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Tanzania Biodiversity Threats Assessment



**Biodiversity threats and management opportunities for
SUCCESS in Fumba, Bagamoyo, and Mkuranga**



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Cover Photo: Beach scene from Bagamoyo

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EXECUTIVE SUMMARY

The Sustainable Coastal Communities and Ecosystems (SUCCESS) Program falls under the Congressional biodiversity earmark, where it fits under the secondary code. These are programs and activities – site based or not – that have biodiversity conservation as an explicit, but not primary objective. One criterion for such programs is that their activities must be defined based on an analysis of threats to biodiversity.

This report aims to assess the biodiversity threats in the land-seascapes where SUCCESS operates. The purpose is to understand the major direct threats to biodiversity as well as the context and root causes of the threats. The assessment also evaluates current activities and help prioritize and anticipate what threats might become more severe in the future. The threats assessment is based on a literature review of articles and secondary data sources, focus group discussions, and key informant interviews, conducted in each field sites.

In Tanzania, the SUCCESS Program builds upon past and ongoing conservation and management programs led by the Coastal Resources Center and other partners in the Bagamoyo and Mkuranga districts on the mainland and on the Fumba Peninsula on the Unguja Island, Zanzibar. All of the land-seascapes covered by the SUCCESS program are in, or adjacent to, one of the priority areas of the Eastern African Marine Ecoregion. The Fumba site is located on the Unguja Island, which is categorized as an area of ecoregional importance. Bagamoyo is considered of sub-regional importance and the Rufiji-Mafia complex, which is adjacent to Mkuranga, has been determined to be of global importance.

Tanzania's coastal zone harbors high biodiversity and an abundance of natural resources. The Bagamoyo coastline is characterized by sandy or muddy tidal flats, mangroves, coral reefs, seagrass beds, seaweeds (algae beds), and lagoons. These ecosystems play a major role in supporting local people, providing a source of food, cash and energy (Semesi, *et al*, 1998). Two major rivers, the Wami and Ruvu, have their estuaries in the Bagamoyo district, providing breeding ground for shrimp and other species. The rivers are also a major supplier of nutrients to the Indian Ocean waters.

The Mkuranga district is endowed with mangrove forest, coral reefs, and rich fishing grounds for coastal fisheries (TCMP 2002; Torell & Mmochi, 2006). It is characterized by remote unpopulated islands, which host endangered species of Colobus monkey and many attractive birds. The Fumba Peninsula is situated within the Menai Bay Conservation Area (MBCA) which is located in the south-west of Unguja Island, Zanzibar. The waters around the peninsula provide traditional fishing grounds, encompassing extensive areas of coral reefs, sea grass beds and mangrove stands. Together these interconnected ecosystems form the resource base for the fisheries of the area. However, the coral reefs have a relatively low live coral cover (12-29%), which can be attributed to the use of destructive fishing methods as well as coral bleaching events (Francis, Wagner et al. 2002).

Tanzania's coast contains many resources that are a key to the country's future. The coastal area encompasses about 15 percent of the national land area, houses 75 percent of the industries and contributes more than one third of the national Gross Domestic Product (GDP). The livelihoods of coastal villagers are highly dependent on the local natural resources (Torell, Tobey et al. 2006). For most villagers, fishing is the

primary livelihood as fertile land is scarce and there is little to no farming activity of food crops. Interviews conducted in the villages showed that most individuals engage in at least two, but often three or four types of livelihoods to make ends meet.

Villagers and conservation staff in the SUCCESS sites perceive biodiversity to be threatened by a variety of human activities as well as management failures and natural factors, such as coral bleaching and crown-of-thorn infestations. In Bagamoyo, villagers and district staff reported trawling, mangrove cutting and destructive fishing practices to be major threats. In Mkuranga, destructive fishing practices, trawling, mangrove cutting, and beach erosion were seen as top priorities, whereas crown of thorn infestation and destructive fishing practices were seen as the most important threats in the Fumba area.

When asked to prioritize the threats, the villagers mentioned that the first priority is conflicts between artisanal fishers and trawlers in Bagamoyo, destructive fishing practices, especially dynamite fishing, in Mkuranga, and crown-of-thorn infestations in Fumba. The allocation and sales of prime beach properties to hoteliers and other investors (increasing the risk of mangrove cutting, beach erosion, and pollution) is seen as a major future threat in all sites, but especially in Bagamoyo.

There are several relatively large conservation and coastal management efforts under way in the field sites, including the SUCCESS Tanzania program, which facilitates district action planning and establishment of CFM areas in Bagamoyo and Mkuranga, the Menai Bay Conservation Area, the Marine and Coastal Environmental Management Program (MACEMP), the Mangrove Management Project etc. Together, these projects address many of the identified priority threats and they are making progress towards solving some of the existing problems.

It is important that SUCCESS' investments are strategic and complement those undertaken by the larger efforts. When SUCCESS began, it concentrated primarily on mariculture development, but as these activities matured, the Program has adopted more conservation related elements, such as establishing no-take areas and initiating monitoring programs that can help us understand the conservation impacts of the Program. In the final years of SUCCESS, the Program could invest in additional targeted activities, such as a crown-of-thorn clean up on the Fumba Peninsula, which directly addresses the priority threats.

The SUCCESS Program has invested in small pilot activities in biologically significant priority areas within the Eastern Africa Marine Ecoregion and the goal is to have a positive impact on the local communities and ecosystems. An underlying premise to SUCCESS efforts is that concentrating on economic and livelihood development is not sufficient for sustainable development and management. Such efforts must be complemented with related resource management strategies to achieve the dual objective of improving quality of life and conserving biodiversity. The SUCCESS Program also has a global objective. By choosing activities that are replicable and applicable elsewhere, piloting similar activities in Nicaragua and Ecuador, and use the field experiences as case studies in regional trainings and networks, the SUCCESS Program has the potential to learn across sites and make a difference far beyond the site level.

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1. INTRODUCTION

On September 30, 2004, the University of Rhode Island (URI) was awarded a Leader with Associates (LWA) Cooperative Agreement in Coastal Management, Fisheries and Aquaculture for a five-year program. This is *the Sustainable Coastal Communities and Ecosystems* (SUCCESS) Program. The Coastal Resources Center (CRC) at the URI is the Leader of this Agreement. The Pacific Aquaculture and Coastal Resources Center at the University of Hawaii (PACRC/UHH) is the sub-recipient. The Program's strategic partners are the Sea Grant Association of Universities, through the Rhode Island Sea Grant College Program; the Nature Conservancy (TNC); World Wildlife Fund (WWF); and Conservation International (CI). Regionally, the partners include the Western Indian Ocean Marine Science Association (WIOMSA) based in Zanzibar, Tanzania; the University of Central America (UCA) based in Nicaragua; and EcoCostas, a nongovernmental organization (NGO) based in Ecuador.

The Program's overarching goal is to help the people of a place improve both their quality of life (health, income, education) and biodiversity through good governance. The Program has four major components.

1. Achieving Tangible On-the-Ground Results
2. Increasing Capacity through Training Linked to On-the-Ground Activities
3. Establishing Regional Learning Networks Supported by Effective Knowledge Management
4. Applying Science to Management and Good Governance

In each region where the LWA Program operates, these components come together to make a coherent, mutually re-enforcing set of strategies. These strategies ensure that community-based demonstrations of successful natural resources governance are connected to supporting actions and policies at the provincial, national and regional scales. This integrating, cross-sectoral and multi-scaled approach has proven to be adaptable to a very wide range of settings.

1.1. SUCCESS IN TANZANIA

In Tanzania, the SUCCESS Program builds upon conservation and management programs led by the Coastal Resources Center and other partners in the Bagamoyo and Mkuranga districts on the mainland and on the Fumba Peninsula on the Unguja Island, Zanzibar. The sites are in or adjacent to land-seascapes that exhibit a high degree of biodiversity, including the Sadaani National Park, partially located in Bagamoyo district, the Rufiji-Mafia-Kilwa land-seascape bordering the Mkuranga district, and the Fumba peninsula located within the Menai Bay Conservation Area. Each of the three sites has overarching coastal management or conservation plans in place and local visioning and planning has already been carried out.¹ Thus, the SUCCESS Program is concentrating on livelihood development through mariculture particularly in the mainland sites, as it is considered to be a priority with high potential but is still relatively undeveloped. By providing targeted benefits for coastal communities and households we build demand and support for large scale resource management strategies. An underlying premise to

¹ The Fumba Peninsula is part of the Menai Bay Conservation Area and the mainland districts are implementing district integrated coastal management action plans.

the SUCCESS program's work is that concentrating on economic and livelihood development above is not sufficient for sustainable development and management. Such efforts must be complemented with related resource management strategies to achieve the dual objective of improving quality of life and conserving biodiversity.



Figure 1. Map of Tanzania and the SUCCESS field sites

1.2. WHY CONDUCT A BIODIVERSITY THREATS ASSESSMENT

The SUCCESS program falls under the Congressional biodiversity earmark, where it fits under the secondary code. These are programs and activities – site based or not – that have biodiversity conservation as an explicit, but not primary objective. Within the Code are four criteria that SUCCESS must meet to be considered a biodiversity program:

- 1 The program must have an explicit biodiversity objective
- 2 Activities must be defined based on an analysis of threats to biodiversity
- 3 The program must monitor associated indicators for biodiversity conservation

4 Site-based programs must positively impact biologically significant areas

Following the second criteria, this threats analysis aims to assess the biodiversity threats in the places where SUCCESS works and evaluate the current activities, to see if they help address priority threats and determine if there is a need to change the goals, objectives, or activities in any of the field sites. This will help us understand the major direct threats to biodiversity as well as the context and root causes of the threats. The assessment will also help prioritize and anticipate what threats might become more severe in the future. This information is critical in designing effective interventions, communicating the rationale behind the program design, and creating adaptive management systems.

1.3 METHODOLOGY

The focus of the assessment is the land-seascape areas where SUCCESS is working. Information was gathered through a literature review and collection of secondary data, as well as with interviews with key stakeholder groups. Since resources allocated to each site is small, the assessment is based on rapid and cost effective methods that match the scope of the program activities. Apart from focus group interviews, little primary data has been collected at field level.

1.3.1 THE TANZANIA STUDY AREA

The threats assessment concentrated on the land-seascape areas where the SUCCESS program is actively working. This includes a number of villages in Bagamoyo, Mkuranga, and on the Fumba Peninsula. The field data collection concentrated on four villages in Bagamoyo (Dunda, Magomeni, Kaole and Mlingotini) and two villages in the Mkuranga district (Kisiju Pwani and Mpafu) on the mainland Tanzania. On the Fumba Peninsula and in the Menai Bay Conservation Area, interviews were conducted in two villages (Fumba and Bweleo). These villages were selected because they are located in the center of the SUCCESS program activities.

1.3.2 DATA COLLECTION METHODS

The threats assessment is based on a review of peer reviewed articles and secondary data sources (see list of references), focus group discussions, and key informant interviews. At least one focus group discussion was held in each village to gather information on marine and coastal resources, biodiversity threats and priorities. In the Bagamoyo district, focus group discussions were held with members of the Collaborative Fisheries Management Central Coordinating Committee (CCC), Village Environmental Committees (VEC), and the Msichoke Seaweed farming group. In the Mkuranga district, focus group discussions were held with the Village Environmental Committees together with beekeepers and fish farmers. On the Fumba peninsula, discussions were held with the Bivalve Zoning Group (BZG) and Village Environmental Committees. Key informants interviewed were fisheries officers, forest officers, ICM members, and Natural resource officers in Bagamoyo and Mkuranga district. On the Fumba peninsula, key informant interviews were held with staff from the Menai Bay Conservation Area (MBCA). An interview guide was designed and used in all villages. (Appendix A).

2. TANZANIA THREATS ANALYSIS

This section will report the results of the threats assessment. The structure is based on the USAID biodiversity conservation guide for staff and partners as well as the organization of assessments conducted by partner organizations (e.g. WWF). The section describes the biological and socio-economic importance of and threats to the coastal area of Tanzania and the land-seascape areas where SUCCESS is working. It further presents the current and anticipated threats to biodiversity as reported by villagers and conservation staff in the land-seascape areas.

2.1 THE BIOLOGICAL IMPORTANCE OF AND THREATS TO THE COASTAL AREA

Tanzania is part of the Eastern Africa Marine Ecoregion, which is one of about ten marine ecoregions around the world. These ecoregions are areas where it is deemed particularly important to develop strategies for biodiversity conservation. Within the Eastern Africa Marine Ecoregion, there are 21 priority areas, of which seven are located in Tanzania or at the border between Tanzania and one of its neighboring countries. All of the land-seascapes covered by the SUCCESS program are in or adjacent to one of these priority areas. The Fumba site is located on the Unguja Island, which is categorized as an area of ecoregional importance. Bagamoyo is considered of sub-regional importance and the Rufiji-Mafia Complex, which is adjacent to Mkuranga has been determined to be of global importance.

Tanzania's coastal zone harbors high biodiversity and an abundance of natural resources. Important ecosystems include coral reefs, mangrove forests, seagrass beds, and marine fisheries. The coral reefs are tropical shallow-water ecosystems with high biodiversity and productivity. They are located along 600 kilometers of Tanzania's continental shelf (Kajuna 2004). Coral reefs support approximately 70% of the artisanal fish production of the country. They are also an asset to the growing tourism industry. The greatest human threats to coral reefs in Tanzania are related to destructive or bad fishing practices, such as dynamite fishing, which has been practiced in Tanzania since the 1960s (Francis, Wagner et al. 2002). Other anthropogenic threats are the use of seine nets, seaweed farming², pollution, coral mining, and the use of motorized vessels, which stir up sediments that can affect coral reef ecosystems. Natural threats include storms and coral bleaching. In 1998, coral bleaching was reported throughout Tanzania, with variable severity. Since then, many reefs have recovered.

Over fishing and destructive fishing practices have reduced the fish stocks that live on the coral reefs. Tanzania has approximately 60,000 full time fishermen (Kajuna 2004) and fish resources seem to be overexploited, shown by the decreased in fish landings and catch per unit effort. For example, in the pelagic fisheries of Zanzibar, the catch declined from 600 tons in 1986 to 91 tons in 1997 (Tanzania Coastal Management Partnership 2003). Overall there are 532 species of fish, 5 species of sea turtle, 1 species of marine snake, and 4 species of marine mammals in Tanzania. In addition, there are 976 species of invertebrates, comprised of mollusks (74%), echinoderms (11%), arthropods (6%), corals (5%), and sponges (4%) (Kajuna 2004).

² Although seaweed farming is thought to be environmentally friendly, research from Unguja has found that it can lower bacterial production and the abundance of small animals such as nematodes on coral reefs.

Mangrove forests are found in all coastal districts of Tanzania. Eight species of mangroves are found on the mainland. In addition, a ninth species can be found on Zanzibar. Similar to coral reefs, mangroves are considered critical habitats with high productivity – producing large quantities of organic matter that serve as food for many organisms. Mangroves also serve as feeding, breeding, and nursery grounds for a variety of invertebrates and fish. Mangroves help stabilize the coastline, preventing erosion, filtering water and helping settle sediments, which could otherwise damage seagrass beds and coral reefs. Economically mangroves are a source of firewood, charcoal, building poles, construction materials, tannin and traditional medicines.

The largest mangrove forests are located in Rufiji, Kilwa, Tanga-Muheza, and Mtwara. Tanzania experienced a small decrease in the overall mangrove coverage between 1990 and 2000 (Tanzania Coastal Management Partnership 2003), particularly in the Rufiji, Kilwa, and Mkuranga Districts. Threats to mangrove ecosystems include harvesting for firewood, charcoal making, boat making, etc. and clear cutting of substantial areas of mangroves for solar saltpans, agriculture (e.g. rice farming), hotel development, and industries (Francis, Wagner et al. 2002). Mangrove ecosystems are also threatened by changes in water movements – either fresh or seawater. These changes can be caused by humans or occur naturally for example through flooding, changes in river courses, strong wave actions, and drought.

Tanzania is also endowed with 12 species of seagrass, 287 species of seaweeds, and 250 species of phytoplankton (Kajuna 2004). Seagrass beds provide important breeding, nursery, and feeding areas. The green turtle *Chelonia mydas* and the dugong *Dugong dugong* depend on seagrass for food. Both these species are considered endangered in Tanzania. Seagrass roots also bind sediments and slow the rate of water flow, preventing erosion of the ocean sediments. In Tanzania, no records of seagrass harvesting have been reported and the direct human uses of seagrasses are limited (Semesi *et al.*, 1998). However, destructive fishing practices, such as beach seining and trawling, threatens seagrass biodiversity in Tanzania. In areas where trawling and seine netting is common, seagrass beds are seriously damaged and in some cases almost completely absent.

Seaweed farming is common in Zanzibar and parts of mainland Tanzania (including Bagamoyo). Although it is not very profitable, it has had a positive economic impact on local communities and especially women. However, research has shown that seaweed farming can negatively impact the coastal environment, where the farms are located (Eklof, de la Torre Castro et al. 2005). A study conducted by Eklof et al. (2005) found that seagrass beds underneath so called peg and line seaweed farms generally had less seagrass and macroalgae, finer sediment, lower sediment organic matter content, and a reduced abundance and biomass of macrofauna, than seagrass beds without seaweed farms. One conclusion is that alternative seaweed growing methods, such as the floating farm method piloted by the SUCCESS project in Bagamoyo, may be better alternatives from a biodiversity conservation standpoint.

2.1.1 BAGAMOYO

The Bagamoyo coastline is characterized by sandy or muddy tidal flats, mangroves, coral reefs, seagrass beds, seaweeds (algae beds), and lagoons. These ecosystems play a major role in supporting local people, providing a source of food, cash and energy

(Semesi, *et al*, 1998). Two major rivers, the Wami and Ruvu, have their estuaries in the Bagamoyo district, providing breeding ground for shrimp and other species. The rivers are also a major supplier of nutrients to the Indian Ocean waters.

The Bagamoyo marine water is part of Zanzibar channel where the continental shelf reaches a width of about 60 km. A number of reefs are located off shore, the largest being Mwamba Kuni (Figure 2). Four of these reefs (Mjini, Poyogo, Mshingwi, and Maduga) have been closed to fishing through a collaborative fisheries management plan that was adopted by the surrounding villages and the district in 2006.



Figure 2. Coral reefs of Bagamoyo
(source: Muhando, 2006).

The coral reefs are productive and support many species of marine organisms of direct importance for the local communities. Monitoring of the reefs has been undertaken by scientists from the Institute of Marine Science as part of the CFM establishment and implementation. These surveys have found that in general the reef conditions in Bagamoyo are stable. Live coral cover is improving after a high bleaching mortality in 1998. Potential for full coral recovery is high in reefs outside Bagamoyo and Mbegani Bays (e.g., Mwamba Mshingwi, Mwamba Mweduga and Mwamba Kuni). Reefs in the Mbegani Bay or just off Bagamoyo town are in constant stress from natural factors (sedimentation, freshwater intrusion, eutrophication, etc.) and human disturbances. Reef monitoring in Bagamoyo also showed that fisheries and fish stocks in the area are decreasing (Muhando 2006). Another problem is that commercial trawling and seine-netting in seagrass areas, threatens the biodiversity of these ecosystems.

Fishermen have identified 20 different types of sea cucumbers in the waters outside Bagamoyo. Sea cucumbers are not part of the traditional diet in Bagamoyo, although some people have begun to eat them. The main collection grounds for sea cucumber are *Mwamba Kuni*, and near *Kitame*, but all intertidal areas are also used. Collection is done throughout a year, and the best harvesting time is during spring low tides. According to Semesi *et al* (1998), the stocks of sea cucumbers and shellfish have already declined through overfishing and the removal of undersized individuals. Several

species of dolphins have been reported in the waters of Tanzania, including the rough-toothed dolphin (*Steno bredanensis*), bottlenose and spinner dolphins (*Stenella longirostris*) and Indo-Pacific humpback. They have been observed in different places including Saadani in Bagamoyo district (Francis *et al.*, 2001).

The mangroves of Bagamoyo form a more or less continuous band along the coast from Saadani to the area near Kitame saltworks and then from Ruvu river to Mpiji river. Overall the condition of mangroves in Bagamoyo seems to be relatively stable. According to the State of the Coast 2003 report, Bagamoyo had about 5,038 hectares of mangroves in 1990 compared to 5,051 hectares in 2000. The abundance of seagrass is also high, although bottom trawling poses a significant threat (Francis, Wagner *et al.*, 2002). Commercial seaweed cultivation was initiated in Bagamoyo in 1998 (Torell *et al.*, 2006) and it is an important source of income for women in some villages (e.g. Mlingotini, which is the largest lagoon system in the Bagamoyo area).

2.1.2 MKURANGA

The Mkuranga district has about 90 kilometers of coastline. The district is endowed with mangrove forest, coral reefs, and rich fishing grounds for coastal fisheries (figure 3) (TCMP 2002; Torell & Mmochi, 2006). It is characterized by remote unpopulated islands, which host endangered species of colobus monkey and many attractive birds. However, the coastal and marine environments are currently subject to a wide range of natural and anthropogenic disturbances that are attributed to the growing coastal population, as well as unsustainable use of coastal resources (Francis *et al.*, 2002).

Mkurunga district is divided into two major agro-ecological zones, the coastal belt and the upland area, based on landforms and soil classification. Geographically, the coastal belt includes the Shungubweni, Kisiju and a part of Mkuranga division. This belt is characterized by sandy soil of low water holding capacity, high water table, and poor fertility. The upland area covers the Mkamba and the remaining part of Mkuranga division which has sandy soil suitable for cultivation. In terms of fisheries, Mkuranga has several areas that are attractive for shrimp and finfish fishing.

Similar to Bagamoyo, the mangrove cover in Mkuranga was relatively stable between 1990 and 2000 (decreasing slightly from 4,159 to 4,092 hectares). The mangroves are generally in good condition, with a high density of mature trees and seedlings. In-between the mangroves there are approximately 2,000 hectares of non-forested area of creeks, saltpans, and bare saline areas (Torell & Mmochi, 2006).

According to Francis *et al.* (2002), the coral reefs of Mkuranga district are in good condition with good live hard coral cover, high fish abundance and relatively low damage. The recently reported trend is however negative, showing an increase in damaged coral cover areas and declining fish abundance. The seagrass abundance is low and beds in tidal areas have been badly damaged by dredging and sedimentation. Bottom trawling poses a significant threat to the seagrass ecosystems (Francis, Wagner *et al.* 2002).

Mkuranga borders the Rufiji-Mafia-Kilwa seascape which has been designated as the first Marine Ramsar site in Tanzania for its rich biodiversity, endemism and ecological significance. It is also regarded as a site of global importance within the Eastern Africa Marine Ecoregion. The Rufiji Delta hosts over 40,000 water birds, representing a

minimum of 62 species (Ramsar, 2005). It can be expected that many of these species are also present in Mkurunga and that they move between Mkurunga and the Rufiji Delta, since there are no restricted ecological boundaries between the sites.

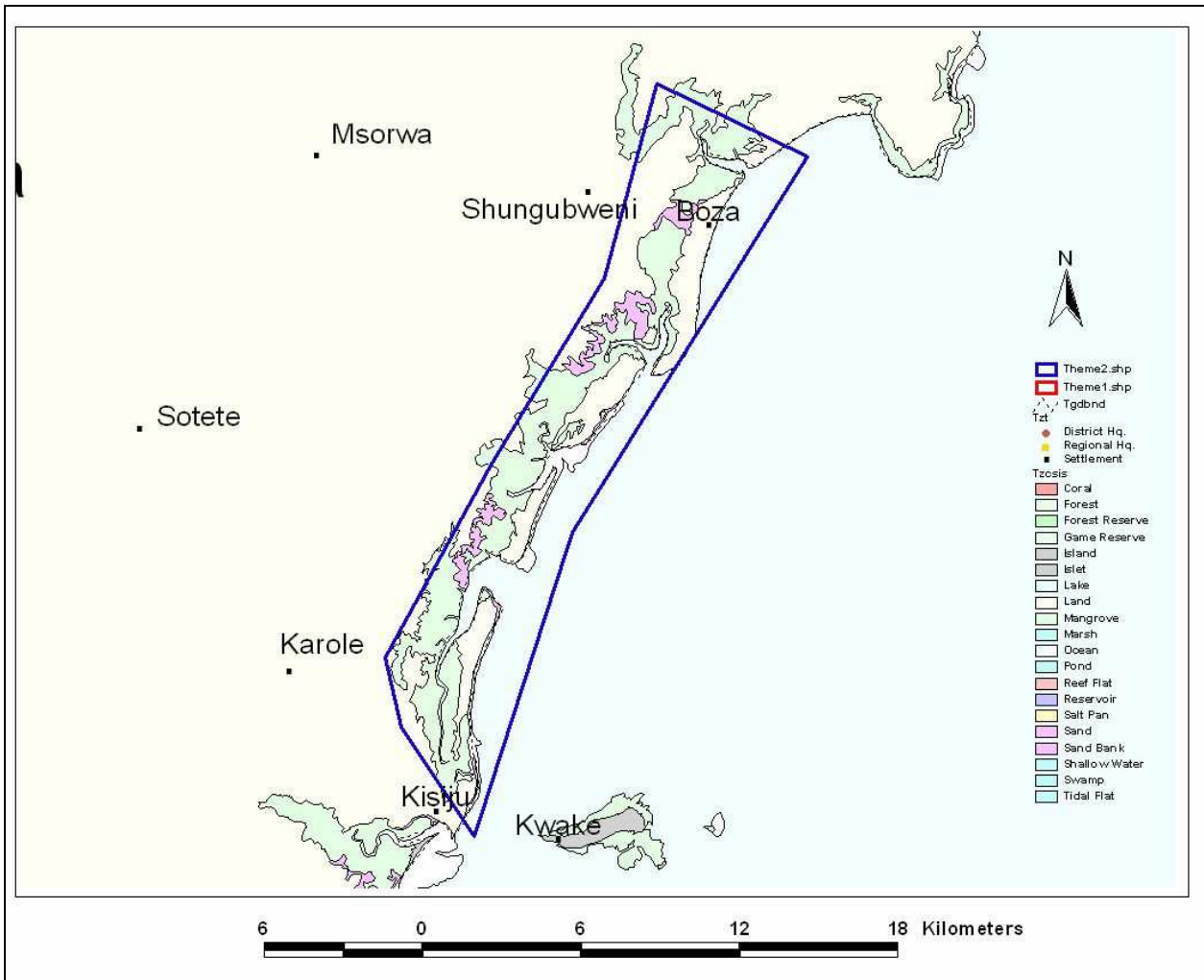


Figure 3. The area of the Mkurunga District where the SUCCESS Program is working.

There has been occasional reports of whales found and/or observed in the in shore waters of Mkurunga. For example, recently a whale measuring 20 feet long and weighing 40 tons was found dead on the beach by the Mdimu village. Apart from serving as food (source of protein), whales are valued for their fat, which is traditionally used by local fishers to smear on their boats as an anti corrosive and for water proofing. As for the meat, the local belief is that it holds curative power for a number of ailments (Per. Comm.; IPP Media, 2006).

2.1.3 FUMBA

The Fumba Peninsula is situated within the Menai Bay Conservation Area (MBCA) which is located in the south-west of Unguja Island, Zanzibar (Figure 4). The Unguja Island is considered a site of regional importance within the Eastern Africa Marine

Ecoregion. The waters around the peninsula provide traditional fishing grounds, encompassing extensive areas of coral reefs, sea grass beds and mangrove stands. Together these interconnected ecosystems form the resource base for the fisheries of the area. However, the coral reefs have a relatively low live coral cover (12-29%), which can be attributed to the use of destructive fishing methods as well as coral bleaching events (Francis, Wagner et al. 2002).



Figure 4. The Menai Bay Conservation Area and the Fumba Peninsula

Menai Bay is also characterized by shallow waters with an average depth of about 10 meters in most places at high tide. The Bay is under the influence of East African Coastal current, which flows northwards throughout the year. The inshore waters of the bay, however, are also under the influence of tidal currents whose direction is determined by the presence of reefs, sandbanks and Islands. Between March and early October (the Kingfish season) the Bay is exposed to south–east monsoons and becomes rough. As a result small fishing vessels like Ngalawas cannot be used during this time. Reverse weather conditions dominate during the north–east monsoons and at this time, the area becomes attractive to visiting fishermen.

Commercial reef fish, harvested in Menai Bay belong to the families of lethumidae (emperors), Saganidae (rabit fish), Serranidae (groupers), Mullidae, Nemipteridae, and Labridae. Pelagic species belong to the families of Sardines, Indian Mackerels, tuna and marlin. Other deep sea resources include octopus and squids (Cephalopods) plus sea cucumbers (Holothroids).

The Bay is also endowed with two types of turtles, namely the green (*Chelonia mydas*) and the Hawksbill (*Eretmochelys imbricata*). Despite the fact that capturing turtles is illegal, some sections of the community consider turtle as a delicacy and capture and consumption still takes place. However, accidental capture of the green turtles in bottom set gill nets has of late become more common, indicating an increase in the population,

and some fishermen are now demanding compensation for their damaged nets. Marine mammals in Menai Bay include Dolphins and Whales. Two common types of dolphins are found throughout the year in the area: the bottle nose (*Tursiops truncatus*) and the humpback (*Seiurus cenerensis*). Undefined migratory whales, possibly from South Africa, visit the Bay from July to November every year. Dolphin and whale watching has become a popular eco-tourism industry in area and it is estimated that 15,000 to 20,000 tourists enter the Bay every year to watch these animals. As a consequence, a number of restaurants have mushroomed around the Bay to cater to the visitors, creating employment opportunities for locals. Many fishermen have modified their boats to ferry tourists into the Bay, indirectly reducing the fishing pressure in the area (Forum, 2005).

Zanzibari women collect over twenty-one species of bivalves, but out of these species some are more prevalent and favored than others. Women tend to collect mostly cockles (*Anadara antiquata*), giant murexes (*Chicoreus ramosus*), conchs (*Pleuroploca trapezium*), and oysters (*Pinctada margaritifera*). The Fumba women reported that near-shore stocks have been depleted and that they are forced to collect mollusks further off shore. The fact that women now have to walk further in order to collect enough bivalves indicates that slowly, the collection of wild bivalves may be dangerously depleting the populations. Thus, if collecting continues without some form of management through a conservation or zoning policy, the stocks will continue to decline.

2.2 SOCIO-ECONOMIC IMPORTANCE

Tanzania's coast contains many resources that are a key to the country's future. The coastal area encompasses about 15 percent of the national land area, houses 75 percent of the industries and contributes more than one third of the national Gross Domestic Product (GDP). The coastal area is a home to roughly a quarter of the country's population. For the year 1995-2000, the average population growth rate was approximately 2.3%. Children under 15 years of age constitute 45% of the population, an indication of rapid population growth in the near future due to the sheer number of young people who will enter the childbearing years. The fertility rate is approximately 6.3 per woman and mortality rate is still high.

The Tanzanian coastal region comprises 13 districts in five regions on the mainland and five administrative regions in Zanzibar. The coastal population is mostly concentrated in Zanzibar and the urban areas of Tanga, Dar es Salaam, Bagamoyo, and Mtwara. The 2002 Population and Housing Census shows that 23% of the Tanzanian population (8 million) resides along the coast. On the mainland, the average rates of growth for the period 1988 to 2002 range from 4.3 percent recorded in Dar es Salaam to 1.4 percent in Lindi. In Zanzibar the average rates of growth for the period 1988 to 2002 ranges from 4.5 percent recorded in Urban West to 2.1 percent recorded in South Unguja. The regions that show the highest rates of growth are dominated by large urban areas (e.g., Dar es Salaam and Zanzibar Town). Apart from Dar es Salaam and the Coast region, whose rates of population growth are 4.3 percent and 2.4 percent respectively, the growth rates in the other coastal regions are well below the mainland average of 2.3 percent.

Tanzania is one of the poorest countries in the world with an annual per capita income of about 270 US dollars (World Bank 2003). Non-income dimensions of poverty are also severe. In 2002, Tanzania was ranked number 151 (out of 173 countries) on the Human Development Index (World Bank 2003). In the coastal regions, the standard of living is

generally lower than the national average (Tanzania Coastal Management Partnership 2001).³ Communities depend on small holder farming, subsistence forestry, lime and salt production, coastal fisheries, seaweed farming, and small-scale trade. Most agriculture is found as small-scale subsistence farms. Only 10% of all cultivated land along the coast are made up of commercial large-scale farms, growing sisal, cashew nuts, and coconuts. Individuals are often engaged in more than one economic activity so that if one source of income to the household, fishing for instance fails, the family still has other sources of food and income. Tanzania's Poverty Reduction Strategy places an emphasis on reducing the risk and vulnerability from deteriorated environmental conditions of particular importance to coastal communities.

The coastal area is of critical importance to development. There is substantial but untapped potential for offshore fisheries (that are currently only utilized by foreign fishing fleets), shipping, urban development, small-scale mining and manufacturing. Coastal tourism, mariculture development and natural gas exploration - such as the Songosongo and Mnazi Bay fields, are potential activities in national economic development and, over time, will contribute to gradual improvement of the quality of life of coastal communities.

2.2.1 BAGAMOYO

Bagamoyo is a large district located just north of the Kibaha District and Dar es Salaam. The total population is 228,967 persons, with an annual growth rate of almost 2%. Bagamoyo is a relatively large district (almost 10,000 square kilometers) with 16 wards (5 coastal) and 78 villages. There are 9 coastal villages (Table 1, the surveyed villages are highlighted in bold), and the Bagamoyo town which recently became upgraded to a township (Torell *et.al*, 2006).

Table 1. Population in the Coastal Villages of Bagamoyo district (Tanzania National Bureau of Statistics, 2002).

	Ward	Village	Population
1	Mkange	Saadani	1,907
2	Magomeni	Magomeni (A, B, and Maji coast)	5,077
3	Dunda	Dunda (Dunda, Dunda Benki and Dunda homeless)	2,298
		Kaole	1,149
4	Zinga	Kondo	1,542
		Mapinga	3,827
		Mlingotini	1,974
		Pande (Pande and Pande Inst. Pop.)	1,863
5	Vigwaza	Buyuni	2,424
Total			22,061

(Tanzania National Bureau of Statistics (2002).

The population of Bagamoyo is a mix of different ethnic groups from the surrounding area and most coastal inhabitants belong to the Wazaramo, Wadoe, Wakwere and

³ However, a socio-economic study conducted in coastal villages in Tanga, Kilwa, Mafia, and on Zanzibar in 2003, found that coastal villages often are better off than inland villages. The study concluded that one reason for this might be that the coastal villages have more livelihood options than in-land villages, since they have access to fishing and gleaning (Tobey, Torell, et al. 2003).

Wazigua tribes (UNESCO 2006). Torell and Tobey (2006) identified the primary activity of Bagamoyo coastal villages (Buyuni and Saadani) as fishing. Secondary activities were identified as salt making, firewood cutting, producing and selling local brew and selling meals and beverages during high fishing season, agriculture (coconuts, cashews, cowpeas and other non-cereal crops), and other small business activities (making and selling mats and baskets, running small “hotels”, preparation of simple meals for customers and sale of beverages, drying and selling fish, selling water and fuelwood, and making and selling of local alcohol) (Torell, Tobey et al. 2006). Seaweed farming is another common livelihood activity in the villages covered by the SUCCESS Program.

The livelihoods of coastal villagers are highly dependent on the local natural resources (Torell, Tobey et al. 2006). For most villagers in Bagamoyo, fishing or farming is the primary livelihood, but in the coastal villages, fertile land is scarce and there is little to no farming activity of food crops aside from coconuts and cashew nuts. However, because both agriculture and fisheries are suffering from a decline in productivity and profitability, poverty and food insecurity are on the rise. Interviews conducted in the villages showed that most individuals engage in at least two, but often three or four types of livelihoods to make ends meet.

The tourism industry is on the rise in Bagamoyo. The reasons are several – for one, the new road from Dar es Salaam has now made access easier. The first hotel was built in Bagamoyo in 1993 and the tourism growth was slow for about ten years. But since the new road was finalized in 2003, the number of hotels has expanded from four to eight. It is expected that city dwellers increasingly will make Bagamoyo a weekend destination. Recently, Bagamoyo was named a world heritage site because of its historical prominence and the Saadani Game Reserve was upgraded to a national park in 2005. Both these events are expected to inspire more tourism to the district. Today, there are only two tourist lodges adjacent to the park on the Bagamoyo side (the Park extends over three districts: Bagamoyo, Pangani, and Handeni), but the number of hotels is expected to increase in the near future.

2.2.2 MKURANGA

The Mkuranga District is one of the six districts that form the Coast Region in Tanzania. The district is approximately 50 kilometers south of the commercial capital, Dar es Salaam (the political capital is Dodoma). Mkuranga is a relatively small district covering 2,432 km² of which 447 km² is covered by the Indian Ocean, 2018 km² is arable land, and 51 km² is forest. Mkuranga is divided into four administrative divisions that are further subdivided into 15 wards and 101 villages. Along the 90 km coastal stretch there are seven coastal villages, namely Shungubweni, Mpafu, Kerekese, Kisiju Pwani, Mdimni, Magawa, and Kifumangao. In addition there are several near-shore islands, hosting the Boza, Kuruti, Kwale, and Koma villages. Most of the villages are remote and often inaccessible, despite the relative proximity to the city of Dar es Salaam (Torell and Mmochi, 2006). According to the Tanzania National Population Census of 2002, Mkuranga district hosts about 190,000 people in 43000 households with an average household size of 4.4. Approximately 15,000 persons live in the coastal villages (Table 2).

Table 2. Population of the coastal villages of the Mkuranga district

Ward	Village	Total Population
Shungubweni	Shungubweni	1,626
	Boza	549
	Kuruti	667
Kisiju	Kisiju Pwani	2,898
	Mpafu	801
	Kerekese	1,627
	Kwale	552
Magawa	Koma	746
	Mdimini	938
	Magawa	2,639
	Kifumangao	466
Total		13,509

(Tanzania National Bureau of Statistics (2002).

The people of Mkuranga primarily belong to four ethnic groups — the Zaramo, Ndengereko, Matumbi and Makonde. Most people live in poor and simple houses thatched by grass or coconut leaves, poles, and mud walls on earth floors. (Institute of Resource Assessment, 2005; Torell & Mmochi, 2006). Agriculture is the principal economic activity, with over 90% of the households engaged in farming. The most common food crops are cassava, rice and beans. Major cash crops are cashew nuts, coconut, pineapple and orange. The District is one of the largest producers of cashew nuts in Tanzania, with over 35,000 hectares under cultivation and close to 3 million trees (United Republic of Tanzania 1997). The production of cashews peaked in the early 1970s, but a combination of issues (mildew disease, world market price decline, and villagization) caused the production to decline. The production started to increase again during the mid-1990s, when extension services improved and farmers began preventing mildew disease by spraying the trees with sulfur dust.

Apart from agriculture, coastal villages depend mainly on subsistence forestry and charcoal production; livestock husbandry; small-scale trade (especially selling of fish, mangrove poles, coconut, salt, lime and retail goods); and handicrafts. Like those living in Bagamoyo, most families are involved in more than one economic activity. Artisanal fishing; lime production; salt production; and seaweed mariculture are common coastal and marine occupations.

A large percentage of men are fishers. Mollusks (which are collected by women and children) and fish are the main source of protein for coastal people. Fish are an important source of income not only for the fishermen, but also for many others engaged in the processing, frying and trading of fish. Most of the catch is from the artisanal fishery using rudimentary traditional techniques and equipment — hooks and lines, traps, seining and digging— to catch inshore pelagics such as herrings, sardines, king fish, mackerel, fin fish, anchovies, shrimp, and shellfish (such as oysters and mussels). Artisanal fisheries contribute to more than 96 percent of total marine fish landings. However, the contribution of artisanal fishing to the district revenue is not clear because control measures to collect daily records are not well established (DED, 2001 in Tembo, 2003).

There are three main types of artisanal fisheries vessels in Mkuranga: sailing outrigger canoe (ngalawa), dugout canoes (hori and mitumbwi), and dhow (mashua). The district has ten official fisheries landing sites, the largest being in Kisiju Pwani. This is the only place where fish landings are recorded. Mkuranga District has two government health centers, fifteen government and ten private dispensaries. Traditional health care systems, with traditional healers, also operate in the district. The district has poor road infrastructure which makes it difficult access to coastal villagers by road, especially during the rainy season.

2.2.3 FUMBA

Officially there are 17 villages in the MBCA, with a population of about 16,000. But according to Menai bay staff, the area has six additional villages (Michamvi, Bwejuu, Paje, Jambiani (2 villages), and Makunduchi). Most of the villages are situated within the coral rag area, which is a land area that is made up by coral rock and is characterized by poor soil conditions, unsuitable for farming.

The villages around Menai Bay are poor, but a material lifestyle analysis based on a survey of 133 households, conducted in 2003, found that the Menai Bay residents are better off than many others in Tanzania (Tobey, Torell *et al.* 2003). For example, 73 percent of the villagers surveyed in Menai Bay have access to piped water (although not in their house), compared to 28 percent for rural Tanzania. Also, 68% of the households reported taking three meals per day compared to the 42.8% of rural Tanzanians. Finally, 16 percent of the Menai Bay residents reported being illiterate compared to a national average of 33 percent (Torell *et al.*, 2006).

Table 3. Population of Menai Bay

Village	Total Population
Fumba	909
Bweleo	842
Dimani	1,560
Kombeni	3,060
Mtende	1,431
Kizimkazi Dimbani	1,360
Kizimkazi Mkunguni	1,848
Muyuni A	935
Muyuni B	853
Muyuni C	788
Muongoni	1,320
Bungi	2,020
Unguja Ukuu Kaepwani	2,185
Unguja Ukuu Kaebona	1,097
Kikungwi	631
Uzi	2,030
Ng'amb'wa	754
Total	23,623

(2002 National population census)

The main economic activity for men living in the villages surrounding Menai Bay is fishing followed by agriculture, livestock keeping, carpentry and petty trade. Women are

primarily engaged in seaweed farming, agriculture, firewood collection, and coconut-husk weaving for rope making and other related products. Women also collect bivalves from the intertidal zone. In two Zanzibar villages within the Menai Bay Conservation Area, women questioned regarding their collection of bivalves reported that they collect during every spring tide (i.e. twice per month). These women also said that most of what they collected was consumed within the household and was not sold commercially. However, bivalve collection can be relatively profitable, providing cash for women who have few other income generating options (Torell and Mmochi 2006).

Both men and women work in the tourism industry, which every year brings 15-20,000 tourists to the area for whale and dolphin watching and snorkeling on the reefs. The poor roads and difficult access to Menai Bay continues to hinder the growth of tourism to the levels of Stone Town and the northern tip of Zanzibar. It is difficult to get transportation to the area and tourist accommodations are not well developed. Currently less than a dozen hotels can be found in the towns situated within the boundaries of the MBCA. Most of the tourism revenue that is currently supported by the park comes from day-trippers, who snorkel and scuba dive on the park's reefs.

Zanzibar has a long demographic history and who was first to set foot on the Zanzibari soil is debatable. However, what is known today is that the natives include the three Shirazi groups of Wahadimu, Wapemba and Watumbatu. Other ethnic groups that inhabit Zanzibar today include Arabs, Asians (Indians & Pakistanis), Comorians, and people from mainland of Tanzania who are ironically referred to as "Africans". Overall, the culture of Zanzibar has been greatly influenced by Persian, Arabic, and African traditions.

2.3 PERCEIVED THREATS TO BIODIVERSITY

This section will describe the current and upcoming threats to biodiversity as reported by the villagers and district/park staff in Bagamoyo, Fumba, and Mkuranga. In the Bagamoyo, Mkuranga and Fumba sites, biodiversity was reported to be threatened by a variety of human activities, management failures, and natural factors. The threats and their severity differ between the sites and the Fumba area is generally considered less threatened than the other areas, potentially because of the presence of the marine protected area.

According to the Bagamoyo villagers surveyed, trawling, mangrove cutting and destructive fishing practices (Small mesh net sizes, dynamite, beach seine and other nets) are the largest current threats to biodiversity, while the tourism sector (including hotel construction) is regarded as a growing threat followed by garbage dumping. Other parameters that cause minor threats to the biodiversity identified by single villages include oil spills from fishing boats, absence of good management, unplanned coastal development, poor fishing gears and vessels, population increase, inadequate awareness education, conflicts between seaweed farmers and fishers, and erosion of traditional knowledge (Table 4).

Table 4. Biodiversity threats identified in Bagamoyo

Threat	Dunda	Magome	Kaole	Mlingo-tini	Total
1. Trawling	Yes	Yes	Yes	Yes	4
2. Mangrove cutting	Yes	Yes	Yes	Yes	4
3. Destructive fishing practices (Dynamite, beach seine and small mesh size nets)	Yes	Yes	Yes	Yes	4
4. Tourist hotel construction	Yes	Yes	Yes		3
5. Garbage dumping	Yes	Yes			2
6. Oil spills from fishing boats	Yes				1
7. Weak management			Yes		1
8. Unplanned coastal development			Yes		1
9. Poor fishing gears and vessels				Yes	1
10. Population increase				Yes	1
11. Poor awareness education				Yes	1
12. Conflicts between seaweed farmers and fishers				Yes	1
13. Erosion of traditional knowledge				Yes	1

In Mkuranga, destructive fishing practices, trawling and beach erosion were reported as the biggest threats to biodiversity. Other threats identified in Mkuranga are mangrove and terrestrial tree cutting, farming on river banks and water sources, increase in number of fishers/ fishing efforts, waste disposal, and mangrove die-offs (Table 5).

Table 5. Biodiversity threats identified in Mkuranga

Threat	Kisiju Pwani	Mpafu	Total
1. Mangrove cutting	Yes		1
2. Destructive fishing practices (Dynamite fishing, octopus fishing, small mesh size and fish poisoning, crab collection)	Yes	Yes	2
3. Trawling	Yes	Yes	2
4. Farming on river banks and water sources	Yes		1
5. Beach erosion	Yes	Yes	2
6. Increase in no of fishers/fishing efforts	Yes		1
7. Waste disposal	Yes		1
8. Mangrove die-offs		Yes	1

On the Fumba Peninsula, the villagers identified Crown of thorns star fishes, and destructive fishing practices (such as seine nets, drag nets, octopus fishing (using spears), fishing by scuba diving, bivalve collection and small mesh size nets) as the biggest threat to the biological diversity, followed by minor threats such as high sunlight during northern monsoon, cutting of terrestrial trees, high wave action, lack of diversified activities (poverty), and fishing vessel movements (Table 6).

Table 6. Biodiversity threats identified in Fumba

Threat	Fumba	Bweleo	Total
1. Cutting of terrestrial trees	Yes		1
2. Crown of thorns star fishes	Yes	Yes	2
3. Destructive fishing practices (seine nets, drag nets, octopus fishing, fishing by scuba diving, bivalve collection and small mesh size nets)	Yes	Yes	2
4. High wave action	Yes		1
5. Lack of diversified activities	Yes		1
6. Fishing vessel movements		Yes	1

2.3.1 GENERAL DIRECT THREATS

Trawling

In Bagamoyo and Mkuranga districts, most of the villagers complained that the current low fish catch is attributed to the trawling industry in the area.⁴ The area that is worst affected is Bagamoyo, north of Bagamoyo town, where shrimp trawling is very popular. The pressure on shrimp resources is high and due to the large amount of trawler effort, the actual annual prawn production is more than twice the scientifically recommended production estimate for sustainability (Bagamoyo District Council and Tanzania Coastal Management Partnership 2005). The trawlers also destroy local fishermen's nets and compete for the fishing grounds (Semesi et al., 1998). Trawlers have the capacity to exhaust local fish stocks to the detriment of the livelihood of small-scale fishers. Their presence is also associated with damaged seagrass beds and sea turtle kills. Trawling also result in a large by-catch of juvenile fish and smaller species of fish targeted by small-scale fishers (Tobey et al., 2005).

Trawlers are often accused of violating the rules and fishing in waters that are too shallow. A fisherman in Dunda narrated that the trawlers often operate close to shore, where the local fishermen fish and their gear destroys the bottom habitat. *"The trawlers are like tractors, they comb the sea bottom taking everything and killing everything. It is too bad that since they only fish for prawn, they always discard all fish by-catch at sea"*.

Conflicts between artisanal fishers and trawlers have been reduced in Bagamoyo over the last couple of years. One reason is that the trawlers are restricted to fishing during the nights, when the artisanal fishers are not active. This has reduced the number of local fishing gears that are destroyed by the trawlers. The trawling vessels pay high tax to the central government, while artisanal vessels pay only small taxes to the district officials (and nothing to the national government). Because of the tax revenue, the national government is reluctant to reduce the number of trawlers, despite the damage they cause to biodiversity.

⁴ However, it is likely that an increased use of beach seines and other destructive fishing practices also contributes to the low fish catch.

Destructive fishing practices

Fishing with destructive fishing gears such as small mesh beach seines and dynamite fishing are practiced in Bagamoyo although is illegal under the Fisheries act of 2005. The areas affected by dynamite fishing are those located furthest from Bagamoyo town (e.g. Saadani and Mlingotini). The interviews revealed that dynamite fishing has ended or been drastically reduced in the areas closer to town since the ICM process, including patrolling, began. Dynamite fishing has also been reduced in Mkuranga, due to patrolling conducted by the Monitoring, Control, and Surveillance Unit of the Fisheries Division. The villagers reported that they used to hear six to eight blasts per day before Sept 2006, but now they only hear one or two blasts per three weeks. According to fishers, dynamiting still take place on the reefs that are further off shore, close to the islands of Nyororo, Mapanya, Chokaa, Kibundi, Koma and Kwale. Some fishers use spears and harpoons for fishing octopus.

Since the 1980's, the number of fishers using beach seine nets as their primary gear has steadily increased. In 1990, 436 fishers in Bagamoyo were beach seining and in 2004 that number had risen to 523 (District Fisheries Statistics). There are currently 49 beach seines in use in the seven fishing villages that are covered under the Bagamoyo collaborative fisheries management plan (Bagamoyo District Council and Tanzania Coastal Management Partnership 2005). In Tanzania, the use of beach seine nets with mesh sizes below 3 inches at the wings and 1.5 inches at the cod end are illegal (United Republic of Tanzania 2005). However, small mesh nets are nevertheless used and small juvenile fish are being caught in increasing numbers. Less fish are able to grow to mature size and reproduce to replenish stocks. One study from Kenya found that a marine reserve next to a closed area that excluded beach seines had the highest catch per area despite having the highest density of fishermen, indicating that beach seining is a major cause of over fishing (McClanahan and Mangi 2001).

Some fishers say that they use small mesh net because local customers (who are the majority) prefer to buy small fishes (which is cheaper), but the fishers also avoid buying nets with big mesh sizes because they are more expensive. The areas affected by small mesh-net sizes in Bagamoyo are Dunda and Magomeni, and the area between Nunge and Saadani. Use of small mesh size under 2" have also been reported in the Kisiju Pwani village, Mkuranga.

On the Fumba peninsula, collection of bivalves and diving for octopus threatens coral reefs and the associated organisms. When fishing for octopus, fishermen use sharp iron rods (*umangu*), which destroy the coral reefs. Harvesting wild bivalves is still unregulated, which means that anyone can collect bivalves of any size he/she wishes without any restriction. Seine netting near the sand banks of islands like Pungume, Kwale and Ukombe has also been identified as a threat to biodiversity by the Fumba villagers, but is continued in secret. In some mangrove forests, seine nets are dragged under the tree canopies. This uproots any seedlings and greatly reduces the possibility of regeneration (Francis *et al.*, 2002). In the Bweleo village, the villagers mentioned fishing by scuba diving as a problem. Drag nets are also used on coral reefs and sea grass areas around Fumba, destroying the habitats and reducing fish stocks.

Mangrove cutting

Mangrove cutting for charcoal, timber, building poles and boat construction was reported as a major threat in both Bagamoyo and Mkuranga. It is interesting that the villagers made this threat a top priority, while the scientific data shows that the mangrove cover has remained relatively stable in both districts. One reason might be that although the forest cover is relatively dense, most of the large trees have been cut, leaving big stumps and smaller secondary growth (Crawford, per com.). In Bagamoyo, people stated that a lot of mangroves are cut and smuggled to Zanzibar, where there is a lack of firewood. Other reasons behind the mangrove cutting are clearance for agriculture, salt production and aquaculture, charcoal production, building poles and digging of the polychaete worms locally known as “daa” used as fish bait (Semesi *et al*, 1998). There was an overall dissatisfaction with the Mangrove Management Program, which aims to manage all mangroves in Tanzania. Villagers reported that illegal logging is common, especially in places that are far away from the center and that the patrolling team cannot reach (e.g. the villages north of the Ruvu River. Hotels have also cleared mangroves to make room for more attractive tourist beaches.

In Bagamoyo, villagers usually cut mangroves far away from the village, leaving the areas close to the village untouched, as they are afraid of being caught. A lady who is a member of the village environmental committee said *“We can’t catch these culprits, as they go deeper inside the mangrove forest where mud is knee deep and where you can’t walk without boots”* The forest officers in Mkuranga district, maintained that the same problem exists in Mkuranga. Illegal cutting is done in areas that you can only access by dug-out canoes during high tide. In Fumba, however, the villagers said that nowadays no one cuts mangroves, but they still cut terrestrial trees for various uses.

Liquid and solid waste disposal

There is no garbage disposal facility in Bagamoyo town and as a result trash and solid wastes are dumped haphazardly and sometimes on the beach. The same problem exists in Mkuranga and the Kisiju Pwani village. The Bagamoyo village environmental committees (VEC) stated that fishing vessels often dump waste in the sea as they stay away from the shore for extended periods. Few villages have toilets and use the beach for defecating. But even where latrines exist, liquid waste seeps into rivers and the ocean. For example, villagers living close to the Ruvu River, suspect that the discharges are seeping into the river.

Plastic bags, plastic rings, abandoned fishing gear, and other man-made materials that are dumped from the shore and ships affect biodiversity in aquatic ecosystems as they can entangle and kill marine mammals and birds. Animals such as sea turtles often die through ingesting bits of plastic and other discarded materials. In addition, abandoned fishing gear such as lobster pots and nets are self-baiting and continue to catch and kill fish and other organisms for years after the gear has been discarded or lost.

Erosion

Erosion was reported as a threat to biodiversity in Bagamoyo and Mkuranga. Mlingotini villagers reported that the highest water mark is advancing inland at a fast rate and that many fresh water wells have been submerged. Farming along river banks has increased in both Bagamoyo and Mkuranga, causing some of the water sources to dry up and

increasing erosion. Beach erosion and wave action were reported to alter the mangrove and other coastal ecosystems in Fumba, Bagamoyo, and Mkuranga. In Kisiju Pwani, one villager complained that he had a house in 1986 which was situated 50 meters from the highest water mark. Due to erosion his house was demolished in 1993. It is estimated that the beach has eroded an additional 70 meters from 1993 to 2006. The villagers said that the erosion was caused by people extracting sand that they used to fill in sacks to balance dhows, but also because the beach was exposed to strong winds and wave action during southern east monsoon. Recently, the sand mining has decreased and mangroves have grown back on the sand bank outside Kisiju Pwani – and as a consequence the erosion has slowed down.

Villagers stated that lack of proper land-use planning is a root causes behind practices that cause erosion. Poorly planned coastal developments contribute to both land-clearing and dumping of solid and liquid wastes. Clearing of forests and other vegetation for house construction, farming, and industries, such as salt making, contributes to erosion and flooding. Over time, clearing of land has removed important stabilizing vegetation and riparian buffers, altered wetlands, and increased the amounts of impervious surfaces covering the land. As a result of these activities, sediment runoff into rivers, lakes, streams, and estuaries has increased and is adversely affecting the biodiversity in a number of ways.

Conflicts between seaweed/bivalve farmers and fishers

In Mlingotini, Bagamoyo there is an ongoing conflict between seaweed farmers and fishers. Fishermen fishing in areas where seaweed is grown because they perceive the fish to be more plentiful in these areas, but at the same time, they destroy the rafts and ropes that the seaweed growers use. A similar problem exists on the Fumba Peninsula, where vessels passing over the bivalve farms during low tide have been reported to destroy the bivalve farms.

2.3.2 GENERAL INDIRECT THREATS

Poverty and lack of diversified activities

Villagers frequently mentioned poverty to be a reason why natural resources are exploited and misused. However, fishermen also stated that if they had more money, they would purchase modern gears and vessels and fish off shore.⁵ Because of poverty, they maintained, they are forced to use illegal and unsustainable fishing methods. The Coastal region, which the Bagamoyo and Mkuranga districts belong to, has the lowest Gross Domestic Product of all mainland regions. Semesi *et al*, (1998) reported that the poverty of coastal communities in Bagamoyo is due to poor farming techniques, infertile soils, expensive fishing gears, lack of credit and extension services, poor infrastructure, diseases and the presence of many vermin that destroys farm crops. In the Fumba village, lack of livelihood options for the youth has been reported to increase pressure to the marine environment.

⁵ If the income increases and the fishermen are able to invest in better gears, there is also a risk that the fishing pressure will increase. Hence, an increased income could have a negative impact on the environment. A major problem is the open access and poor enforcement control, which in turn are caused by poor institutional arrangements and management efforts.

Population increase and growing demand for fish

Bagamoyo and Mkuranga have experienced an increased demand for fish, both locally and from Dar es Salaam. A high birthrate and level of migration to the coast and cities has caused this increased demand. The tourism industry has also increased the demand for fish and shrimp as tourists often prefer seafood. Another reason that the market has expanded is that the roads to Bagamoyo and Mkuranga have improved in recent years, making it easier for fish mongers to access the fish-landing sites. In Bagamoyo, the fishermen were happy to report that the growing market had driven up the price for fish and seafood, helping them maintain a steady income, despite declining catches. However, one consequence of this is an increased pressure on the reefs by fishermen (Muhando *et al.*, 2001).

Poor institutional arrangements

Conflicting or non-functioning government management systems and overlapping jurisdictions are serious policy problems. In practice, when legislation is enacted, the responsible ministry is required to develop its own strategy for implementing the legislation through development of regulations and management mechanisms. This is done sector-by-sector and without consultation between sectors. This process requires resources and expertise. Lack of infrastructure, personnel, and funding has resulted in the non-translation of the laws into regulations and management strategies or into enforcement, which is generally very weak. Unilateral translations of the laws have in some cases developed into conflicts. Some examples are cited below:

- Salt making licenses are issued by the Commission of Minerals and land titles by the Commission of Lands.
- Local authorities continue to issue licenses for cutting mangrove poles and for construction of salt pans despite the government ban on mangrove cutting imposed in 1987. The ban was lifted in 1992 and the Mangrove Management Project now controls cutting, which is allowed only in designated zones.
- Whereas the Forestry Division has regulations that designate all mangrove forests as reserves, the Fisheries Division issues permits for the development of prawn farms and the Ministry of Industries and Trade issues permits for the extraction of salt in the same designated mangrove forest reserve areas.
- Mining laws allow for the granting of mining rights in protected areas, without consultation with the Minister responsible for land matters and/or protected areas.

Policy failures

National policies form the framework for the actions developed to satisfy the country's goals. Some policies in Tanzania have inhibited rather than facilitated economic growth and equity as was their original intention. After independence, Tanzania adapted the Socialism "Ujamaa" policy, emphasizing equality and moving people to designated villages. In the late 1980s, the Ujamaa policy was abandoned and the country adopted the Structural Adjustment Programs (SAPs). SAPs emphasize private ownership and undermine common ownership, the main form of community involvement in use, and conservation of the coastal resources in Tanzania (Semesi *et al.*, 1998).

Erosion of traditional knowledge and practices

The traditional knowledge that communities possess around the environment is important for the preservation of biodiversity. However, villagers pointed out that youth does not adhere to traditional rules and practices when they fish and this poses a threat to biodiversity conservation (as they are more likely to use illegal and unsustainable methods).

2.3.3 BAGAMOYO SPECIFIC THREATS

Tourism (hotel construction)

In Bagamoyo town, the entire beach has been divided into plots for hotel development. The Dunda and Magomeni villages, which have very small beach areas, have seen most of their beaches developed already and fishers are finding it hard to access the beach. Some hotels have been observed to discharge wastewater directly into the ocean, polluting the beach. As described above, the hotels also clear the mangroves that are standing in front of the hotels, exposing the beaches to erosion. Hotel developers are not observing the sixty-meter set back line and many of their buildings are in areas that by law are meant to be public. Hotel development is not a problem in Mkuranga since there are no coastal tourist hotels in the district. Only one tourist hotel has been reported in Fumba village and according to villagers the hotel has not caused any problems, but instead assisted with conservation programs.

Oil spills from fishing boats

Using engine boats is popular among fishers, since they are perceived as faster and safer, but occasionally they also cause oil spills. It is well documented that oil has a lethal effect on eggs and larvae, seabirds, and any many other surface dwellers (including larvae of commercially important species) through asphyxiation and poisoning effects. Oil exposure can also cause the loss of fur and feathers among mammals and birds resulting in hypothermia. Further, it can inhibit mammals and birds from eating, which can be fatal. In Bagamoyo, oil spills from fishing boats have been observed in the Dunda village.

Absence of good management and environmental education

In Bagamoyo, villages complained that people are still fishing on the established closed areas (reefs). The number of fishing vessels and their fishing methods are uncontrolled and pose major threats to the fisheries sector and welfare of the local population. Members of the environmental committees also stated that the general public is not aware of the impacts that their actions have on the environment. They also do not know how important, for example microorganisms are to the aquatic habitat and their ignorance place biodiversity at a greater risk.

2.3.4 MKURANGA SPECIFIC THREATS

Crab fishing

Crab fishing using the *mapanga* technique was reported to be common in the Mpafu village. This technique, which is regarded as very lucrative, is destructive because the

fishers dig up the mangrove roots to search for crabs, killing the mangrove trees at the same time.

Mangrove die-offs

Mpafu villagers reported a mangrove (*Avicennia marina*) die-off problem in their area. The problem started since 2005 when they began to see trees dry-up and die. The villagers did not know the cause for the dryness and die-off.

2.3.5 FUMBA SPECIFIC THREATS

Crown of thorn infestations

Crown-of-thorns (*Acanthaster planci*) is a large starfish which feeds on corals by extruding its stomach out onto the coral to digest the living tissue layer (Birkeland 1989). These predators seriously affect the coral reefs. Large numbers of crown-of-thorns have been reported in all villages surveyed in MBCA. They were also reported by Francis *et al.*, (2002) to be a medium threat to coral reefs in the Fumba area.

2.4 ANTICIPATED THREATS TO BIODIVERSITY

In the Bagamoyo district, hotel development was considered the largest anticipated threat to biodiversity. The district continues to approve licenses for hotel construction and selling land that include areas that are less than 60 meters from the highest tide mark. Solid and liquid waste is another upcoming problem as farming around rivers using artificial fertilizers and sprays is increasing and the town is yet to create a garbage dumping area. Increased demand and price of mangrove charcoal and firewood from Zanzibar and Dar es Salaam will create more incentives for people to involve in mangrove cutting. Poverty, lack of education and employment options and the increasing market demand for fish and shellfish makes it less likely that fishermen will adopt more sustainable fishing practices.

In Mkuranga, villagers maintained that the development of a harbor, a petroleum refinery plant, and industrial compound by a private company will create more threats to the biodiversity. In Fumba, villagers stated that hotel development might pose threats to biodiversity in the near future, as there are rumors that new hotels are being planned.

Another potential threat is the increased interest in fish and shrimp aquaculture in Mkuranga and other areas. If uncontrolled development occurs, it could lead to environmental and biodiversity impacts before long.

2.5 CONSERVATION PRIORITIES

During the field interviews and focus group discussions, we asked the conservation staff and villagers to prioritize the threats according their urgency, how probable it would be to address the threat successfully, and to what extent the stakeholders agreed about the severity of the threat. In Bagamoyo, trawling was reported to be the most urgent threat because the practice exhausts local fish stocks and occasionally destroys local fishing gears, followed by mangrove cutting, construction of tourist hotels, and small mesh net sizes. In Mkuranga, dynamite fishing was reported as the most urgent threat, as it is very

destructive and because the villagers felt that it is not within their power to enforce this prohibition. Other priority threats were trawling, illegal cutting of mangroves, and beach erosion. In Fumba area, crown of thorns infestations were explained as the biggest threat, because they eat and destroy seagrass and coral reefs. Other priority threats were lack of alternative livelihood activities, unsustainable octopus fishing, and seine netting.

Community members mentioned a number of specific areas, and specific activities, that conservation programs should invest in to address the priority threats:

- Provide alternative livelihood activities to coastal communities
 - Train and provide alternative livelihood activities to youth
 - Extend bivalve farming for pearl production to other villages on Fumba and Menai Bay, because now it is only done in the Bweleo village
- Implement activities to stop illegal fishing
 - Bylaws on closed areas should be implemented
 - Provide enforcement facilities and equipment (boats, radios etc.) to village environmental committees
 - Initiate a gear replacement scheme
 - Hold meetings between all fishers and district staff to discuss how to address problems
 - Educate artisanal fishermen
 - Install fences/marks on the established no take zones in Fumba and Bagamoyo
- Promote sustainable harvesting of mangroves in Bagamoyo and Mkuranga
 - Provide enforcement facilities and equipment (telephone, transport and guns) to village environmental committees
- Enforce rules to stop activities that cause beach erosion in Bagamoyo and Mkuranga
 - The government should make a follow up on the tourist hotels constructions and making frequency visits on the existing hotels to make sure that they are not cutting the mangrove that faces their hotels
 - Make sure that all tourist hotels have licenses
- Resolve conflicts between artisanal fishers and trawlers in Bagamoyo and Mkuranga
 - Trawlers should be strictly prohibited to fish in the areas used by the artisanal fishers.
 - Initiate conflict resolution between the two groups
 - Suspend trawling for a few years
- Reduce crown of thorns star fish in Fumba
 - Control crown of thorns through spaying and collection
- Control waste dumping in Bagamoyo and Mkuranga
 - Trawlers licenses should be given with strong restrictions including garbage dumping
 - Develop and implement bylaws around solid and liquid waste management from fishing boats and communities
- Take action to prevent oil spills in Bagamoyo
- Other general coastal management support
 - Frequent monitoring of ICM plans
 - Involve members of parliament in environmental management

- Selection of village environmental committee members should be done in cooperation with village elders, because they are the ones who know the real hard workers in the villages.

3. CURRENT EFFORTS TO CONSERVE BIODIVERISTY

This section describes the current efforts to conserve biodiversity at national at field site level. The section reveals that there are a number of biodiversity-conservation related projects and programs working in the field sites and that together they are tackling many of the priority threats identified by villagers, district, and conservation staff.

3.1 NATIONAL AND LOCAL POLICIES, LAWS AND INSTITUTIONAL STRUCTURES

In Tanzania there are a number of policies and laws that influence biodiversity conservation and management decisions. Legislations and policies that are relevant for conservation and management of marine and coastal resources cover sectors such as fisheries, marine parks, agriculture, forestry, industry and trade, land use planning, culture, marine transport, environment, energy and tourism.

It is important to note that the mainland and Zanzibar have separate laws and policies for dealing with the environment. Even though Zanzibar is not a sovereign state, its government manages all matters that are considered internal to the two islands of Unguja and Pemba. However, both mainland and Zanzibar are covered by the regulations stated in the Deep Sea Fishing Authority Act and they have a joint territorial sea and Exclusive Economic Zone. Table 7 and 8 summarize the main policies, legislation and plans that are relevant to the management of biodiversity on the mainland (including Bagamoyo and Mkuranga) and Zanzibar (including Fumba).

Table 7. Key policies, legislation and plans relevant to marine and coastal environment of mainland Tanzania

Mainland policies and regulations related to natural resources
Environmental Management Act of 2004
Integrated Coastal Environmental Management Strategy, 2003
National Environmental Policy, 1997
Water Policy, 1991
Water Utilization (Control and Regulation) (Amendment) No.10, 1980
National Fisheries Sector Policy and Strategy Statement, 1997
Fisheries Act of 2005
Marine Parks and Reserves Act, 1994
National Forest Policy, 1998
Forest Ordinance, 1957
National Forest Action Plan, 1990/91-2007/08
Management Plan for the Mangrove Ecosystems in Tanzania, 1991
The Territorial Sea and Exclusive Economic Zone, 1989-Union Government
Deep Sea Fishing Authority Act, 1997
Mariculture Investment Guidelines, 2001
Seaweed Development Strategy, 2006
Policies and regulations related to land use
National Land Policy, 1995

Mainland policies and regulations related to natural resources

Land Act, 1998
Village Land Act, 1998
Town and Country Planning Ordinance, 1956, Cap.378
The Town and Country (Public beaches planning area) Order, 1991
Government Notice No.76 reducing the Beach Protection Line from 200 m to 60 m, 1992
Guidelines for Coastal Tourism Development in Tanzania, 2003
Other relevant policies and regulations
National Strategy for Growth and Reduction of Poverty (Mkukuta), 2005
Merchant Shipping Act of 1967
Local Government Reform Program, 1997
Local Government (District & Urban Authorities) Acts, 1982
Regional Administration Act, 1997
District and Village By-laws
Public Health (Sewerage & Drainage)
Mining (Environmental Management & Protection) Regulation, 1999

Table 8. Key Legislations relevant to marine and coastal environment of Zanzibar

Zanzibar policies and regulations related to natural resources

The Fisheries Legislation (Revised 1988)
The Forest Reserve Decree (Cap.120) and Wood Cutting Decree (Cap.121)
The Wild Animals Protection Decree (Cap.128)
The Wild Birds Protection Decree (Cap.129)
Policies and regulations related to land use
The Land (Distribution) Decree, 1966
The Town and Country Planning Decree (Cap.85)
The Public Land Decree (Cap.93) Removal of Natural Produce Rules
The Commission of Lands and Environmental Act, 1988
Other relevant policies and regulations
The Investment Promotion Act, 1986
The Administrative Authorities Act, 1981
The Local Government Act, 1986
The Public Health Act (Cap.73)
The Dangerous Goods Act (Cap.160)
The Petroleum Act, 1980
The Mining Act, 1979

On the mainland, recent pieces of legislation and strategies that are relevant to biodiversity conservation are the Environmental Management Act (2004), the Integrated Coastal Environmental Management Strategy (2003), the Fisheries Act (2005), the Mariculture Investment Guidelines (2001), the Seaweed Development Strategy (2006), the Guidelines for Coastal Tourism Development (2003), and the National Strategy for Growth and Reduction of Poverty, which is also called the Mkukuta (2005).

The Environmental Act of 2004 provides a legal and institutional framework for sustainable management of the environment, prevention and control pollution, waste management, environmental quality standards, public participation, environmental compliance and enforcement. Furthermore, it clarifies the roles of different government

authorities (e.g. the National Environmental Management Council, the Division of Environment, and the Districts) and provides a mandate to undertake, for example, environmental impact assessments, enforcement, and monitoring. The Environmental Management Act of 2004 describes the Tanzania coastal zone subject to special controls: “no human activities of a permanent nature or which may, by their nature, likely to compromise or adversely affect conservation and, or the protection of ocean or natural lake shorelines, riverbanks, water dam or reservoir, shall be conducted within sixty meters” (Part V – 57- 1). It further establishes that the districts’ responsibilities include hiring environmental officers and developing environmental action plans.

Tanzania has embraced coastal management as a means to guide local efforts to manage coastal resources and ensure they are developed in balance with national needs. A national integrated coastal environmental management strategy (ICEMS) was adopted in 2003. The strategy’s overall goal is 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. The strategy seeks to:

- Alleviate poverty by sustaining the environmental resources that people depend on to generate income and provide food.
- Manage growth and development in urban and peri-urban areas of the coast.
- Direct development pressures to ensure economic growth for communities and the nation.
- Conserve and restore critical habitats and areas of high bio-diversity.
- Give powerful and tangible evidence of government's commitment to sustainable coastal development and serving the people of the coast.
- Support decentralisation
- Build human and institutional capacity
- Overcome fragmentation inherent in single sector management
- Bring Tanzania into compliance with regional and international accords.

The Mkukuta of 2005 also provides a framework for environmental protection. Its third operational target is to provide “access to clean, affordable and safe water, sanitation, decent shelter and a safe and sustainable environment and thereby, reduced vulnerability from environmental risk.” This includes the following targets

- Increase the proportion of rural population with access to clean and safe water from 53% in 2003 to 65% by 2009/10⁶.
- Increase the urban population with access to clean and safe water from 73% in 2003 to 90% by 2009/10.
- Increased access to improved sewerage facilities from 17% in 2003 to 30% in 2010 in respective urban areas.
- Reduce households living in slums without adequate basic essential utilities.
- 100% of schools to have adequate sanitary facilities by 2010
- 95% of people with access to basic sanitation by 2010.
- Cholera out-breaks cut by half by 2010.
- Reduced water related environmental pollution levels from 20% in 2003 to 10% in 2010
- Reduction in harmful industrial and agricultural effluents

⁶ Access to clean and safe water means spending less than 30 minutes per day collecting water.

- Planned and serviced urban settlements with functioning town planning procedures in place
- Increased number of people having secure tenure of land and properties that can be mortgaged, and women and men have equal rights to access, ownership and inheritance.
- Reduced vulnerability to environmental disasters.
- Soil, forest and aquatic ecosystems that people depend upon for production and reproduction conserved.
- Reduction in land degradation and loss of biodiversity

Protected areas in Zanzibar are considered to be an essential element in the implementation of both the National Environmental Policy (1991) and the Forest Policy. The legal framework for protected area establishment is enabled through the Environmental Management for Sustainable Development Act (1996), the Forest Resources Management Act (1996) and the Fisheries Act (1988), which provides for the establishment of MPAs. A National Protected Areas Board was established in 2002 in Zanzibar under section 80 of the Environmental Management for Sustainable Development Act to coordinate the designation and management of the national protected areas system. The functions of the Board are to: a) formulate, advise and coordinate the implementation of government policies on protected areas; b) make recommendations for designations of protected areas; c) approve management plans for protected areas; and, d) designate an appropriate lead institution to manage the protected area system.

3.2 DISTRICT LEVEL GOVERNANCE

In Tanzania, the central government has the constitutional right to establish policies and laws related to natural resource management, but local governments have also been delegated specific powers of planning, implementation, and enforcement, that differ depending on the particular resources and laws involved. Key plans developed by coastal districts are environmental action plans, coastal action plans, and development plans. One rule, however, is that any district plan and implementation action must conform to policies, legislations, and guidelines set by the central government.

Environmental management at the district level must also connect to the Local Government Reform Program, which aims at transferring the responsibility of managing local affairs, including natural resources from central government to local government authorities. The purpose is to achieve accountability by the people through their councils and improve service delivery. As a result of the reform, District Councils now control and own natural resources within their area of jurisdiction. The village councils still have the authority to create by-laws and manage village affairs, but the District Councils are the most relevant level of government for citizens as they have to approve the by-laws and other decisions to make them legally binding.

3.3 VILLAGE-LEVEL GOVERNANCE

Community based management, of for example forests and coral reefs, are becoming more and more common in Tanzania. The creation of self reliant village-based governance has been central to this process. Most of rural Tanzania is now divided into over 9,000 villages, each with its own discrete land area. Villages are able to elect their

own government, or village councils, which administers community affairs. The councils legislative powers enables them to create enforceable village by-laws on virtually any matter affecting the social or economic well-being of the community or the resources within the local village area (Alden Wily 2001). Each village has a number of committees, including environmental committees, which can prepare by-laws and present to the village council for approval.

Village environmental committees (VEC) are active partners in environmental management in the coastal villages of Bagamoyo and Mkuranga. The environmental committees in Bagamoyo and Mkuranga districts deal with ICM issues in their respective areas. They also coordinate and carry out the development and implementation of local action plans concerning the environment. The VEC is also responsible for resolving village environmentally-related disputes, implementing village-based actions and proposing by-laws to complement the implementation of environmental management plans. The committees' composition depends on issues to be addressed but all members are recruited within the village communities.

In Fumba, the Village Environmental Committees have been replaced by Village Fisheries Committees (VFC) and Village Seaweed Committees (VSC), which have the same functions as VEC. The VFCs are responsible for fisheries management and for communications between the village and the fisheries department and the Menai Bay office. The VSCs works to improve seaweed activities and improve community livelihoods.

3.4. LOCAL COASTAL AND MARINE BIODIVERSITY CONSERVATION EFFORTS

Coastal and marine protection takes a variety of forms in Tanzania. For instance, a number of marine reserves, known as the Dar es Salaam Marine Reserves System and encompassing four small islands, were designated in 1975. The Fisheries Division became authorized to manage the reserves, but no specific management and institutional mechanisms were put in place to manage them. Maziwe Island (off Pangani) and Chole Bay and Tutia Reef (Mafia Island) were designated as marine reserves in 1981. By law, the reserves are restricted no-take zones. This first generation of marine reserves was created centrally by government. No-take reserves often created a resistance within local communities who felt cut off from traditional fishing grounds and resources without compensation. Successful compliance with the no-take rules is nearly impossible without continual and stringent enforcement.

The Marine Parks and Reserves Act of 1994 provided the first guide on the establishment and the institutional mechanisms for the management of parks and reserves. **Mafia Island Marine Park** was legally established in 1996 and the **Mnazi Bay Marine Park** was gazetted in 2000. MPAs consist of relatively large, multiple use MPAs that are very much like small-scale models of integrated coastal management. The need to balance the protection of the natural resource base while maintaining the local communities' right to resources has necessitated the adoption of this management approach.

Protected areas are declared under separate legislation in Zanzibar and Pemba. The **Menai Bay Conservation Area** off the south coast of Zanzibar was established in 1997 and is one of a number of marine protected areas being operated at the local level, with local government and community involvement in park utilization and management.

Misali Island Marine Conservation Area is located 10 km off the west coast of Pemba. Misali Island was leased to a private company for hotel development in 1993, but local community and international objections led to an annulment of their permit and establishment of the island as a conservation area. **The Jozani-Chwaka Bay Conservation Area** is located 35 kilometers south east of Zanzibar town. Jozani Forest was declared a Reserve in 1960. A proposal to upgrade the status of the Jozani Forest Reserve to a National Park would expand the area from 2,500 to 5,000 hectares and extend to the Chwaka Bay mangrove system.

We can distinguish two other forms of marine protection in Tanzania. First, community-based marine protection as in Tanga, Muheza, Pangani, and Bagamoyo districts. Community-based management is based on the idea of empowering communities to care for their own resources. Rather than establishing marine protected areas through formal MPA legislation, the program has relied on a reef closure system based on community-based, collaborative fisheries management plans that are legally binding through village by-laws. A marine reserve, the Maziwi Island Marine Reserve, has been incorporated into the Ushongo fisheries management plan.

Second, in Zanzibar there are small protected areas managed by private companies with the agreement of government. They include **Chumbe Island Coral Sanctuary**, a private nature reserve that is managed by Chumbe Island Coral Park, Ltd., and **Mnemba Island Marine Reserve**, managed by Conservation Corporation Africa.

Marine Park and Reserve Unit, Government of Tanzania

Goal: To ensure sustainable conservation of Marine Protected Area resources for the benefit of present and future generations

Vision: Establishment of a well managed, integrated network of marine and fresh water protected areas, which ensure the sustainability of Tanzania's aquatic biological diversity and ecological processes for the benefit of present and future generations

Objectives:

- To protect, conserve, and restore the species and genetic diversity of living and non-living marine resources and ecosystem processes of marine and coastal areas.
- To stimulate rational development of underutilized natural resources.
To manage marine and coastal areas so as to promote sustainability of existing resource use, and the recovery of areas and resources that
- To ensure communities in the vicinity of marine parks and reserves are involved in the all process of management and share the benefit of protected areas.
- To promote community awareness on sustainable conservation of marine parks and reserves resources.
- To facilitate research and to monitor resource conditions and uses within the marine parks and reserves

3.5 BIODIVERSITY CONSERVATION EFFORTS IN THE STUDY SITES

3.5.1 THE MENAI BAY CONSERVATION AREA (MBCA)

Menai Bay Conservation Area (MBCA) is situated in the southwest of Zanzibar and covers an area of 467 km² inclusive of 6 islets, with a seaward boundary close to 61 km offshore. It is the biggest marine conservation area in Zanzibar. The government of Zanzibar officially designated Menai Bay a conservation area in August 1997. The area is extensively covered with coral reefs, sea grass beds and mangrove forest. It had remained relatively undisturbed until the early 1990s, when fishing pressure combined with destructive fishing techniques became a serious environmental concern. As a step toward regulating fishing pressure, local communities around Fumba Peninsula, with the assistance of the Commission of Natural Resources formed an informal management committee to monitor fishing activities of visiting fishermen. Members of the committee volunteered to undertake unpaid sea patrols, but ran into trouble due to lack of training in arresting procedures.

In 1994, at the invitation of the Commission of Natural Resources, WWF began to provide support to enhance management measures originally initiated by local communities of Fumba Peninsula. This was instrumental in having the area designated a conservation area. Designation of the bay as a conservation area was received with mixed feelings. Visiting fishermen, especially those from Dar es Salaam, condemned the move outright as an act intended to discriminate against them. Local communities, however, applauded the decision.

The main goal of MBCA is to conserve the natural resources of the area for sustainable use with active community participation. The objectives of the conservation area are to:

- Protect the marine ecosystem and improve resource yields through management systems that include active local community participation
- Involve local communities in planning, implementation and monitoring of the natural resources of Menai Bay
- Increase awareness of conservation through educational and public awareness programs
- Support biological and socio-economic research and monitoring to provide the basis for rational management

Menai Bay does not have any exclusion zones where fishing is not allowed, but has slightly stricter fishing regulations than other parts of Zanzibar. MBCA has increased patrolling against illegal fishing methods in collaboration with the government anti-smuggling unit. Local fishermen help to patrol their areas using hand-held radios provided by WWF, and a 7-meter fiberglass patrol boat is based in one village to respond to emergencies and incidences of illegal fishing. This patrol system has significantly reduced dynamite fishing in the area and fishermen using illegal nets are increasingly being prosecuted in court (Ngaga et al., 1999). However, some villages do not see the Menai program as useful because it has not provided alternative sources of livelihood to villages in the area that have traditionally used illegal fishing gear.

Under the supervision of village headmen and Menai Bay project staff, Village Fisheries Committees have been setup in each of the 16 participating villages. Village

representatives also participate in the overall management of the project. A number of alternative income generating projects have been supported, including bee keeping and tree farming. The program also encourages mangrove protection and replanting.

3.5.2 COLLABORATIVE FISHERIES MANAGEMENT IN BAGAMOYO AND MKURANGA

Both Bagamoyo and Mkuranga are in the process of establishing or implementing collaborative fisheries management (CFM) areas. In Bagamoyo, the CFM area was approved in 2006 and it is currently being implemented. In Mkuranga, the planning process begun in 2006, when the district held consultative meetings in the involved coastal villages to introduce and raise awareness around the concept of CFM. Five villages are involved in the CFM process: Mdimuni, Kisiju Pwani, Kerekese, Mpafu and Shungubweni. During 2006, a total of 234 villagers attended the introductory meetings.

The process of developing the CFM area in Bagamoyo began in September 2004, with a study tour to the Tanga region for villagers and district staff to learn about the collaborative fisheries management efforts in Tanga and the use of fishery no-take zones (areas closed to fishing that allow habitat recovery, build up of large numbers and size of fishes and eventually spillover of fish outside the closed area that then become available for capture to the artisanal fishery). Back in Bagamoyo a community participation process facilitated the identification of fisheries issues and concerns leading to a decision to establish a Bagamoyo CFM area.

A team of scientists and village fishermen performed a rapid ecological assessment of the proposed coral reef no-take areas to determine which were most suitable for no-take zones in the CFM area. District fisheries officers and private stakeholders (hotel owners) also participated and provided resources to support this effort. The team recorded the coral composition and health, status of commercially important fish species, and status of invertebrates. They also mapped the locations of all suggested reefs. The ecological assessment results and recommendations were discussed in meetings with village governments and fishers. After the ecological assessment meetings, village governments, along with fishers, made their final selection of CFM no-take areas. Following identification of management issues and selection of no-take areas, a workshop was held to establish management structures and bylaws for the management area and to protect the no-take zones.

The goal of the Collaborative Fisheries Management Area, which was approved by the involved villages in 2005 and by the District Council in September 2006, 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 area includes coral reefs and fishing grounds within Bagamoyo District boundaries that are in close proximity of the seven villages. The area includes more than 16 coral reefs (fringing and patch), several extensive seagrass beds, and large tracks of mangroves near the Ruvu River and Dunda. Mwamba Mshingwi, Mwamba Maduga, Mwamba Poyogo, and Mwamba Mjini have been selected as no-take zones (See Figure 1). There is approximately 47 kilometers of coastline within the management area.

Although the management area consists of fisheries areas adjacent to and utilized most frequently by the participating CFM villages, fishers from other villages and from Zanzibar also use reefs within the management area. The village governments of non-

pilot neighboring villages have been notified of the establishment of the no take areas, including their rules and penalties. However, continued awareness raising of the rules governing the no-take areas among outside fishers (e.g. from Zanzibar) is needed. Since the area was established, district staff and Central Coordination Committee members have patrolled the area and they are also involved in annual monitoring of the reefs.

The CFM areas are part of the implementation of District ICM Action Plans in both Bagamoyo and Mkuranga. Apart from the CFM, the action plan implementation also includes components such as livelihood development (e.g. beekeeping and seaweed farming) and conflict resolution between artisanal fishermen and the trawling industry.

3.5.3 OTHER EFFORTS RELATED TO BIODIVERSITY CONSERVATION IN THE STUDY AREAS

The Mangrove Management Project (MMP) is responsible for implementing a national mangrove management plan, which was approved in 1994. Through this plan, all mangroves on mainland Tanzania are protected through a national zoning scheme. The actual zoning of existing mangrove areas is still going on, but the MMP is currently active in both Mkuranga and Bagamoyo. With technical support from the MMP, the Kisiju Pwani, Mdimuni and Mpafu villages in Mkuranga have developed and are currently implementing Community Forest Management Plans.

The Marine and Coastal Environment Management Project (MACEMP) in Tanzania is a new project funded through loans and grants from the World Bank. The aim of this project, which has several project sites, including the Menai Bay, is to improve management of coastal and marine resources and contribute to economic growth and poverty reduction. MACEMP is currently supporting MBCA in implementing enforcement activities.

The Tanzania Coastal Management Partnership⁷ has been operating in Tanzania since 1997. Funded by USAID, the partnership is working at national, district, and village level, supporting the implementation of the National Integrated Coastal Environment Management Strategy (ICEMS), adopted in 2002. The strategy calls for “*implementing the national environment policy and other policies in conserving, protecting and developing Tanzania’s coast for use by present and future generations.*” Associated with the national strategy are guidelines on tourism and mariculture development, and a seaweed development strategy. These supporting policies and guidelines help set the stage for sustainable economic development, which can contribute to the government’s objectives on poverty alleviation while ensuring environmentally sustainable development.

The national ICEMS and related policies and guidelines provide an overarching framework for implementation on-the-ground, and this process has begun. District action plans are being implemented—with support of the National Environmental Management Council (NEMC) and related national agencies. The emphasis during implementation is on establishing collaborative fisheries management plans, whereby fishers play an important role in planning, management and enforcement of fisheries rules, in addition to enterprise development opportunities linked to the coast’s rich cultural heritage and

⁷ The Partnership is now primarily funded by USAID through the Sustainable Coastal Communities and Ecosystems (SUCCESS) program.

natural resources. This includes development of small-scale enterprises in tourism, mariculture and beekeeping.

Both Mkuranga and Bagamoyo have adopted **District ICM Action Plans**. The essence of local ICM action planning is to address local coastal resource use and management issues, through a combination of strategies that use co-management approaches. It empowers local communities to identify their own opportunities and obstacles, propose intervention measures, develop and implement their plans to address identified obstacles using available resources. The goal of the Bagamoyo action plan is to *“improve the livelihoods of the local communities along the coastal area through sustainable utilization of the coastal resources in the district”*. Following this goal, the plan has three objectives:

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

The overall goal with the Mkuranga action plan is *“to improve the quality of life of coastal communities, through better utilization of marine and coastal resources while maintaining the biological diversity and productivity of coastal ecosystems in the district”*.

The action plan’s three main objectives are to:

- 1 Ensure harmonious and sustainable utilization of marine resources
- 2 Control illegal cutting of mangroves
- 3 Ensure hygienic condition and attractive beach area

3.6 SUCCESS OBJECTIVES AND ACTIVITIES IN THE STUDY SITES

The Sustainable Coastal Communities and Ecosystems (SUCCESS) program has operated in the Bagamoyo and Mkuranga districts and on the Fumba peninsula since October 2004. While the SUCCESS Leader award funds are small in comparison to other donor initiatives in Tanzania, strategic interventions have the possibility for a high likelihood of adoption and replication or scaling-up by these other programs. Complementing the implementation of the district action plans in Bagamoyo and Mkuranga and the Menai Bay Conservation Area in Fumba, the program focuses on mariculture livelihood development. All sites have also initiated some sort of community-based coastal area zoning and monitoring scheme that is complemented by simple management strategies that matches the local capacity.

In all three field sites, the SUCCESS Program demonstrates how mariculture development needs to be linked to other related management issues. For instance, this includes ways to avoid use conflicts in Bagamoyo and protect wild brood stock harvests of bivalves in Zanzibar. An underlying premise to SUCCESS efforts is that concentrating on economic and livelihood development is not sufficient for sustainable development and management. Such efforts must be complemented with related resource management strategies to achieve the dual objective of improving quality of life and conserving biodiversity. Hence, SUCCESS is supporting the development of tangible benefits, through livelihood development, which helps create an interest in and demand for community based management strategies related to biodiversity conservation goals.

In the field sites, the SUCCESS program has the following objectives and strategic niches:

To implement natural resource management and conservation goals in coastal areas. Activities at SUCCESS Tanzania sites are contained in significant conservation zones or within the larger landseascape region around these zones that exhibit a high degree of bio-diversity importance. These include the Sadaani National Park, partially located in Bagamoyo district, Rufiji-Mafia-Kilwa marine ecoregion bordering the Mkuranga district, and Fumba village located within the Menai Bay Conservation Area. Hence, all of the activities contribute to larger landscape and seascape approaches for effective biodiversity conservation efforts within Tanzania.

To implement national policies. SUCCESS program is playing an important role – assisting the sites/districts to make operational both the national mariculture guidelines and the national seaweed development strategy so as to ensure that national policies are being implemented. The mariculture guidelines and seaweed strategy were developed with support of the USAID Tanzania Mission and contribute to the poverty alleviation and environmental management priorities of Tanzania.

To improve coastal livelihoods. The SUCCESS Program links directly to the USAID mission's emphasis on livelihood development. This includes providing technical and business support services to groups of mariculture farmers on culture technology and post-harvest handling as well as providing advice on micro-financing, delivering training on entrepreneurship, and offering marketing assistance. In addition, the Program is helping partners develop strategies for how to utilize pilot demonstration farms to promote adoption of finfish, seaweed farming, and bivalve culture.

3.6.1 ACCOMPLISHMENTS TO DATE

The SUCCESS accomplishments in Tanzania can be grouped into two main categories of activities: 1) promotion of mariculture as a diversified livelihood option and 2) community-based resources management and zoning initiatives.

In Fumba, Bweleo and Unguja Ukuu in the Menai Bay Conservation area in Zanzibar, the Program is assisting women shellfish farmers with improved production techniques and piloting farming of half pearls. Villagers from Bweleo, Fumba Bondeni, Fumba Chaleneni and Nyamanzi have also identified no-take areas for improved cockle management. The process was participatory and the decisions concerning closed locations, rules, penalties and management committees were made by the villagers. The Menai Bay conservation authority attended the opening orientation for the communities and is fully supportive of this effort. A draft ordinance for the no-take zones has been produced and is under discussion with the villages. The ordinances will formalize the no-take areas at the village-scale before being forwarded to the Menai Bay Conservation Authority for final endorsement and inclusion in their management plan.

In Mpafu village in Mkuranga and Changwahela village in Bagamoyo, milkfish production is being piloted. In Mlingotini, Changwahela, Pande and Kondo villages in Bagamoyo district, new seaweed farming practices are being developed and farming expanded to new beneficiaries and communities.

In all the mariculture sites, SUCCESS is supporting the development of zoning schemes and other policies to ensure that sustainable mariculture practices are followed and to show how national and district-level ICM and conservation plans and policies can be linked to and implemented at the village-scale. SUCCESS has also developed extension

manuals for half-pearl and milkfish cultivation that can be used to develop extension courses and expand the livelihoods to new areas. Economic analyses are also being conducted to evaluate the advantages of new versus traditional methods (e.g., off-bottom method versus floating seaweed farms) and to provide a comparative assessment of profitability of the mariculture systems being promoted.

In all sites, baseline records and data are collected on a continuous basis in order to monitor environmental changes. For example, on Fumba, five individuals from each village were identified to lead community monitoring efforts. These and other villagers (145 individuals, 87 female) attended training events implemented in each village on how to monitor and conduct analysis of size distribution of the cockles. After the training, these individuals then conducted a baseline assessments in the designated no-take zones, the collected areas, and control sites far from the villages—where collection is minimal.

3.7 GENERAL ACHIEVEMENTS TOWARD ADDRESSING THE IDENTIFIED PRIORITY THREATS

Together the coastal management and biodiversity conservation efforts that are active in the field sites have succeeded in, at least partially, addressing some of the priority threats identified by the communities. Villagers, district officials, and MBCA staff, relayed that the SUCCESS Tanzania, Menai Bay, and other projects, have contributed to the following successes:

- Some conflicts between resource users have been resolved or at least reduced:
 - Conflicts between trawlers and artisanal fishermen in Bagamoyo have been reduced as the trawlers have been prohibited from fishing during the hours when the artisanal fishers are most active. This has reduced the number of artisanal fishnets destroyed by trawlers. The reduction of conflict is attributed to the district ICM action plan implementation.
 - Because of conflict mediation facilitated through the SUCCESS Global Program, conflicts between artisanal fishers and seaweed farmers have been reduced in Bagamoyo and between artisanal fishers and bivalve farmers in Fumba. In both places, the conflicts arose when artisanal fishermen destroyed the aquaculture structures (rafts and corrals) by, for example, driving over them with boats.
- Because of patrolling initiated by the district mangrove cutting has been reduced in Bagamoyo and Mkuranga.
- Dynamite fishing has decreased and is now non-existent in some areas in Bagamoyo and Mkuranga. The reduction of dynamite fishing is attributed to the CFM combined with patrolling in Bagamoyo and patrolling by district staff in Mkuranga.
- Beach seine fishing has been reduced in many villages, especially in Bagamoyo. In Bagamoyo and Mkuranga, district staff has confiscated and replaced many of the small mesh size nets.
- The livelihoods of villagers in the field sites have increased somewhat due to the alternative livelihood activities initiated by the SUCCESS Tanzania (various livelihoods and micro-credit programs) and SUCCESS Global programs (Bivalve farming in Fumba, seaweed and fish farming in Bagamoyo and fish farming in Mkuranga).

- Awareness about the importance of coastal and marine biodiversity has increased among the resource users in all sites.
- In Fumba, the Menai Bay staff reported that fish harvests have increased in recent years due to the conservation program.

4. CONCLUSION

This threats assessment has showed that the coastal areas of Tanzania are endowed with a rich biodiversity in various habitats, including coral reefs, mangrove ecosystems, estuaries, and seagrass beds. Coastal villages that live within or adjacent to these ecosystems depend on their products and services for their subsistence and livelihood. Interviews showed that villagers and conservation staff perceive biodiversity to be threatened by a variety of human activities as well as management failures and natural factors, such as coral bleaching and crown-of-thorn infestations. Overall, there is a perception that Fumba is less threatened than the other areas, maybe because of the presence of the marine protected area and a general sense that it is contributing to protecting the environment. Scientific data, however, shows that the live coral cover in the area is only 12-29%, an indicator that the biodiversity threats might be larger than the communities think.

According to the literature review, coral reef degradation and over fishing seem to be the largest biodiversity threat in Fumba. In Bagamoyo, stocks of fish, shellfish, and seacucumbers seems most threatened and in Mkuranga, where the biodiversity seems to be relatively pristine (possibly because it is more remote and less densely populated than the other two sites), scientific monitoring is showing an increase in damaged coral reefs, declining fish abundance, and seagrass beds that have been damaged by trawling and continued cutting of mangroves.

The threats identified through the literature review largely correspond with the threats identified by local stakeholders. In Bagamoyo, villagers and district staff reported trawling, mangrove cutting and destructive fishing practices to be major threats. In Mkuranga destructive fishing practices, trawling, mangrove cutting, and beach erosion were seen as top priorities, whereas crown of thorn infestation and destructive fishing practices were seen as the most important threats in the Fumba area. Destruction of mangrove ecosystems through unsustainable cutting is the only issue that was identified as a priority by those living and working in Mkuranga and Bagamoyo, but did not come through as a threat in the literature review. This might be because the ecosystem monitoring that provides a basis for the literature reviews was based on remote sensing images, which might show a complete mangrove cover, but fail to show how the mangroves have been degraded (e.g. that there are only secondary growth left or that there are many small pockets of clear cutting).

When asked to prioritize the threats, the villagers mentioned that the first priority is conflicts between artisanal fishers and trawlers in Bagamoyo, destructive fishing practices, especially dynamite fishing, in Mkuranga, and crown-of-thorn infestations in Fumba. The allocation and sales of prime beach properties to hoteliers and other investors (increasing the risk of mangrove cutting, beach erosion, and pollution) is seen as a major future threat in all sites, but especially in Bagamoyo.

There are several relatively large conservation and coastal management efforts under way in the field sites, including the SUCCESS Tanzania program, which facilitates

district action planning and establishment of CFM areas in Bagamoyo and Mkuranga, the Menai Bay Conservation Area, MACEMP, the Mangrove Management Project etc. Together, these projects address many of the priority threats and the assessment has shown that progress is being made towards solving some of the existing problems.

Because of these large efforts and their foci, the SUCCESS Program does not necessarily have to address the more extensive priority threats (for which the Program's budget might be too small anyway), such as destructive fishing. Instead, it is important that SUCCESS' investments are strategic and complement those undertaken by the larger efforts. When SUCCESS began, it concentrated primarily on mariculture development, but as these activities matured, the Program has adopted more conservation related elements, such as establishing no-take areas and initiating monitoring programs (i.e. water quality monitoring in Bagamoyo and Mkuranga and cockle abundance on Fumba) that can help us understand the conservation impacts of the Program. It would, however, be possible for SUCCESS to undertake activities that address additional priority threats. One idea, for example, would be to initiate a crown-of-thorns clean up on the Fumba Peninsula.

The SUCCESS Program has invested in small pilot activities in biologically significant priority areas within the Eastern Africa Marine Eco-region and the goal is to have a positive impact on the local communities and ecosystems. The targeted investments are leading to tangible on-the-ground results and it seems likely that the program will reach its biodiversity conservation and poverty reduction targets. However, the Program also has a global objective. By choosing activities that are replicable and applicable elsewhere, piloting similar activities in Nicaragua and Ecuador, and use the field experiences as case studies in regional trainings and networks, the SUCCESS Program has the potential to learn across sites and make a difference far beyond the site level.

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APPENDIX A. BIODIVERSITY THREATS ASSESSMENT INTERVIEW GUIDE

People interviewed:

District/Park

1. District NRM officer
2. District fisheries officer
3. District ICM facilitator (If different from NRM)
4. MPA staff (working in the site – Fumba)
5. Representatives from other ICM/NRM projects that are active in the site

Village

6. Members of village environmental committee
7. Members of CCC (Bagamoyo)
8. Members of bivalve zoning group (Fumba)
9. Representatives from microenterprise groups (e.g. seaweed farmers in Bagamoyo, beekeepers in Kisiju Pwani)
10. Other key groups in village, if deemed necessary (e.g. fishermen and women's group)

Interview questions

Biodiversity threats (for all interviewees)

1. What are the direct threats to biodiversity in this area?
2. What are the root-causes to these threats?
3. Do you anticipate any additional threats in the near future?
4. Why are these threats on the rise?
5. Prioritize the threats to biodiversity for the site, considering the following factors:
 - urgency of addressing the threat
 - probability of success in mitigating the threat
 - area affected by the threat
 - feasibility of addressing the threat (e.g. culturally, politically, economically)
 - level of agreement among the stakeholders about the threat.
6. What needs to be done to address the priority threats?
7. Can these actions be addressed by current conservation efforts?
8. How should current SUCCESS activities be revised to better address the priority threats?

Current biodiversity conservation efforts (mainly district/conservation staff)

9. Who are the key players in biodiversity conservation in the site?
10. If there are other efforts in the site (apart from SUCCESS), what do they do?
11. Are there any village by-laws or district/site based plans for conservation.
12. If so, who is responsible for implementation and monitoring?