village. This generated interest by a quite large number of people for engaging in mariculture activities.

Salt flats are suitable areas for fish ponds and Table 8 shows their frequency in the Mbegani Bay area—as well as the few fish ponds that already exist. Most of the sites zoned as suitable are salt pans, and most of these are owned by private companies. Some investors grow fish in a few of their salt pans (reservoirs). To prevent unplanned and unwise siting of new ponds, the Bagamoyo District has zoned suitable and unsuitable sites in the coastal zone as part of the development of Decentralized Minor Permit Procedures for Small Scale Mariculture activities. These Procedures are intended to both protect habitat and promote growth in a way that is planned and sustainable.

The National Integrated Coastal Management strategy provides a framework under the National Environment Policy that links sectors at the District level and leads those sectors in a cooperative way in order to bring sustainable development. Coastal resources are under huge pressure that is caused by people being highly dependent on them for food and other basic needs, thus increasing the likely failure of these resources to support our future generations. Recently, different large economic activities are being located in coastal areas and more will follow. The establishment of a zoning and management plan for small-scale pond mariculture in Bagamoyo district addresses one of the economic activities that are to provide development in our coastal communities.

Bagamoyo district has decided to use an Integrated Coastal Management (ICM) strategy to introduce a zoning system that will establish permitting procedures for estuary and mangrove areas for pond mariculture. This system addresses the expanding number of requests for milkfish pond developments and will ensure that there is no significant environmental impacts from individual farms as well as potential cumulative impacts due to increase in number of ponds to particular area. Bagamoyo is creating a model ordinance relevant to other areas of the nation and is a way to scale up responsible milkfish farming in the vicinity of existing pond sites.

The District authorities will now regulate eligible projects for minor permits, set limits on the location, size of small scale mariculture operations and determine suitable species for cultivation. Establishment of new ponds and normalizing existing pond aims to encourage well running pond operations that produce the intended products which are highly resistant to damage and disease. The ponds in Bagamoyo will not cause problems to others. The new procedures remove any uncertainties in decision making, which benefits the district as well as the permit holders in the three wards where fish pond development will be permitted.

The planning and design of this document involved a range of stakeholders from village to district levels. The process involved village government leaders, fishers, mariculture farmers, salt producers and district experts in fields of natural resources and allied industries.

The steps followed to prepare this document included identification and mapping of potential sites for mariculture activities along the coastline of Bagamoyo District. (See Figure 11) The field survey involved seed scouting and setting of criteria for the best mariculture practices.

Ward	Village	Location Name	HECTARES	Status
Ruvu River estuarine area	Magomeni	Mapunda/Mtailand	3.4	Fish Pond
		Azizi	40.9	
		Umoja	25.5	
		Stainley	97.6	
Dunda	Kaole	Pimbini/Nyamza	18.0	
Zinga	Kondo	Sheikh Aboud	15.0	
		Magereza	36.6	Fish Pond
		Sadiki	5.3	
		Jurasa	2.4	
		Manji	104.1	
		Mwarabu	25.3	
		Sharif	68.0	Fish Pond
		Jumanne	56.6	
		Nyaswa	22.8	
TOTAL			521.4	

Table 8. Salt flats suitable for mariculture and the location of current fish ponds in the Mbegani Bay area

(Source: Decentralized Minor Permitting Procedure for Pond Mariculture (2012), Bagamoyo Town Council.)

Fish Pond: Locations with existing areas of mariculture operations

* Estimate of areas based upon GIS analysis of Mangrove Forest Maps published in 1990 by the Ministry of Lands, Natural Resources and Tourism, Forest and Beekeeping Division. All field surveys of existing and potential mariculture suitable were supervised by Mutatina Alieth. Also from TCMP in 2010 where GIS and maps analysis were conducted by Jumanne Mohamed from TCMP with technical backstops from Don Robadue from University of Rhode Island.

Furthermore, the guidelines for mariculture practices in Bagamoyo district serve as an important part of a master plan for the coast that will reduce conflicts in potential mariculture areas for the benefit of all coastal communities. It is anticipated that enhanced mariculture practices will contribute to economic growth of communities and hence play part in poverty reduction as stipulated in MKUKUTA, MILLENIUM 2015, Dira ya Taifa ya Maendeleo 2025 and Kilimo Kwanza Policy.

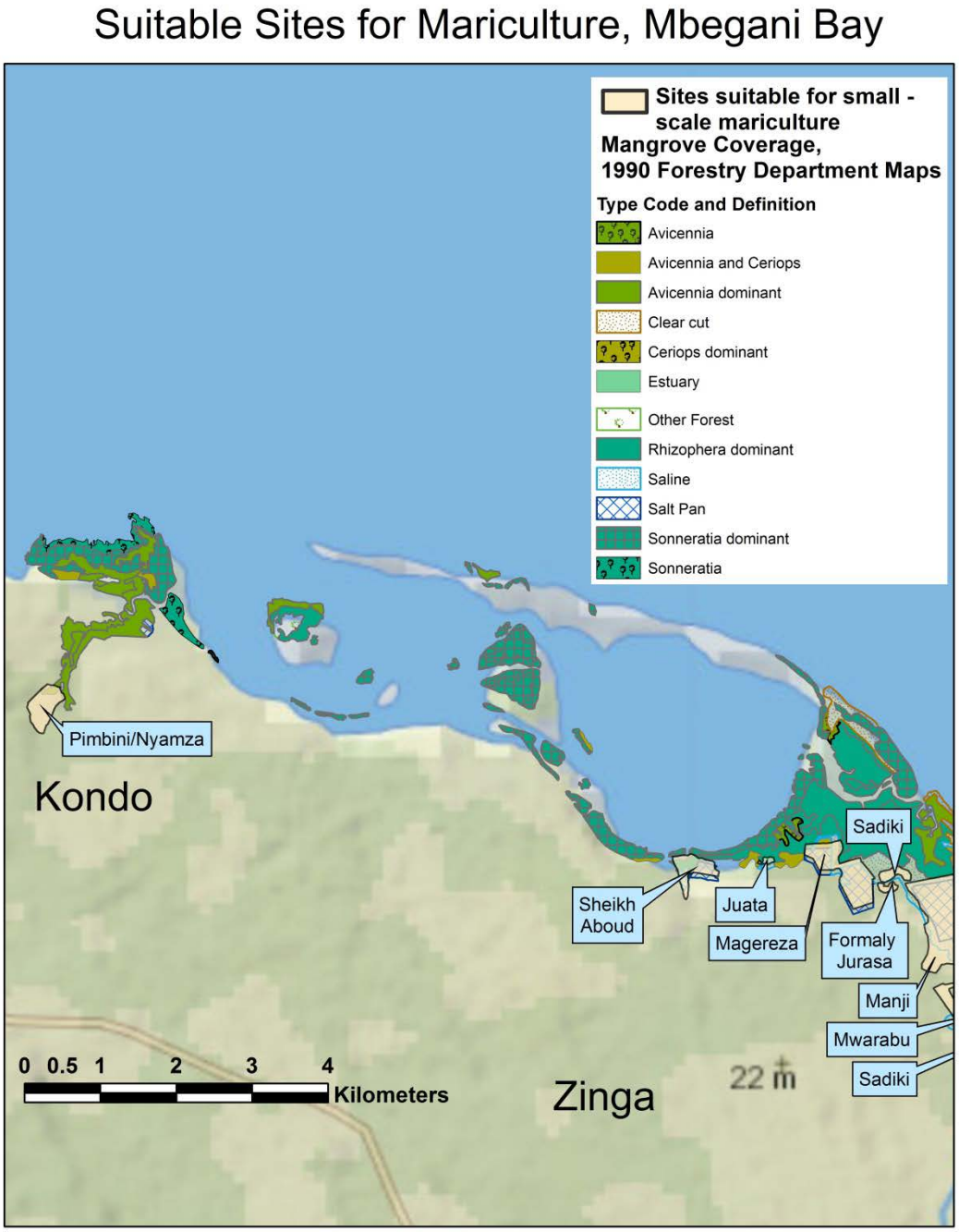

Figure 11 Salt flats suitable for mariculture and the location of current fish ponds in the Mbegani Bay area

Seaweed Farming

Seaweed farming is not highly lucrative but it is an important source of income and increases the resilience of poor households and women especially since women are predominantly the seaweed farmers. Residents in Mlingotini have for more than a decade engaged in farming two species in Mbegani Bay: Euchema Cottoni and Euchema Spinossum commonly known as Cottoni and Spinossum respectively.

Earning opportunities are constrained by the low international market price for seaweed and the fact that the average farm size is small. In Mlingotini, the seaweed farmers are organized in a group called the Msichoke Seaweed Group—being organized as a group has increased production (*Mutatina, 2008*). The Group also providess other social benefits, including being a member of a Savings and Credit Cooperative Organization (SACCO).

4.3 Ecotourism and Cultural/Historic Tourism

Ecotourism is a form of responsible travel to natural areas that conserves the environment and improves the well-being of local people. Helping communities earn income from ecotourism, which depends upon the natural environment, simultaneously provides an economic alternative to destructive, unsustainable activities and an incentive for biodiversity conservation. Mbegani Bay's and surrounding areas natural amenities make it suitable for eco-tourism. MlingotinI village, which faces the lagoon, has a small ecological and cultural tourism industry and one beach lodge and the narrow raised platform on the seaward side of the Bay has a private beach hotel (Lazy Lagoon Resort).Ten tour guides have been trained in ecotourism best practes and tour guiding skills in Mlingotini village. The village has also established an ecotourism resource center, which is led by an ecotourism committee. The committee has developed an ecotourism handbook that establishes a user fee system. Tourists that visit the village pay a small fee that is shared by the community members.

Figure 12 The Mlingotini Information Center and signboard

Figure 13 Kaole Ruins

Beach hotels in Bagamoyo Town rely on the natural endowments of the beach and sea as well as the cultural and historic amenities of the Mbegani Bay area. The area around Mbegani Bay has a rich history as a major early maritime trading center. Kaole village, about 5 km south of downtown Bagamoyo, was founded in the 12th century and was an important hub on the early Arab and Portuguese trade route. Kaole has ruins of two mosques and 22 tombs dating from the 13th century (Figure 13). They are thought to be the oldest mosques on the East African mainland.

The town of Bagamoyo, which is the Bagamoyo District's capital, was founded at the end of the 18th century. At that time Muslim families who were relatives of the then Sultanate of Oman settled in Bagamoyo. They initially made their living by enforcing taxes on the native population and by trading in salt, gathered from the Nunge coast north of Bagamoyo. In the early 1800's, the Sultanate of Oman transferred its capital from Muscat to Zanzibar. Bagamoyo then became a mainland entry point for the Arab ivory and slave trade that was based in Zanzibar. From Bagamoyo, the trade routes went deep into the interior of eastern and central Africa. The importance of what is now known as 'Old Stonetown' in modern day Dunda village (in Bagamoyo town) changed drastically from the moment Arab slave traders decided to use Bagamoyo as the final mainland destination for their slave caravans from the center of the country (from places as far as Morogoro, Lake Tanganyika and Usambara). It became one of the most important trading ports along the East African coast. The slave trade explains the meaning of the word Bagamoyo ("Bwaga-Moyo") which means "Lay down your Heart" in Swahili, a despair expressed by people who were captured as slaves knowing that they might never see their home areas again.

Figure 14 Anglican Church

Also in the 19th century, Bagamoyo became an important entry port for explorers to the interior of what is today Tanzania, the Democratic Republic of Congo, Burundi and Rwanda. From Bagamoyo, European explorers moved out to find the source of the River Nile and explored the African inner lakes. The explorers included David Livingston, Richard Francis Burton, John Hanning Speke, Henry Morton Stanley and James Augustus Grant. The Bagamoyo museum is a small museum which displays Bagamoyo history in relation to its contact with foreigners. On the same compound there is a small chapel known as the Anglican Church of the Holy Cross. The church is where the remains of David Livingston were laid before taken to Zanzibar en route to Westminster Abbey for burial. The Church itself was dedicated to opposing the slave trade.

During the latter part of the 19th century, the Sultanate of Oman passed the administration of the town to then German colonial administration. From 1889 to 1891—before shifting to Dar es Salaam—Bagamoyo was the first capital of the colony of German East Africa. Buildings built before or during the German colonial period still stand—some of which are listed as national heritage under the antiquities law—but, they are crumbling. Bomani, the German Colonial administration headquarters, is currently under extensive restoration. In the first year of World War I, the German colonial rule ended after a British air attack and naval bombardment was launched on Bagamoyo.

Table 9. Tourist Attractions in Bagamoyo

Attraction	Description
Old Fort	This provision house, built in 1856, is the oldest surviving building in Bagamoyo. Used by the Arabs until 1870s; subsequently used as a German military camp, a British prison, and as a customs office and police headquarters. Original function was to hold slaves before being shipped to Zanzibar. Now used as headquarters of the Department of Antiquities.
Caravan Serai	Place where caravan parties rested and prepared for journeys to and from the interior. It is said that caravan porters gave Bagamoyo its name as the place where "one's heart came to rest and relax after a long journey."
German Boma	Built in 1897 to replace Liku House as German government's colonial administration headquarters and residence.
Old Bagamoyo Tea House	One of town's oldest buildings, notable for its authentic carved door.
Slave Port	Waterfront area, now a fish market, where slaves were transported to Zanzibar.
German Customs House	Built in 1895. Still in use as a customs house.
Mwambao Primary School	Built in 1896, was the first multi-racial school in what is now Tanzania. Still in use.
Hanging Tree	Scaffolded gallows where leader of the Bushiri rebellion may have been executed in 1889.
German Cemetery	Cemetery for German soldiers killed during the Bushiri War and other battles. Features twenty graves dating from 1889.
Kaole Ruins	5 km south of Bagamoyo. Includes ruins of two mosques and 22 tombs. Founded in13th century, and thought to have one of the oldest mosques on East African mainland.
Holy Ghost Mission and Catholic Museum	Complex including: Catholic Museum, located at the old Sisters' House; original Holy Ghost Church, built in 1872; Old Fathers' House; New Holy Ghost Church, constructed just before WWI; cemetery for early missionaries; and a grotto built in 1876 by emancipated slaves living at the mission. Privately funded and managed.
Cross by the Sea	On the waterfront close to the Anglican Church, this monument marks the establishment of the first Roman Catholic church in East Africa, in 1868. Managed by Catholic Museum.
Anglican Church	Donated by Anglican parish in 1974, 100 years after the death of Dr David Livingstone, whose body was carried on the church's door from modern-day Zambia before being taken to Zanzibar for transport back to the UK.
Liku House	Built in 1885, served as German headquarters in East Africa until 1891 when capital was transferred to Dar es Salaam. Served as German regional headquarters until offices moved to the Boma in 1897. Now houses immigration department.
German Block House/ Dunda Tower	Built in 1889 as a defense tower to protect Bagamoyo during the Bushiri War.
Mwana Makuka Cemetery	Muslim cemetery, with oldest tomb in Bagamoyo, dating from 1793.
Chuo Cha Sanaa	Bagamoyo College of Arts and Culture. Provides short and long courses in music/dance/theatre/art. Conducts frequent local performances; organizes and hosts annual Bagamoyo Arts Festival.
Fish market	Waterfront location where fish are landed daily and sold fresh as well as cooked.

Attraction	Description
Bagamoyo Salt Works	Privately run salt mining operation. Visitors are welcome to visit and observe but are not guided.
Kaole Mamba Ranch	Privately run farm raising crocodiles for export (meat, skin, and alive) but with tourist viewing as a secondary business.
Village walks	Mlingotini and Bagamoyo. Guided walks through 'traditional' village, marketplace, etc.
Marine 'no-take' areas	Four designated coral reef/protected areas from fishing.
Seaweed farm	Operates in lagoon adjacent to Mlingotini village.

Today, Stonetown in Dunda village, Bagamoyo town is designated as a UNESCO World Heritage site. Its history attracts thousands of Tanzanian students and both resident and non-resident tourists annually. It is also known as the 'arts capital' of Tanzania. The biggest event of the year is the annual Festival of Arts and Culture, organized by the Bagamoyo College of Arts and Culture, held in late September/early October, and now in its 30th year. The College of Arts and Culture is an internationally known arts college in Tanzania, teaching traditional Tanzanian painting, sculpture, drama, dancing and drumming.

4.4 National Development Plans for Mbegani Bay

Development of Bagamoyo Port at Ras Mbegani, which is currently at the fore front of the National development agenda and Tanzania Port Authority (TPA, 2011), is another activity that would significantly affect livelihoods and change the current hydrodynamic setting of the Bay. The proposed Port is designed to cater to forecasted growth in container and vehicle trade, including provisioning of Export Processing Zone (EPZ) industries that are now being constructed in Bagamoyo just off the Bagamoyo-Dar es Salaam main highway. TPA has planned the Port to be operational by the year 2018 (TPA, 2011). However, the estimated cost is $1 billion, and a source of funding has not been identified.

The details of the proposal are not known and the environmental impact assessment has not yet been released. However, such a major industrial development would have major impacts on the Bay and current residents.

The Bay is currently a shallow Bay with a major sand bank separating the two tidal channels. The Bagamoyo Port development project at Ras Mbegani would involve: 1) massive dredging of the northern parts of the Bay, including the tidal channel which connects the Bay with the Indian Ocean; 2) land reclamation of some of the intertidal areas of the Bay, and 3) removal of mangroves and other vegetation on the backshore for laying Port Buildings and other Port infrastructure (Figure 15).

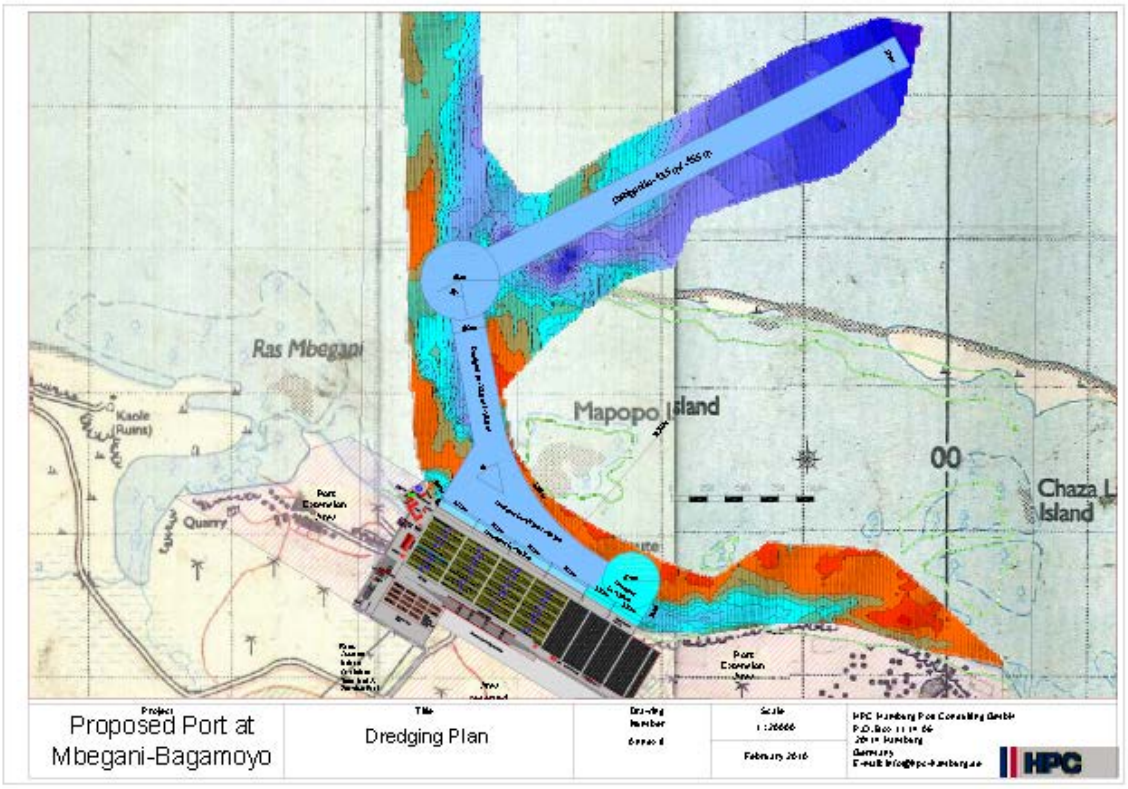

Figure 15 Proposed Channel layout for the Bagamoyo Port Development at Ras Mbegani (Source: TPA, 2011**)**

Potential environmental and social risks associated with the port and EPZ project

A commercial port and related industrial development would be a threat to ground water, surface water and marine ecosystem contamination.

Currently, the water depths along the eastern tidal channel are relatively higher than the water depths along the western tidal channel. This suggests that most of the flow is currently along the eastern side of the Bay. The envisaged Port Development is planning to undertake massive dredging along the western tidal channel and therefore divert much of the flow to the western side of the Bay. The tidal currents on the western side of the Bay are therefore expected to increase. The Tidal currents along the western side of the Bay will be further intensified by the land reclamation planned to be undertaken on the western side of the Bay. The intensification of the tidal currents may have negative impacts on the raised reef platforms (Mapopo and Chaza Islets) and the sand spit located inside the Bay. The function of these physical structures which currently serves very well to protect the southern shores of the Bay from wave erosion will therefore be jeopardized.

Clearing of the mangroves and other vegetation will not only lower the existing stability of the coast against wave erosion but also result in other ecological and socio-economic losses (which include loss of some of the fish spawning grounds, loss of fishing grounds for the surrounding coastal communities, loss of sea weed farming sites, etc.).

Environmental shocks, such as large-scale industrial development along shorelines, create a variety of other broader short and long-term public health losses as well. Disease ecologists

have noticed a relationship between resiliencies present in undamaged ecosystems and equally its loss, and rise in vulnerability to infectious diseases and effects on humans.

An example of this was the commercial and industrial development along Lake Victoria which altered lake ecology and exacerbated competition between fisherfolk, fueling transactional sex (i.e. fish-for-sex). Potential exists for similar disrupted ecological connectivity in Mbegani Bay. Impairing the intricate food web of the Mbegani Bay area with an industrial port will fragment habitats and diminish ecosystem integrity, thereby reducing fish stocks. Distorted ecosystems (natural and human) amplify risk of HIV Infection. A rise in mobile populations (e.g. truck drivers, traders) related to economic activities of the port will greatly increase sexual networks in Bagamoyo town and surrounding communities increasing the frequency of cases of new infections.

4.5 Other Livelihood and Development Issues

Population and commercial growth

In terms of the Mbegani Bay area development and livelihoods, and threats to natural ecosystems, there is also a concern over land conversion and population growth. Population density and commerce along the Bagamoyo-Dar es Salaam road is growing rapidly and the demand for developable land and population growth rate are likely to increase in the near future.

The growth of the Dar es Salaam peri-urban expansion has not been accompanied by orderly land use planning and surveying of new plots. It is haphazard and unplanned with inadequate infrastructure (water, sewage, electricity). Unplanned commercial, residential and beach hotel development on the shore or inappropriately close to the shore in the vicinity of Mbegani Bay would adversely affect the ecological quality and functioning of the lagoon and coastal shores.

Challenges create opportunities, in this case for land use planning and zoning, improved use of spatial information technologies, shoreline development best practices, review and enhanced awareness and enforcement of environmental regulations, and monitoring and research on ecological vulnerability, among other things.

Climate Change Impacts

There is now wide agreement that climate change and increased climate variability are already occurring and producing serious consequences for Tanzania. The predictions from the experts on climate change are that the problems caused by climate changes will increase and make management of coastal ecosystems and improvements to community resilience even more difficult. The following threats are predicted to cause major problems for coastal resources, livelihoods and the well-being, safety, and food security of coastal communities, including those of Mbegani Bay:

1. More unpredictable precipitation (seasonality and intensity)
2. Increases in strong storms
3. Sea level rise
4. Increased sea surface and ambient air temperatures
5. Ocean acidification

District government staff together with the USAID/Pwani project conducted an assessment of climate change vulnerability in Mlingotini village in 2010-2011. A twelve member climate change focus group was formed and a series of participatory rapid assessment tools applied to determine observed climate change impacts, assets at risk, and adaptive capacity.

Observed climate change impacts in Mlingotini include:

- The timing and intensity of the long and short rains are no longer reliable. In the past, rains early in the primary rainy season were heavy and these were followed later by small continuous rains which resulted in a good soaking of the soil. Presently rains early in the season are heavy and these are followed by dry conditions, which are not conducive to crop growth. Rains in the smaller rainy season in October are now of short duration (not more than two weeks) and they are usually of low intensity compared with the past. Without predictable primary rainy season precipitation and smaller rainy season, agricultural planning under rain fed agriculture is difficult and food security is endangered.
- Sea level rise has resulted in salt water intrusion in the water table contaminating fresh water and producing saline soils. Public fresh water wells have been lost to salt water intrusion and it has caused diminished agricultural productivity. Bananas no longer grow well and are vanishing in Mlingotini village. “Mabwiki” and pumpkins have disappeared. Coconuts, mangoes, and paddy rice all have lower yield now.
- Sea level rise and severe flooding events cause increased shoreline erosion. The backshore biological resources, including the mangroves, sand dunes, shrubs, tidal marshes, which play a significant role in maintaining the shore, are potentially under threat of disappearing from the influence of wave erosion and sea level rise.
- Marine areas where seaweeds were once grown no longer support seaweeds, which are sensitive to changes in water temperature and salinity
- The direction and strength of seasonal prevailing sea winds are no longer predictable. This affects fishing and safety at sea, but also agriculture. In previous years, prevailing winds were used as indicators of crop planting season. Now, the prevailing winds have changed making the planting season very uncertain.

5. GOVERNANCE SYSTEMS AND CONSERVATION EFFORTS

At the 2002 World Summit on Sustainable Development, governments around the globe declared that eradicating poverty is the greatest global challenge facing the world today, and an indispensable requirement for sustainable development. Given the fact that 1.3 billion people continue to live in abject poverty, the world community reaffirmed the goal of halving by 2015 the proportion of people whose income is less than $1 a day and the proportion of people who suffer from hunger. Livelihoods, environment, and poverty reduction are main objectives of Tanzanian Government policy. Plans for poverty reduction were outlined in the Tanzanian Development Vision: 2025, the National Poverty Eradication Strategy of June 1998, and the Poverty Reduction Strategy Paper of October 2000. The Government of Tanzania's Development Vision 2025 clearly articulates the importance of sustainable environmental management for poverty reduction. It recognizes that the poor in Tanzania are heavily dependent on the environment and natural resources for their livelihood and income generation and therefore, emphasizes mainstreaming environmental sustainability into poverty reduction efforts. Tanzania's Vision 2025 and the MKUKUTA (the National Strategy for Growth and Reduction of Poverty), which is the main vehicle of implementation, sets the development agenda for Tanzania, including the Bagamoyo District and the villages surrounding the Mbegani Bay. The vision has three target areas that guide development efforts:

1. Growth and reduction of income poverty
2. Improved quality of life and social well-being
3. Governance and accountability

The National Integrated Coastal Management Strategy (adopted by Cabinet in 2002) stresses the need "to preserve, protect and develop the resources of Tanzania's coast for use by the people of today and for succeeding generations to ensure food security and to support economic growth." One of the principles of the Strategy is that coastal development decisions shall be consistent with the government's priority of poverty alleviation and food security. The Strategy offers an opportunity for the coordination of marine parks, conservation areas and reserves with a broader policy framework focused on the conservation of natural resources, on ensuring food security, and on supporting poverty alleviation and economic growth.

5.1 Local Governance Structure

The Mbegani Bay area administratively falls under two administrative Divisions: Yombo and Mwambao. Each of these Divisions has two wards, and thus there are a total of four Wards (Zinga, Kerege, Magomeni and Dunda) that have a direct influence on the Bay. The Bay itself is located in Zinga Ward, but there are seven coastal villages that frequently use and directly influence the bay: Mlingotini, Kondo, Pande, Kaole, Dunda, Magomeni and Makurunge (through its hamlets of Kitame and Razaba). Adjacent inland villages, including Mapinga and Zinga, also use and influence the Bay.

Local governance (district and village level) is defined by the Local Government Authority Act. Five year National Development Plans and the Ruling Party Manifest are two additional key documents that guide districts in their development planning. Elected Village Chairmen are the highest authority at the village level. The chairmen are assisted by a Village Executive Officer, who is an employee of the government and oversees all government activities in the village. Each village has a Village Government (council) consisting of not less than 25

members who are elected by the villagers. The Village Government is divided into five committees that focus on specific topic areas. The Village Act requires that at least one third of the representatives in each committee must be women. One committee is responsible for Environment and Natural Resources Management issues.

Leadership at the district level is provided by the District Commissioner, who is the arm of the Central government and the District Executive Officer, who is an employee of the Local Government Authorities. Councilors elected from the divisions form part of the District Council Team that is charged with daily operations. The District Council is led by the Council Chairman – who is elected from amongst the Councilors.

The Bagamoyo municipality does not qualify to have a mayor and that makes the Chairman of the Council the highest authority of the elected leaders. The Local Government Act devolves the powers to undertake planning, collect certain types of taxes, and supervise development activities to the District and Village Councils. The District Council is also empowered to prepare bylaws, which must be approved by the Minister responsible for local government. Under the current administrative set up, traditional leadership has a negligible role in the Bagamoyo government, because it is not part of the formal structure. Traditional leadership is only relevant and practiced among the pastoralist communities that are found in Bagamoyo—and only for matters that have relevancy to these groups.

Although the rules and procedures are clear and well defined in the law, there are implementation gaps, especially with respect to accountability and transparency of public resources and funds. Village level meetings to deliberate matters of interests to the villagers are not taking place as often as they are prescribed in the Local Government Authority Act. There are specific issues related to environmental governance; for example, there are inadequacies in how natural resource related levies and taxes are collected and accounted for.

The Bagamoyo District has a Strategic Plan and a five year Development Plan. The district also has an Integrated Coastal Management Action Plan, which was first adopted in 2001. In implementing the District ICM Action Plan, there is an ICM Working Group at the District level.

5.2 Ongoing coastal governance efforts relevant to Mbegani Bay

There have been many government, civil society and donor project efforts focused on conservation and coastal management around Mbegani Bay, the Mbegani Fisheries Center and Mlingotini village. They are briefly summarized below. For example, at the District level, in the last decade there have been Intgrated Coastal Mangmeent (ICM) Action Plans, Collaborative Fisheries Management planning and the designation of no-take zones in four reef zones around the outside of Mbegani Bay, Mariculture Zoning at the District level, and Eco-tourism planning both in Dunda and Mlingotini. In addition, in Mlingotini Village, the Msichoke Seaweed Farmers Community Based Organization has been active in seaweed farming planning and management in Mlingotini Bay.

Despite this, there remain weaknesses in the governance of the Mbegani Bay area. Plans do not always result in effective implementation and well intentioned efforts are not always sustained. A specific management plan for the Bay does not exist that would give the District and local stakeholders the legal authority to designate the Bay as an ecologically sensitive area under special protection from destructive development and uses. Nor does the District have its own spatial zoning plan that defines what local stakeholders would like to see as the

road map that puts limits on the location and intensity of future development and mandates conservation areas.

ICM Action Plans

In 2001, the Bagamoyo District Council completed its first ICM Action Plan. The Plan identified nine key issues and outlined three overarching objectives:

- Reduce conflicts in the use of coastal resources
- Ensure that destructive activities are controlled and resources improved
- Build capacity in coastal resources management

The Action Plan was updated in 2009 with the assistance of the World Bank Marine and Coastal Environment Management Project (MACEMP). However, the revised action plan is yet to be approved by the District. The following key issues were identified in 2009:

1. Illegal and uncontrolled cutting of mangroves
2. Destructive fishing practices
3. Conflicts between shrimp trawlers and artisanal fishers
4. Resource use conflicts between fishers (artisanal and trawlers) and seaweed farmers
5. Lack of alternative income generating activities
6. Inadequate credit facilities
7. Declining shrimp catch
8. Conflict on the use of beach areas (hoteliers and community)

MACEMP also provided grants to livelihood groups in villages surrounding the Mbegani Bay. Alternative Livelihood and Fishing Groups were formed in all fishing villages at the time of the MACEMP project for the purpose of gaining access to the grants. Most of the funding requested by the groups, including those in Mlingotini and Kondo village were directed at fishing boats, gear and engines, thus increasing pressure on over exploited fish stocks (Mkama et al., 2010).

Collaborative Fisheries Management

Collaborative Fisheries Management (CFM) and Beach Management Units (BMU) were formally introduced in Law with the Fisheries Regulation 2009. However CFM's have existed in Tanzania for almost 20 years.

The Bagamoyo Collaborative Fisheries Management planning process took place between 2005 and 2006 and resulted in the adoption of a CFM plan covering the seven coastal villages that use the reefs outside the Mbegani Bay. The Goal of the plan is to rebuild fish stocks and associated habitats to levels that allow for increased and sustainable fish catches by artisanal fishers, and that result in improved income for artisanal fishers in the Bagamoyo District. The plan identifies three key issues:

- Depletion of fish stocks due to over-fishing and harvesting of juveniles
- Habitat destruction due to unsustainable fishing (and other) practices

- Conflict between trawlers and artisanal fishers

Each CFM has a leadership and membership structure, typically located in a single fishing village (but a CFM can also encompass more than one village). While BMUs deal only with fish resources; a CFM is designed to address fish resources and other marine resources (mangroves, reefs, seagrass, etc.). In this way, CFM is an ecosystem-based approach to coastal and marine conservation. Multiple CFMs are resource users of the same reef system and marine ecosystem, so a Central Coordinating Committee (CCC) that draws from all of the relevant CFMs is the coordination and decision-making structure for that particular marine area. The CCC is responsible of managing and overseeing the protection of the four areas that are closed to fishing (i.e. no-take zones) within this Bay. As shown in Figure 15, the four closed reefs are Maduga, Mshingwi, Mjini, and Poyogo. The no-take zones are in essence community based marine protected areas (MPAs) declared by the District/Village by-law.

The Bagamoyo CCC is currently not active and there is no patrolling or monitoring of the closed reefs. The main problem is that the district and local villages have no funding for these activities. The Department of Fisheries is reviewing the Fisheries Act to determine how to provide sustainable funding for CFM structures, and to provide policy guidance to Districts on how to manage CFM areas without outside support.

Figure 16 Mbegani Bay and surrounding area of influence showing location of fish no-take sites (source: Muhando, 2006)

Beach Management Units

Beach Management Units (BMU) are composed of stakeholders from a fishing village. The BMU's goa is to conserve, protect, monitor, and control fisheries resources and the environment. The BMUs also collaborate with the local government to plan and develop the fishing community. The intent is to minimize conflicts between different stakeholder groups engaged in fisheries, reduce the costs of patrol and surveillance, and support Village

Environmental Committees in marine environmental protection. The BMUs are tasked with the following (MLDF, 2010b):

- Enforce the Fisheries Act and Fisheries Regulations
- Prepare by-laws to facilitate the implementation of the National laws
- Ensure beach sanitation and hygiene
- Collect fisheries data/information, including fish catch and effort
- Educate fellow community members on the negative impact of illegal fishing practices and other environmental issues that affect fisheries resources and the general environment
- Inspect fishing licenses, vessels, gear and fishing camps
- Monitor marine resources, including nursery and spawning grounds

BMUs are composed of a Chairperson, Secretary, Executive Committee, and the BMU Assembly (made up by all members). The Assembly is supposed to meet once per year. In principle, the CCCs and BMUs are intended to share recommendations and guidance and be mutually supportive. At this time, BMUs exist on paper but they are not active. To be more effective, BMUs need a sustained source of funding and training for the BMU leadership and Assembly members.

6. SCENARIOS FOR MBEGANI BAY'S FUTURE

Focus Group meetings and key informant interviews were conducted with village leaders in four villages in the Mbegani Bay area: Kondo, Kaole, Mlingotini, and Pande. Interviews were also held with District officials and the Fisheries Education and Training Agency. Structured, informal conversations focused around the the following question:

- How would you like the Bay to be in 2030?
- What are the obstacles to reach that future?
- What are the perceived positive and negative aspects of development?
- What needs to be done to support a positive development future?

The overall finding from the discussions is that Bagamoyo's residents and leaders have a number of common hopes for the future of coastal development, and see the need for some degree of intense economic development involving tourism, education, commerce and industry in order to create employment opportunities and bring much needed infrastructure, utilities and services to coastal communities. All share the desire for a transparent, foresightful and equitable decision process that insures that displacement of residents is kept to a minimum, that compensation is fair and timely, and that human rights are respected during the major land use and economic transformation that is to come. However, a great deal of uncertainty surrounds the development process, due to low transparency, the economic uncertainties facing project planners and potential investors, and the wide range of economic development proposals in terms of scale and type of development.

What follows is a first attempt to combine the concerns and aspirations of local residents with some of the major attributes of the land use and port development plans in a set of scenarios that can be used to highlight the need to establish a solid, transparent process for development decision making in Bagamoyo so that outcomes in 2030 meet the aspirations of residents while avoiding their fears and allaying their concerns.

SCENARIO 1 - Bay conservation through stagnation: No investment plus urban sprawl

Some continued growth in the Mbegani Bay coast is inevitable as it becomes increasing attractive as a location for recreation, events and residents as a peri-urban area of Dar es Salaam. Highway access is already improving, placing it about a one hour drive in non-peak traffic. However, this development is haphazard, unplanned and not accompanied by revenues and infrastructure that would also benefit existing residents. New residents who work in the city are scarcely interested in low paying natural resource based livelihoods. The national designation of the coast as a special economic zone steadily leads to a more built-up shoreline and a scattering of commercial, industrial and planned unit developments that are mainly opportunistic and too small scale to provoke infrastructure development that would also benefit current residents. While relatively little major physical changes are made to the bay, the uncertainty created by continued aspirations for economic zone development and intermittent coastal tourism oriented projects prevent community members from organizing themselves to expand their involvement in natural resource based, sustainable livelihoods. Salt production, sea weed farming, bee keeping, artisanal fishing, small scale fish ponds in newly designated low-impact zones as well as initial efforts at bay ecotourism all proceed with modest success. However, heightened concern and action for bay conservation fails to occur because continued talk of major new development is not taken seriously, and bay conditions continue to slowly degrade.

SCENARIO 2 - Slow transformation of the Bay: Low port and limited special economic zone investment

Opportunistic development takes place in the special economic zone, but plans to build the Mbegani Port recede into the future until around 2020, as demand for alternatives for cargo import and export through Dar es Salaam or ports in Kenya finally triggers investors to proceed with the first phase of Bagamoyo port development. The Mbegani Fisheries School is relocated, dredging of the channel at the mouth of the bay begins, and basic road and rail infrastructure are put into place. Some direct and indirect employment is provided to local residents during port construction and for some of the facilities in the export processing zone, but the number of permanent jobs for Bagamoyo citizens is disappointing. Even so, many outsiders are attracted to the area because of the misplaced belief that jobs are forthcoming. Because of the relatively slow and haphazard development, key infrastructure such as water supply and waste water disposal is not installed nor is there much attention to land based sources of pollution to the bay. The continuing haphazard urbanization process driven by growth of the Dar es Salaam region and in-migration generates a patchwork of residential, hotel and commercial development. Areas reserved for future port expansion such as Mlingotini are left in limbo. Some newly arrived people turn to the bay for any way possible to subsist. This generates conflicts with the existing, better organized local groups pursuing a mix of sustainable livelihoods using voluntary agreements to accommodate the needs for shore and water area space. Anxiety by political leaders precludes putting much pressure on the Special Economic Zone and the Mbegani port to adopt strong natural resource protection or environmental management systems. Little selectivity is exercised in allowing investments to enter the economic zone due to the slow rate of growth.

SCENARIO 3 - Rapid transformation of the Bay: Port Authority "Baseline" port investment and flourishing economic zone

By 2014 it becomes clear to everyone that the base scenario envisioned by the consultants to the Tanzania Port Authority is going to become a reality. Engineering studies and a pro forma EIA are prepared quickly so that construction of the initial phase of the port can begin in earnest, and simultaneously a big push is made to upgrade roads and build the rail spur to the Special Economic Zone. Employment begins to increase during the construction phase, however many more local residents and some businesses are displaced, and conflicts over compensation increase. The preparation and public release of project impact statements creates the opportunity to address growing concerns about transparency in decision making and fairness in resettlement and compensation questions. The possibility is raised for some mitigation measures to protect portions of Mbegani Bay including access and ecotourism, however the absence of a master water supply, wastewater collection and drainage plan sees water pollution increase in the tiny coastal streams feeding the bay. Investors move more quickly to acquire sites in anticipation of the port, including more land for residents, hotels to serve the business community and tourism. Local residents, untrained and ill-prepared to take on many of the construction jobs or permanent positions, find themselves squeezed by rapid inflation in food and shelter costs, fewer places to grow food for subsistence and income, and competing with newly arrived immigrants for employment. Employment, port income, investment and development opportunities surpass local expectations, but largely bypass local participation in those benefits. Investors buy up sections of the coast and prepare to build hotel and recreation facilities that supplant existing small scale hotels and locally organized tour operators. Local authorities become overwhelmed with the volume of land development, unprepared to address the competing demands for local services and amenities in the face of rapid approval of major new projects by national authorities.

Local residents are astonished to see enclaves of foreign rather than Tanzanian workers set up to build the rail, road, port and core industrial infrastructure. The volume of dredging, installation of seawalls and potential groin to prevent sedimentation of the change are all going to occur at a scale greater and more likely to alter the Bay than anticipated in the Tanzania port master plan. This creates an engineered shore and highly altered bay sediment and water circulation, as well as impacts on mangrove ecosystems. The expected result is the modification of an ecosystem to an extent heretofore unseen in Tanzania.

SCENARIO 4 –The Balanced Use "Bay": Strong implementation of environmental and social best practices through stakeholder vigilance and negotiation

In 2014, a group of local leaders and bay stakeholders take a carefully organized study tour of mega-ports in Europe and the Indian Ocean. All are models of economic efficiency but three subscribe to and implement green port best practices to address local environmental and social concerns, while the other ports generate local suffering from social conflict, displacement and contamination. The participants in the tour realize that it is the same shipping companies and businesses operating profitably in all six ports. The difference is that in the green ports, local stakeholders are respected by authorities, are well organized, understand the needs of the shipping and export processing businesses, and also are clear in their insistence that it only takes some policy and behavior change and a small investment to protect the environmental resources and livelihoods in the harbors and estuaries and to insure that local needs and employment opportunities are fully considered.

The local leaders and stakeholders return to Bagamoyo and quickly set out to do two things. First a District task force is organized and sets out to learn all it can about port environmental and social best practices and how "voluntary" port environmental management systems are organized and work. They are tasked with fully engaging in environmental assessments and negotiating with government authorities on the stipulations and requirements to be included as the port and physical development of the processing zone as well as monitoring implementation and impacts. Second, the District moves forward to prepare and adopt its own plan for Mbegani Bay and the export processing zone that focuses on setting the bay as a model Green Port for the Western Indian Ocean, with zero discharges of pollutants, mitigation of habitat damage, and strong protection measures for conservation and natural resource based livelihoods. Two endowment funds are established with revenues from port development. The first provides education, training and career counseling/ placement for both port and export processing jobs and natural resource based livelihoods. The second supports an integrated approach to community and environmental health and resilience, with a specific approach to addressing the needs and protecting the rights of families during the transition in land uses, and adequate long term funding to monitor and manage bay and shore wildlife, water, vegetation and ecosystems.

The result of this mobilized and increasingly capable District and local stakeholder engagement is a more compact and orderly expansion of the export processing zone, upfront investments in water supply, waste management and pollution control systems. Within 3 years, one fourth of the high school and college age students are graduating with entry level jobs in the businesses involved in building the first phase of the port and in the earliest arriving firms in the export processing zone. Also within the first three years, zones for conservation and low-impact natural resource livelihoods have been designated and the first cadres of trained adults are operating new or more efficient small businesses. The local university has hired extension-oriented faculty who are teaching and building the skills of both adults and their children. Micro-credit/ local savings and loans institutions have

emerged to provide financial resources. Within five years, the natural products and environmental quality of Mbegani Bay are increasingly appreciated and sought after by the thousands of new permanent residents as well as the many business and recreational travelers and their families coming to Bagamoyo to do business. Within ten years, the Bagamoyo Green Port is attracting not only business but is acting as a regional training center as a living laboratory for how economic growth can serve environmental quality, economic participation, and community resilience goals.

The Way Forward

As these four scenarios indicate, there is no specific, guaranteed-to-occur development plan for Bagamoyo's coast. Without any prospects for economic development, the area surrounding Mbegani Bay may be occupied by urban sprawl driven by the growth of Dar es Salaam and modest opportunities for coastal tourism. The pace and concentration would be so slow that it likely doesn't generate funding for desperately needed infrastructure and employment opportunities, and land for small scale farming and mariculture, and natural resource based livelihoods compete with second homes, residential enclaves and shoreside hotel investments. Environmental protection and natural resource management will have to rely on outside donor or government projects, and small scale, resource based livelihoods will need innovative funding and technical assistance if there is any hope that residents will move beyond subsistence living styles.

At the other extreme, the advent of a Chinese investor funded and managed mega-port would generate enough funding and infrastructure improvements to provide water supply, waste disposal, new schools and public services, and even protection for the mangroves in the bay. However, these benefits will likely not accrue to existing residents, many of whom will be resettled outside the development zone and those who stay will not be sufficiently educated or trained to participate in the new economy of the District. "Low" and "baseline" port development scenarios offer challenges in terms of bay protection and environmental management.

A low forecast for cargo shipments will make developers and authorities reluctant to place any impediments in the way of the few opportunities that come along to the area. A baseline forecast port development scenario will require local authorities and residents to be on their toes and well prepared in what would be a fast-tracked decision process as well as a situation where relatively few controls are placed on projects, few mitigation measures required, and little effort expended to insure that the Mbegani Port and the new investments in the Special Economic Zone adopt a robust, voluntary Environmental Management System approach. The ironic twist in these scenarios could be that the funds and willingness to take adequate mitigation measures are present, but local authorities and citizens are not sufficiently prepared to understand impacts and viable alternatives or have the courage to insist that economic development also pay to prevent and mitigation potential damage.

As scenario 4 illustrates, the better prepared the citizens of the district and the users of Mbegani Bay are to deal with any of these scenarios, by knowing what conditions they desire and being willing to hold developers and decision-makers to account, the more likely economic, social and environmental hopes can be realized, and fears of displacement and exclusion can be pushed aside. Taking the State of Mbegani Bay report the next step toward a plan for sustainable use and conservation of the bay, and clearly identifying marine, coastal and land use protection and best use priorities will make it easy for developers and investors to include such requirements in their project proposals. Greatly increasing local understanding of how shipping companies and businesses are readily able to meet high

environmental and social standards, will strengthen the case for insisting that such best practices are applied in Bagamoyo as well. Establishing independent endowments or funds to finance promised environmental and social requirements will insure that mitigation, capacity building and conservation measures aimed at benefiting local stakeholders will be sustained.

Negotiation on the overall plan and case-by-case development decisions threatens to overwhelm local officials. A steady, guaranteed stream of resources, through a port development impact fund, needs to be guaranteed in order to greatly improve local capability to participate in decision making, gather and interpret the results of environmental and social monitoring, and provide leadership for an ongoing program and partnership to exercise wise stewardship over bay resources and to provide ongoing oversight on the expansion and operations of the port and export processing zone.

7. CONCLUSIONS

Mangroves are extensive throughout the coastline of the Mbegani Bay area. Mangrove awareness and protection need greater emphasis. The mangroves provide habitat and a nursery for wildlife and commercially valuable species. They also protect the shoreline from erosion and eliminate contaminants from terrestrial run-off. Due to the extensive mangrove areas of the Ruvu and Wami rivers, the second most important prawn fishing ground in Tanzania is found in the Mbegani Bay area and northwards.

There are extensive seagrass beds in the Bay area that are highly productive and are high in species diversity and abundance. They are a valuable fish nursery and habitat for numerous marine species. If managed well they have the potential for becoming a fish aggregation site. Coral reefs together with the seagrass beds are very important for the fisheries sub-sector. In terms of preferred fishing locations, most of the fishing (perhaps up to 70%) takes place on seagrass beds located adjacent to coral reefs.

The coral reefs in the Bay area are not in good condition. Dynamite fishing and other destructive fishing practices around the reef zones, together with natural causes, have taken their toll.

The livelihoods and well-being of coastal communities around the Bay area depend very much on the ecosystems just listed. These include the artisanal fisheries, ecotourism, seaweed farming, and fish pond culture.

There have been numerous planning and management efforts in the past decade directed at the Bay area ecosystem and its natural endowments. All government, civil society and donor project efforts over the last decade indicate that the preferred future for the Mbegani Bay area ecosystem is an improvement in its health and productivity.

Nevertheless, plans do not always result in effective implementation and well intentioned efforts are not always sustained. A specific management plan for the Bay does not exist that would give the District and local stakeholders the legal authority to designate the Bay as an ecologically sensitive area under special protection from destructive development and uses. Nor does the District have its own spatial zoning plan that defines what local stakeholders would like to see as the road map that puts limits on the location and intensity of future development and mandates conservation areas.

The Mbegani Bay ecosystem will be further degraded over time to the detriment of all the livelihoods that depend on it in a “business as usual trajectory” as a consequence of overexploitation, destructive fishing practices, population growth and habitat change (especially from the relentless growth of the Dar es Salaam peri-urban expansion).

The area will be severely altered in a “container port and industrial development” scenario. Development of Bagamoyo Port at Ras Mbegani is planned by the national Port Authority and an Export Processing Zone has already been designated in Bagamoyo just off the Bagamoyo-Dar es Salaam highway.

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