Protection of Marine Areas in Kenya

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The need for marine protected areas

Kenya has a rich diversity of marine and coastal ecosystems. These ecosystems include mangrove wetlands, coastal forests, estuaries, sandy beaches and sand dunes, coral reefs, and seagrass beds that support a host of marine and coastal species. The ecosystems constitute an important life-support system for local communities. They supply vital resources that support livelihoods and economic development. Additionally, these ecosystems maintain the health of marine and coastal landscapes and seascapes at large.

The Kenyan coast is also endowed with a rich history of social and cultural interactions and traditions that span the entire shoreline. Notable amongst these traditions are the social, cultural, and economic opportunities that have been provided to the Kenyan coastal population through the use of the marine and coastal ecosystems for food, trade, recreation, and transport (Government of Kenya 2011). It is reported that trade in mangrove poles surpassed tourism and agriculture in foreign earnings in colonial times. To this day, opportunities for employment, tourism, and recreation provided by the marine and coastal environment and its resources, continue to make considerable contribution to the Kenyan economy. It estimated that more than 60% of tourists visiting Kenya must pass through the coast.

However, immense pressure has been exerted on Kenya's marine resources by the ever-increasing human population and demand for natural resources. Consequently, Kenya's marine environment, ecosystems, and associated resources have shown signs of degradation due to over-exploitation as a result of unregulated use. Recognizing the value of its coastal and marine resources and the imminent threats, Kenya adapted the use of marine protected areas (MPAs) as one of the management strategies to ensure marine ecosystems remain ecologically and economically viable.

MPAs are defined as "any area of intertidal or subtidal terrain, together with its overlaying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment" (Dudley 2009).

Kenya is signatory to several international conventions and protocols that advocate the implementation of MPAs as a tool for biodiversity conservation and regulation of fisheries. Some of these conventions include the Convention on Biological Diversity (CBD) and the United Nations Law of the Sea, and Chapter 17 of Agenda 21. The Jakarta Mandate (1995), which outlines the program of action for marine and coastal biodiversity within the CBD,

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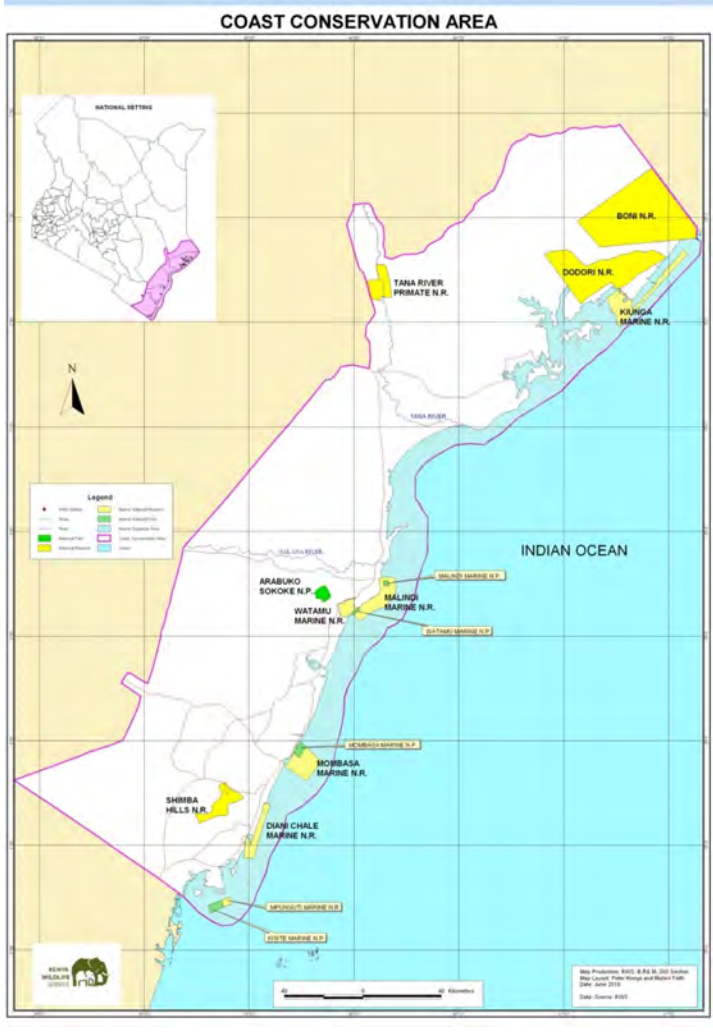
identifies the establishment of MPAs as one of the five thematic areas for implementation of the convention. MPAs are also meant to promote the implementation of an ecologically representative, effectively managed network of protected areas. Kenya made a commitment to work towards meeting the international target of establishing representative and effectively managed MPA networks by 2012 (IUCN 2003). The country has already established a fairly unified network of MPAs, under the management of Kenya Wildlife Service (KWS; Figure 1). All the existing MPAs were established between 1968 and 1993, and protect ecosystems, habitats, and fauna and flora that transcend international borders. International conventions, treaties, and agreements are used to guide regional conservation efforts. These include the CBD, Convention on Climate Change (CCC), Convention on Migratory Species (CMS), Convention on International Trade in Endangered Species (CITES), and the Nairobi Convention.

Figure 1. Kenya's marine protected areas network.



History of MPAs in Kenya and institutional arrangements for management

The first MPA in Kenya, Malindi/Watamu Marine National Park and Reserve, was established in 1968. To date, five more MPAs have been established covering a total area of 1,139 km² (Figure 1). Three of these have been protected from all forms of fishing since the period 1968–1972 (Malindi, Watamu, and Kisite national parks). Mombasa Marine National Park is the most recent MPA, effectively protected since 1991. (The Diani–Chale Marine National Reserve was gazetted in 1994, but there is no official active management.) This is mainly the result of opposition by local communities, although efforts are underway to solicit support from them. Two main categories of protection are defined for MPAs in Kenya:

- Marine national park: Total protection from any type of consumptive utilization. Research and recreation (tourism) are the only uses allowed, for a fee.
- Marine national reserve: Traditional harvesting of resources is allowed as well as research and tourism.

In most cases, a marine park is surrounded by or contiguous to a marine reserve which acts as a buffer. All MPAs have management plans produced by KWS in collaboration with key stakeholders, including government institutions, local communities, nongovernmental organizations (NGOs), the private sector, community-based organizations (CBOs), and interested individuals.

Kenya's MPAs fall under two IUCN categories (IUCN 1994) which incorporate a range of types of management areas or zones. These include no-take areas (parks), multiple-use areas (reserves) and biosphere reserves (Table 1). Kenya's MPAs were established to protect and conserve the marine and coastal biodiversity and related ecotones for posterity in order to enhance regeneration and ecological balance of coral reefs, seagrass beds, sand dunes and beaches, and mangroves. Additionally, they are established to promote sustainable development, scientific research, education, recreation, and any other resource utilization. The goals include:

Table 1. Kenya's marine protected areas.

MPA	DESIGNATION	SIZE (km²)	IUCN CATEGORY	YEAR ESTABLISHED
Kiunga	MR &MaBR	600	VI	1980
Malindi Marine Park	NP &MaBR	6.3	II	1968
Watamu Marine Park	NP &MaBR	32	II	1968
Malindi&Watamu	MR &MaBR	177	VI	1968
Mombasa	NP	10	II	1986
Mombasa Marine Reserve	NR	200	VI	1986
Diani	NR	75	VI	1993
Kisite	NP	28	II	1978
Mpunguti	NR	11	VI	1978

MR – Marine Reserve, MP- Marine Park, MaBR – Man and Biosphere Reserve, NR – National Reserve

- Preservation and conservation of marine biodiversity for poverty alleviation;
- Provision of ecologically sustainable use of the marine resources for cultural and economic benefits; and
- Promotion of applied research for educational awareness programs, community participation, and capacity-building.

Issues addressed by MPAs in Kenya

Conservation of reef systems and fisheries. An important function of MPAs is to mainly enhance marine biodiversity, and in particular enhance sustainable fisheries associated with the coral reef ecosystem. MPAs have mainly protected the "fragile benthic habitat-forming organisms" from the direct physical impacts of fishing. This has subsequently improved the habitat quality within the MPA, enhancing overall coral reef ecosystem structure and function (Rodwell et al. 2003). There are indications that the degradation of reef ecosystems—and in particular fisheries—has been checked or at least reduced along those stretches of coast where MPAs have been established (FAO 2001). Monitoring in Kenya's MPAs has shown that protection from resource use has significantly changed the ecology of coral reefs. MPAs have improved coral reef habitat quality over the years with active management (Rodwell et al. 2003). A good example is the case of Mombasa Marine Park, which was established in 1986. The coral cover and fish biomass increased significantly in the first 10 years of its establishment (McClanahan and Kaunda-Arara 1996; Rodwell et al. 2003).

The improved coral reef ecosystem has provided an important breeding ground for fish. This has generally improved fisheries, mainly through enhanced fish biomass and a "spillover phenomenon" associated with the movement of fish assemblages from the marine park into the reserve, enhancing adjacent artisanal fisheries. The role of MPAs in enhancing fisheries, through the emigration or spillover of exploitable fishes, has been studied in all Kenya's MPAs. These studies have found evidence of spillover from the park boundaries, mainly associated with better fisheries management (McClanahan and Mangi 2000).

Tourism and livelihoods. All MPAs in Kenya serve as important tourist attractions. Many dive operators in Kenya conduct most of their business within MPAs. The total number of visitors in Kenyan MPAs has been ranging from 70,000 to 160,000 visitors annually from 1997 to 2010. The revenues generated from MPAs entry fees are above US$1.5 million annually (KWS, unpublished reports). The MPAs support close to 2,000 local boat operators who conduct marine park tours and excursions.

A recent study estimated the value of goods and services within the Watamu Marine Park and Reserve at over US$135,000 per hectare per year. The figure excludes the value of fuelwood, timber, carbon sequestration, and coastal protection.

This study and numerous others generally substantiate a high degree of dependence on marine ecosystems by local communities. A majority of the communities rely on fishing or fishery-related activities. Of all the estimates, tourism has the highest value, being a major income earner probably in all MPAs. This highlights the importance of integrating protected areas into wider landscapes, seascapes, and sectoral plans and strategies. This also demonstrates that MPAs are important national economic assets.

Threats to MPAS in Kenya

There are numerous resource management and environmental challenges facing MPAs in Kenya. The main concerns are the loss of biodiversity through habitat degradation, overexploitation, and development. Human-related pressures come from overfishing and fisheries-related damage, urbanization, tourism development, agriculture, and industrialization. The impacts of climate change, including temperature increases, irregular precipitation, sea level rise, and ocean acidification also pose great challenges to the health, structure, and function of these ecosystems. These challenges have contributed to coral bleaching and the sporadic infestation of coral reefs by the invasive crown-of-thorns starfish. Additionally, enhanced precipitation events have greatly increased siltation, which in turn has resulted in diebacks of mangroves.

The high poverty levels of coastal communities, coupled with their dependence on natural resources and high population growth rates, have generally resulted in the overexploitation of natural resources. The growing coastal populations, rising global demand for fisheries products, and introduction of new technologies are creating increasingly severe threats to many coral reef and mangrove ecosystems. The loss of mangrove cover due to overharvesting of mangrove wood for domestic fuel has also greatly reduced breeding habitats for a diverse array of species. These increased pressures result in diminishing fish stocks, and declines in catches per unit effort. In all the MPAs increased fishing intensity has reduced the number of sea urchin predators, allowing the population of sea urchins to increase. In turn, sea urchins scrape the corals, reducing their diversity and complexity (McClanahan et al. 1994). Overfishing has altered reef ecology, delaying the effects on coral and reef recovery.

Climate change effects are also increasingly impacting on the coral reef systems. Coral reefs along the entire coast of Kenya suffered widespread bleaching and mortality during the first half of 1998 (Wilkinson et al. 1998; Obura 1999; McClanahan et al. 1999, 2005). Land use changes in adjacent watersheds contribute to the problem of sedimentation in coral reefs. Sediment loads change the nutrient balances of shallow coastal waters and can kill corals directly through smothering (McClanahan and Obura 1997). Other key sources of land-based pollution that threaten reefs include urban runoff, industrial discharges, drainage schemes, and coastal developments. Ships further threaten coral reef areas through ballast discharges, oil spills, and sewage.

Management measures

Monitoring climate impacts. Kenya has expansive reef coverage, with over 250 species of corals identified. Coral bleaching is caused by unusually warm sea waters, making it a phenomenon outside the direct control of MPA management. KWS has partnered with marine scientists in the region to monitor coral bleaching, mortality, and effects on the benthic structure. Coral bleaching impacts are monitored by use of sea temperature maps generated from satellite sea-surface temperature data. These maps help the managers understand the level of temperature stress on the corals. In order to get more accurate local information, KWS is establishing a network of temperature loggers throughout the MPAs. Most of these are downloaded about once per year and provide a historical picture of sea temperatures. Surveys of

corals through rapid assessments (Obura et al. 1998) and line transects (Obura 1995) are also used to monitor the effects of bleaching on the benthic community. Given that bleaching events are predicted to increase in intensity and number (Hoegh-Guldberg1999) it is crucial that MPAs develop mechanisms that minimize the potential impacts of future El Niño–Southern Oscillation (ENSO) events.

Improving management, including training MPA managers. The availability of skilled personnel is fundamental to the successful management of MPAs. To enhance the skills of its managers, KWS has encouraged the capacity-building of its MPA staff through various regional trainings. The Western Indian Ocean Marine Science Association (WIOMSA) has been in the fore at advancing opportunities for training of MPA managers in the Western Indian Ocean region. There are also certification programs developed for MPA practitioners at different levels. WIOMSA and the Coastal Resources Center (CRC) at the University of Rhode Island (USA), in collaboration with other regional partners, initiated the development of a certification program, known by the acronym WIO-COMPAS, for marine protected area professionals in the Western Indian Ocean region . WIO-COMPAS assesses and certifies MPA professionals in the region based on recognized standards of excellence, and, in doing so, maps out a career path for MPA management professionals. Attainment of the various levels of competence within the WIO-COMPAS program provides a skills audit that allows MPA management staff to "move up through the ranks" and at the same time allows them to better market themselves in their chosen career.

Adaptive resource management. KWS uses the adaptive management strategy to manage its marine resources. The strategy involves setting clear and measurable objectives to assess the success of management efforts. Biological parameters and human use patterns in parks are monitored to determine if objectives are being met. The key feature of adaptive management is strong feedback between monitoring (data) and decision-making in a process of "learning by doing."

Management effectiveness monitoring. Kenya has been conducting assessments of management effectiveness of its MPAs. The assessments have helped in revealing serious gaps in MPA management, ranging from problems with threats such as poaching and pollution, infrastructural gaps in management planning, and staffing (Nyawira 2009). The overall objective of the assessments is to identify trends and issues that need to be addressed for improving management effectiveness of MPAs in Kenya. These results are used in improving management (adaptive management), for accountability, in audits for prioritization and resource allocation, and to support budget submissions to government requesting increased allocations.

Species recovery action plans

To address the decline of marine turtle populations, KWS and the Fisheries Department have established a national task force to advise on, among other issues, the development and implementation of a national conservation and management strategy for sea turtles. The main tools for implementing this strategy include advocacy, communication, education, public awareness, targeted research and monitoring, and threat mitigation. Ultimately, the wider participation of local communities and other stakeholders, including scientists, government,

and nongovernmental institutions, is to be realized. The strategy builds on ongoing efforts and initiates changes that will add value to sea turtle conservation efforts. The strategy is also aligned to international and regional conservation conventions and agreements. KWS and key partners have now embarked on the development of the coral reef recovery strategy.

ICZM and state of the coast assessments

Kenya's MPAs are affected by activities outside their boundaries, including industrialization, agriculture and forestry, aquaculture, infrastructure development, and urbanization. These activities may have as great an impact on the MPA as those taking place within its boundaries. The tight connections between MPAs and adjacent land and water, through currents, migratory species, larval dispersal, nutrient exchange, and other processes, require that MPAs are incorporated within an overall coastal management regime for the country. Kenya's MPAs are essential components of an integrated coastal zone management (ICZM) program because they protect biodiversity and ecological processes on which human use of the coastal zone depends. Thus they are a major contributor to sustainable development and have tremendous economic benefit. The management of MPAs is coordinated and integrated with management activities outside the boundaries and linked to development programs that address the needs of local people. Kenya's MPAs are multiple-use areas that allow for different uses of marine and coastal resources, and the involvement of large numbers of stakeholders in the management process. They therefore help catalyze the development of an ICZM program in the area (Government of Kenya 2011).

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