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The Eastern African Marine Ecoregion

*Towards the Establishment of an Ecologically
Representative Network of Marine
Protected Areas in Kenya, Tanzania
and Mozambique*

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ACRONYMS

AIG	Alternative income generating activities
AMCEN	African Ministerial Conference on the Environment
APAI	African Protected Areas Initiative
CBD	Convention on Biological Diversity
CCA	Conservation Corporation Africa
CRCP	Coral Reef Conservation Project
(DCCFF)	Department of Commercial Crops, Fruits and Forestry, Zanzibar
DNAC	National Directorate for Conservation Areas
DNFFB	National Directorate of Forestry & Wildlife
EAC	East African Community
EAME	East African Marine Ecoregion
EEZ	Exclusive Economic Zone
GEMPA	Group of Experts in MPAs
IBA	Important Bird Areas
ICM	Integrated coastal management
ICRI	International Coral Reef Initiative
IDPPE	Institute for Development of Small scale Fisheries, Mozambique
IIP	National Fisheries Research Institute, Mozambique
IMS	Institute of Marine Science, Zanzibar
IUCN	International Union for the Conservation of Nature
KEMFRI	Kenya Marine Fisheries Research Institute
KICAMP	Kinondoni Conservation Area Management Programme
KWS	Kenya Wildlife Service
MACEMP	Marine & Coastal Environmental Management Project
MANREC	Ministry of Agriculture, Natural Resources, Environment & Co-operatives, Zanzibar
MBREMP	Mnazi Bay-Ruvuma Estuary Marine Park
MICOA	Ministry for Coordination of Environmental Affairs, Mozambique
MIMP	Mafia Island Marine Park
MPA	Marine protected area
MNP	Marine National Park
MNR	Marine National Reserve
MNRT	Ministry of Natural Resources & Tourism, Tanzania
MP	Marine Park
MPRU	Marine Parks & Reserves Unit
MR	Marine Reserve
NEMA	National Environment Management Authority
NEMC	National Environment Management Council
NEPAD	New Partnership for African Development
NMK	National Museums of Kenya
TCMP	Tanzania Coastal Management Partnership
TCZCDP	Tanzania Coastal Zone Conservation & Development Programme
UEM	University of Eduardo Mondlane
URT	United Republic of Tanzania
WIOMSA	Western Indian Ocean Marine Science Association
WSSD	World Summit on Sustainable Development
WPC	World Parks Congress
WWF	World Wide Fund for Nature

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EXECUTIVE SUMMARY

This publication concerns the marine protected areas (MPAs) of three countries of the Eastern African Marine Ecoregion (EAME): Kenya, Tanzania and Mozambique.

In all three countries, a large proportion of the rapidly increasing coastal population depends on marine resources for their food and income, inshore fisheries are over-exploited and degradation of marine and coastal ecosystems is escalating. MPAs are increasingly recognised as a tool for addressing these problems. In Kenya, Tanzania and Mozambique there are 23 MPAs plus a further two areas (Tanga Collaborative Fishery Management Areas in Tanzania and Vilanculos Coastal Wildlife Sanctuary in Mozambique) that are included in this report as they are managed areas, ranging in size from small sanctuary areas of less than 1 km², to large zoned multiple-use areas of over 1,500 km². Management arrangements also vary greatly, ranging from the government run system in Kenya to MPAs in Tanzania that are essentially community managed, and others in Tanzania and Mozambique that are managed either by, or in collaboration with, the private sector. There is also one Ramsar site, and two of the MPAs in Kenya are designated as Biosphere Reserves in addition to their national designation.

Individual protected areas are unlikely to be fully successful and the need for networks is now generally recognised. Kenya, Tanzania and Mozambique have committed themselves under regional and international treaties to establishing protected area networks and have set ambitious targets for achieving these. Tanzania, for example, has committed to increasing protection of its seas to 10% by 2012, and 20% by 2025.

The aims of this publication are to:

- Provide guidance on how scientifically-based representative networks of MPAs can be established and the benefits to be gained from this approach.
- Generate a focus on the commitments made at the World Summit on Sustainable Development (WSSD), and the obligations required under international and regional treaties relating to MPAs.

- Review the status of the small but growing network of MPAs in each of the three countries.
- Assess the effectiveness of existing MPAs in protecting marine biodiversity and contributing to sustainable livelihoods.
- Identify gaps in the network at the level of the EAME and the actions needed to complete it.
- Identify areas where international support (from donors and technical agencies) is most urgently required to help these countries meet their targets and obligations.

Sections 1-4 provide a general overview and summary of existing MPAs in relation to how well they contribute to a regional MPA network, and gives recommendations for its future development.

Section 5 provides a more detailed description of progress made in establishing and managing MPAs for each of the three countries, with recommendations for expansion and strengthening of these national networks.

Extent of biodiversity protection

The report reviews the current extent of biodiversity protection by existing MPAs in terms of biogeographical, habitat and species representation. Unlike the terrestrial environment, there is still no generally accepted global biogeographical classification for the marine environment, although there are a number of categorisations. WWF's system of marine ecoregions is one of these and includes the EAME.

Within the EAME four biogeographically representative subregions have been identified:

- The **Monsoon Coast** in northern Kenya is the smallest subregion and has one MPA (Kiunga MNR), covering only 0.5% of the subregion.
- The **Coral Coast**, extending from Kenya down to Mozambique, is the second largest subregion and has the greatest number of MPAs (20), and also the greatest protection (2.2%).

- The **Swamp Coast** in Mozambique has one protected subtidal habitat (Marromeu Game Reserve) which is included in the Marromeu Complex Ramsar site.
- The **Parabolic Dune Coast**, also in Mozambique, is the largest subregion as the 2,000m depth contour, used to define the seaward boundary of the EAME, extends over 80km from the coast; it has 3 MPAs with subtidal habitat and a coastal Game Reserve (Pomene), covering 0.9% of the subregion.

In terms of habitat representation, coral reefs are well represented, occurring in most MPAs. Coral diversity was one criterion in the selection of EAME priority seascapes, and the fact that many seascapes include MPAs suggests that the reefs with the highest biodiversity may be relatively well represented in the existing network. Mangroves are also found in many MPAs, but there are nevertheless some outstanding gaps, such as the Tana River Delta in Kenya, which is unprotected. There are insufficient data to determine whether seagrass beds and other marine and coastal habitats are adequately represented within the current MPAs.

Lack of comprehensive data also prevents an effective assessment of species representation within the existing MPA network. All known remaining populations of the dugong, one of the most endangered species in the region, occur to a certain extent within MPAs. The current MPAs protect a large number of turtle nesting beaches, although some key sites are unprotected. There are 20 coastal/marine Important Bird Areas (IBAs) in the three countries: 4 of the 5 Mozambican IBAs receive partial or full protection within MPAs; 3 of the 5 Kenyan IBAs lie within MPAs; and all except one of the 10 Tanzanian IBAs are within, or are partially protected, by existing MPAs, or are in areas shortly to be designated. Thus of the 20 coastal IBAs in the EAME, 80% are in MPAs or receive some form of protection. Insufficient information is available on the distribution of dolphins, whales, fish and invertebrates to assess how well species and populations are represented in existing MPAs.

Given the lack of data at the level of individual species, a more useful approach (as used in WWF's ecoregion assessment) is to look at sites of high overall biodiversity. Within EAME, a total of 21 key biodiversity sites (or seascapes) have been identified. 18 of these lie in Kenya, Tanzania and Mozambique. These have been assigned the categories 'globally'

(G), 'ecoregionally' (ER) or 'subregionally' (SR) important. Kenya has 3 seascapes, Tanzania 5, and Mozambique 8. 2 sites are transboundary: one straddling the Kenya–Tanzania border; the other the Tanzania–Mozambique border. All of the 7 globally important seascapes have MPAs. Of the 7 ecoregionally important seascapes, 3 (40%) have MPAs. None of the 4 subregionally (SR) important sites, has an MPA. Only three MPAs (Mombasa MNP/MNR and Diani MNR in Kenya; and Dar es Salaam MR System in Tanzania) and one coastal Game Reserve (Pomene in Mozambique) lie outside EAME priority areas.

Thus, although it is often stated that protected areas have been created in the past on an ad hoc basis, this analysis shows a good correspondence between the existing MPAs and priority areas for biodiversity conservation. This does not mean that there are enough MPAs in the three countries, or that they are large enough to ensure adequate representation, but it does indicate that existing MPAs form a sound baseline for the development of a regional network.

Area of MPAs

At the World Parks Congress held in 2003, it was recommended that networks should be extensive and include strictly protected areas amounting to 20-30% of each habitat. At present, a relatively small proportion of each seascape is protected: an average of 12% for globally important areas; 1.6% for ecoregionally important areas; and 0.3% for subregionally important areas. The seascapes with greatest MPA coverage are Mida Creek-Malindi in Kenya, Mtwara-Quirimbas bordering Tanzania and Mozambique, and Bazaruto Archipelago in Mozambique.

Using the continental shelf to a depth of 200m as the area of analysis, current MPA coverage (of all types of MPAs – not just no-take areas) is 8.7% in Kenya, 7.8% in Tanzania and 4.4 % in Mozambique. In the EAME, the earliest designated MPAs tended to be small (often less than 10 km²) and focused on individual species or habitats. Some of these, including core zones in multiple use MPAs, could form the basis of a network of no-take areas. Local networks of no-take areas are being set up in Tanzania, within the Tanga collaborative fishery management areas (1.5 % of the whole area is closed; and for each management area with a closed reef, the amount closed varies between 0.5 and 3.0%, with an average of 1.9%). In Mafia Island

Marine Park (MIMP), also in Tanzania, 1.3 % of the total area is closed. There is no information on how much of each habitat type is protected in no-take areas, but most of these areas are on coral reefs. Making the assumption that no-take areas are entirely coral reef habitat, an estimated 8.6 % of reefs in Kenya and 1.8% in Tanzania are fully protected; this is progress but a long way from the proposed 20-30% closures.

Achievement of MPA objectives – how successful have existing MPAs been?

Very few MPAs in Kenya, Tanzania and Mozambique have the necessary baseline information or sufficiently long datasets to show improvements in biodiversity health that can be attributed to management. Kenya probably has the best monitoring programmes and some of the longest established MPAs, but even so there are few conclusive results.

For coral reefs, the impact of MPAs is difficult to judge because of the coral-bleaching event of 1998 associated with El Niño, which caused widespread coral mortality. Reefs both inside and outside MPAs were affected. In Kenya, reefs within MPAs suffered greatest damage as these had the more vulnerable coral communities, with species that were less tolerant to stress. There are some indications that reefs within MPAs recovered faster than those outside. The key factors determining reef health seem to be coral bleaching, and in some areas (e.g. Tanzania) the use of destructive fishing gears, rather than the existence of MPAs *per se*.

In all three countries, mangroves are subject to specific controls on cutting. Tanzania probably has the most comprehensive mangrove protection programme, and a recent survey has found that the arial cover of mangroves has remained relatively constant over the last 10 years, although there has been a decline in quality. This may however reflect more on the implementation of the Mangrove Management Programme, than of MPAs. All mangroves are gazetted as Forest Reserves, in which cutting is allowed in all except one type of zone. For Kenya and Mozambique, there are no data to assess the extent to which MPAs have contributed to mangrove conservation.

There are some indications that the MPAs may be having a positive impact on fish populations, at least within closed areas. For example; the no-take MPAs of Chumbe (Zanzibar) and Kisite (Kenya) have larger fish

and a higher diversity of fish species, sometime 3.5 times more biomass, than fished reefs off Dar es Salaam and in Tanga region. The abundance of economically important fish such as triggerfish, surgeonfish and parrotfish is higher in no-take than in fished areas. Populations of the heavily overfished triggerfish *Balistapus undulates* have partially recovered over a period of 5-10 years in no-take areas at Malindi, Watamu, Mombasa, Kisite and Chumbe.

At many of the MPAs in Kenya, Tanzania and Mozambique, fishermen report that fish catches immediately outside closed areas are greater, although monitoring has not shown statistically significant changes. It is often difficult to separate the impact of closed areas from improvements due to overall better fisheries management, such as reduction in the use of dynamite and other damaging fishing methods. In Kenya, catches initially increased following enforcement of Mombasa Marine National Park but total fish catch was still about 30% lower than before the MPA was set up. There are similar reports from Menai Bay in Zanzibar where there is no closed area, but where there is effective enforcement of fishing gear restrictions.

The success of an MPA may be affected by the extent to which fishermen are displaced, lose their livelihoods, or find their catch reduced. In Kenya, Tanzania and Mozambique, where fishing is often the occupation of 'last resort' for people with no land or employment, the imposition of closed areas may result in conflict and/or increased fishing pressure outside the MPA. Nevertheless, no-take areas should be included in any MPA network, not least because they will help to make the catch outside the area more diverse, more sustainable and less vulnerable to collapse, and will help to maintain or slow declines in fish catches.

There is some evidence, although poorly quantified, to suggest that MPAs can generate greater income from tourism than from the fisheries that they displace (in the case of no-take areas) or reduce (in the case of areas where fishing is allowed but in a more regulated fashion). Communities living adjacent to MPAs in Kenya benefit from a range of tourism-related employment opportunities. In Mozambique, an estimated 25% of local communities benefit from the tourism generated by Bazaruto Archipelago Marine Park. Similar schemes are in place or being established at the community-managed

and privately operated MPAs on Zanzibar, and are planned for the government sites on the mainland. Such mechanisms tend to take time to develop and negotiate, but if a successful arrangement can be set up, local communities should be able to benefit significantly from MPA-generated tourism.

Donor support and technical assistance for MPAs often includes the introduction of livelihood activities aimed at both benefiting local communities and taking pressure off marine resources. In Kenya, women's groups have benefited from such MPA-related support, and fishermen affected by the existence of some MPAs have received assistance such as obtaining tenure over or improving access to their landing sites. Such assistance might not have come about if the adjacent areas had not been designated MPAs. In Tanzania, community development has become a central feature of the management of many of the MPAs, with special funds being established using revenue from the MPA, and a range of supplementary income generating activities being set up in adjacent local communities. A review of this experience would be useful to develop a better understanding of the extent to which livelihoods have improved and the extent to which the existence of the MPA has contributed.

Recommendations

There are two fundamental requirements for improving the network of MPAs in the EAME:

- Ensuring sustainable and effective management of the existing MPAs.
- Expanding the network by creating new MPAs.

1. Improving management at existing sites

This analysis has shown that existing MPAs are already playing an important role in biodiversity protection and sustainable development. However, there is insufficient capacity and financial support to ensure that MPAs meet their objectives. In order to ensure that existing MPAs are successful, it will be essential to increase and maintain this support, particularly since growing interest in establishing new protected areas risks reducing support to existing sites.

Key areas requiring strengthening and support include:

- Improving partnerships for management.
- Improving legislation and strengthening

mechanisms for its enforcement.

- Ensuring that MPAs are linked into wider integrated coastal management (ICM) and fisheries management programmes.
- Assessing management effectiveness as a regular procedure, and strengthening monitoring programmes.
- Improving the funding base.
- Training and capacity building.

2. Expanding the MPA network

All three countries are now taking active steps towards establishing national networks of MPAs, but as yet there is no co-ordinated approach to developing a regional network. A systems plan is a recommended first step in developing a network or system for a country, and perhaps should be considered for the EAME, recognising that the priorities in each country will be to develop national MPA networks. Key steps in a regional MPA network plan might be:

- Developing a baseline by gathering and synthesising existing knowledge.
- Defining goals and objectives for a regional network, and the level or scale at which it is being determined.
- Developing criteria for site selection.
- Identifying sites and biodiversity components in need of protection.
- Identifying the most suitable management arrangements within each country.
- Identifying options for a co-ordination mechanism.
- Developing an agreed approach on the relationship between MPAs and other forms of economic development, such as tourism, industry and port development, and setting MPAs more clearly within a framework of ICM.

The following are considered to be the priority recommendations at site level:

Kenya

- Kiunga-Lamu (G): increase size of Kiunga MNR; find an appropriate mechanism for protection of Ras Tenewi and adjacent waters.
- Tana River Delta (ER): explore mechanisms for protection, e.g. coastal wetlands reserve / Ramsar site; protect turtle nesting beach at Kipini.
- Malindi-Watamu (G) possible nomination of Mida Creek as a Ramsar site.
- Shimoni-Tanga (ER): possible extension of Mpunguti MNR to Tanzania border and development of a transboundary initiative with Tanzania.

United Republic of Tanzania

- Shimoni-Tanga (ER): development of a transboundary initiative with Kenya.
- Rufiji-Mafia-Kilwa (G): Designation of protected areas for the reefs around Kilwa and the reefs of the Songo Songo archipelago (being developed by WWF through the Rufiji-Mafia-Kilwa Seascape Programme); designation of a Ramsar site in the Rufiji Delta (application submitted but not yet declared).
- Mtwara-Quirimbas (G): development of a transboundary conservation area with Mozambique.
- Unguja (ER): establish additional MPAs e.g. Mwaruga and Nyange reefs and islands off Stone Town.
- Pemba (ER): establish additional MPAs e.g. Matumbini reef complex; Mtangani reefs; Muongoni Bay; Ras Kiuyu.
- Latham Island. (ER): establish a protected area.
- Implement a programme to protect the dugong, including sanctuaries at key sites (e.g. Rufiji, Kilwa,) where management would focus on regulation of use of gillnets and prawn trawling, and development of incentives and alternatives for the fishermen affected.

Mozambique

- Mtwara – Quirimbas (G): establishment of transboundary conservation initiative with Mnazi Bay – Ruvuma Estuary MP in

Tanzania; establishment of new MPAs in northern coastal provinces of Nampula and Cabo Delgado.

- Inhambane Bay (SR): potential co-management MPAs being identified.
- Maputo Bay – Machangulo Complex (G): Ponta de Ouro (key turtle nesting site) – Cabo de Santa Maria - extension of Maputo Reserve to include marine waters and potential Ramsar site; transboundary conservation area with Greater St Lucia Wetlands Park in South Africa; support management of MPA at Ilhas da Inhaca e dos Portugueses.
- Ilhas Primeiras e Segundas (ER): gazettelement of the proposed National Park.

Several of the EAME priority seascapes might meet the criteria for nomination as World Heritage Sites, notably the following;

- Mnazi-Bay/Ruvuma Estuary in Tanzania; and Bazaruto and Maputo Bay – Machangulo Complex in Mozambique which are considered to be of Outstanding Universal Value.
- Kiunga-Lamu in Kenya; Shimoni-Tanga on the Kenya-Tanzania border; Pemba in Tanzania; and the Zambezi River Delta in Mozambique which need further study.
- Ilhas Primeiras e Segundas; and Nacala – Mossuril in Mozambique for which there is insufficient information, and where further research is needed.

1. INTRODUCTION

Worldwide the marine environment is facing unprecedented threats from unsustainable fishing practices, pollution, insensitive coastal development and the consequences of climate change.

Recent research indicates that:

- The extinction risk to marine species, once thought to be inexhaustible on account of their presumed large ranges and abundance, is much higher than previously understood, with many species with relatively small distributions (Roberts & Hawkins, 1999; Roberts *et al.*, 2002) and others, such as sharks and large predatory fish, highly vulnerable to exploitation (Myers & Worm, 2003; Fowler *et al.*, in press).
- Major declines have taken place in populations of large marine species and in several ecosystems, particularly coral reefs, so that the 'baseline' today is very different from that of over 500 years ago, or even 100 years ago (Jackson *et al.*, 2001; Gardner *et al.*, 2003).
- Recovery of marine species and ecosystems from damage and over-exploitation is much slower than previously believed. In some cases this may be because populations have fallen below critical thresholds, or because they have shifted to stable but less desirable states (Roberts, 2003).

In developing countries, poverty is the main driving force behind much of the destruction. At the same time, however, it is becoming clear that protection of marine ecosystems and biodiversity is essential if livelihoods and food security are to be improved. Fisheries, for example, cannot be sustained unless the vulnerable life stages of exploited species are protected and natural systems are functioning normally; the tourism industry requires clean waters and beaches and healthy reefs.

This report concerns the three main countries of the Eastern African Marine Ecoregion (EAME): Kenya, Tanzania and Mozambique¹ (Figure 1; Box 1).

Figure 1. Map of EAME including biographical sub-regions



¹Somalia and South Africa, whose coastlines lie largely outside the EAME, are not included.

Box 1. The Eastern African Marine Ecoregion (EAME)

The EAME extends approximately 4,630 km along the eastern coast of Africa, including the southern part of the coast of Somalia, the entire coastline of Kenya, Tanzania, and Mozambique, and the northern part of the eastern coast of South Africa. It covers an area roughly estimated at 540,900 km², including the territorial waters and Exclusive Economic Zones off these countries to the 2,000 m depth contour, beyond the continental slope. The main oceanographic influence is the South Equatorial Current that splits into the northerly flowing East Africa Coastal Current and southerly flowing Mozambique Current about half-way along the length of the ecoregion in northern Mozambique; it is also influenced by the Somali current in the north and the Agulhas current in the south (Figure 2).

The north-south orientation of the EAME, covering c. 30 degrees of latitude, contributes to its high levels of marine biodiversity: more than 1,500 species of fish, 200 species of coral, 10 species of mangrove, 12 species of seagrass, 1,000 species of algae, several hundred sponge species, 3,000 species of molluscs, 300 species of crabs and 250 of echinoderm, have been recorded (WWF, 2004).

Since 1999, a series of workshops involving governments, NGOs, academics and other experts has been held to identify the biological values of the EAME and to develop a vision and strategy for its conservation and sustainable management.

The EAME vision aims to define how the EAME should appear in 2051 and is as follows:
'A healthy marine and coastal environment that provides sustainable benefits for present and future generations of both local and international communities, who also understand and actively care for its biodiversity and ecological integrity'

The EAME conservation strategy lays out how the vision is to be achieved, including the need to establish more MPAs. Ecoregions represent the geographical scale that correspond to the major ecological processes that create and maintain biodiversity, and address populations of species and ecological phenomena that require large scale conservation. Analysis of data at this level thus provides a sound scientific basis for recommendations for future conservation and management interventions, including MPA establishment, in that it ensures that an ecosystem approach is taken.

In the EAME, 21 marine and coastal areas (or 'seascapes') of conservation importance have been identified: 8 are considered to be globally outstanding (G); 7 are ecoregionally important (ER); and 6 are of subregional importance (SR) (Table 5). Implementation of the EAME strategy will depend on national level mechanisms and institutions, supported by regional governance mechanisms such as the Nairobi Convention.

In all three countries, a large proportion of the rapidly increasing coastal population, whose growth is accelerated by those immigrating to coastal cities and towns in search of employment, depend on marine resources for their food and income. Inshore fisheries are already over-exploited and degradation of marine and coastal ecosystems is escalating as unplanned development accelerates, fuelled by industrialisation, the tourism industry and the need for land.

Marine protected areas (MPAs) (Box 2) are increasingly demonstrating their role in protecting biodiversity and contributing to sustainable development.

As elsewhere in the world, MPAs in Kenya, Tanzania and Mozambique have been established for two core reasons: **biodiversity conservation** (including protection of endemic, rare and threatened species, restoration of natural ecosystem

functioning, conservation of habitats for vulnerable life stages) and **sustainable use** (fisheries, recreation, education, research and aesthetic reasons).

Two economic sectors - fisheries and tourism - benefit from MPAs and demonstrate how MPAs can help to alleviate poverty. The relationships between these sectors and MPAs has not yet been well documented but there is a growing body of evidence that MPAs can generate substantial income through tourism, and potentially play a major role in the recovery of over-exploited fisheries. Despite this, the marine environment is very poorly represented in the current global system of protected areas. Although protected areas cover about 10% of the world's land surface, less than 1% of the oceans are similarly protected. Within the EAME, a growing number of MPAs are being established. However, there is an urgent need to develop a more complete representative network.

Box 2. MPA definitions

The most widely used definition of an MPA is that of IUCN (adopted in resolution 17.38 at the IUCN General Assembly of 1988):

Any area of intertidal or subtidal terrain, together with its overlying 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.

This intentionally broad definition covers all types of marine areas with protection, provided their primary objective is biodiversity protection, and thus includes marine reserves, sanctuaries and marine parks, among others. MPAs with the same type of name in one country may be different in nature (objective, management approach) from that in another. The terms 'park' and 'reserve' can cause particular confusion. In Kenya, National Marine Parks prohibit fishing and extraction of any kind but allow recreation, while in Tanzania, Marine Parks are zoned for a wide range of uses, including fishing. In Kenya, Marine Reserves allow for non-destructive forms of fishing; in Tanzania, Marine Reserves are no-take areas. In the scientific literature, the term 'reserve' is often used interchangeably with the term 'fully protected' MPAs, in both cases referring to areas that are closed to all forms of extraction. 'Fully protected' MPAs, used in this sense, are however often not protected from other potentially serious impacts – such as damage from recreational activities.

Figure 2: Map of Oceanic Currents and Prevailing Monsoons in the EAME



1.1 Aims

The purpose of this publication is to:

- Provide guidance on how scientifically-based representative networks of MPAs can be established and the benefits to be gained from this approach.
- Generate a focus on the commitments made at the WSSD, and the obligations required under international and regional treaties relating to MPAs.
- review the status of the small but growing network of MPAs in each of the three countries.
- assess the effectiveness of existing MPAs in protecting marine biodiversity and contributing to sustainable livelihoods.
- identify gaps in the network at the level of the EAME and the actions needed to complete it.
- identify areas where international support (from donors and technical agencies) is most urgently required to help these countries meet their targets and obligations.

2. THE CONCEPT OF PROTECTED AREA NETWORKS & SYSTEMS

The concept of 'networks' and 'systems' of protected areas has had a relatively short history of testing and application but has been much discussed in the scientific literature, for both the terrestrial (e.g. Bedward *et al.*, 1992; Pressey *et al.*, 1993; Margules *et al.* 1994; Davey, 1998) and marine environments (e.g. Kelleher & Kenchington, 1992; Kelleher *et al.*, 1995; Salm *et al.*, 2000; Roberts *et al.*, 2003a and b). The terms 'network' and 'system' are used to describe a group of protected areas spread across a country or region, with defined linkages between them. Although there is no specific definition for each term, many practitioners perceive a difference:

- A 'network' has a mainly geographical and physical sense, and recognises 'connectivity' between the components, which in some cases may be a physical connection.
- A 'system' has a functional sense in that, as well as describing geographical and physical relationships, it implies consistent institutional and managerial arrangements, with co-ordinated planning.

'Network' is often used when 'system' is probably meant according to the above definitions. However, because of its widespread use, particularly in WSSD and CBD discussions, the word 'network' is used in this report. Other related terms include ecological networks, bioregional/ecoregional planning, biological corridors, and the ecosystem approach. All aim to promote planning at the broad level and to develop cross-sectoral partnerships.

The original terrestrial concept involved a series of core protected areas with buffer zones, linked by corridors to allow the direct dispersal of animals between the different components. Now it is recognised that the linkages must be designed to allow a broader range of integration and exchange between species, communities and ecological processes (Bennett, 2003). The dynamic characteristics of the ocean environment however, make it difficult to plan geographically permanent networks as marine populations and physico-environmental parameters may move and

change over time more than in the terrestrial environment. An MPA network needs to encompass linkages caused by currents, wind, and exchange of biota, young and old, and also materials (e.g. organic matter) that are key to the functioning of natural ecosystems. It will need to include a balanced sampling of all biogeographical regions, all ecosystem/habitat types and all species in the area (country, region etc). For any large area such as the EAME, and for species with large ranges and long larval life stages, a number of individual MPA components will be required, spread across the major ecosystems.

The benefits of both national and regional level networks, where the individual components have been appropriately selected, include:

- Ensuring that all types of biodiversity (both species and ecosystems) receive protection.
- Helping to maintain the natural range of species.
- Ensuring protection of unique, endemic, rare and threatened species.
- Ensuring adequate mixing of the gene pool to maintain natural genetic characteristics of the population.
- Ensuring protection of ecological processes essential for ecosystem functioning.
- Ensuring social and economic connections between protected areas are addressed, bringing sectoral agencies together, and helping conservationists, fishery managers and other stakeholders with diverse interests to find a common goal.
- Facilitating sharing of information and lessons learned.

Although individual MPAs will be managed at the national level or lower, the integration of national networks into regional MPA networks is also important to ensure that:

- If an ecosystem or species cannot be adequately protected in one country, consideration will be given to protecting it in another country within the region.
- Trans-boundary MPAs are given adequate attention.

Designing a scientifically based MPA network is thus a major task (Box 3). Countries where networks have been set up or developed include South Africa (Hockey & Branch, 1997), Canada (Day & Roff, 2000), USA (e.g. California -Airame *et al.*, 2003) and Australia (for the State of Victoria, and the Great Barrier Reef (Day *et al.*, in press). These countries generally have greater scientific capacity and knowledge available than the EAME countries and, in the case of California, have used advanced computer-based modeling (Leslie *et al.*, 2003; Possingham *et al.*, 2000) to help identify where to site the MPA components and to determine optimum sizes. Most of these

networks focus on no-take areas and the total area involved is much smaller than that of the EAME (and in some cases smaller than some of the individual priority sites identified within the EAME).

The relative lack of knowledge and capacity should not, however, deter the EAME countries from developing MPAs networks. Often the basic elements of a network are already in place. Furthermore, the precautionary approach dictates that even with the lack of scientific certainty (in this case as to where MPAs should be located, how large they should be and how many are needed) such a useful tool should be put into practice.

Box 3. How is a network set up? Examples from the USA and Australia

California, USA - Channel Island Marine Sanctuary, 4,292 km²

The aim of this initiative was to establish a system of no-take MPAs (marine reserves) within this large MPA, first designated in 1980. A Marine Reserves Working Group was established, comprising managers, fishermen, conservationists and other stakeholders. The goals for the system were established: to protect representative and unique habitats; to achieve sustainable fisheries; and to minimise short-term economic losses. The Working Group set up two advisory panels, on science and socio-economics. The science panel recommended setting aside 30% of each habitat as no take areas to conserve biodiversity and sustain fisheries. The socio-economic panel analysed the potential impacts of this on fishing and other activities. This led to considerable modification of the original plan through discussions and numerous meetings over a period of 2 years. Ultimately, in 2002 after four years work (all decisions required a consensus), 10% (450 sq km) of the total area was approved as no-take, in which diving and other recreational activities are allowed, the system including representative samples of all marine habitats. Although the overall closed area was smaller than originally planned, the Channel Islands now has a network of closed areas, and the process was considered sufficiently successful that the State of California is now planning a similar approach for the rest of the State. (*MPA News* 4(6); Airame *et al.*, 2003)

State of Victoria, Australia - 540 km²

The process to develop a system of marine national parks in the State of Victoria started in 1991 and took 10 years (although it was planned to take only 4 years), and involved six periods of public comment. The initial concept was for 21 multiple use MPAs, with a relatively small coverage of no-take areas, in an overall area of c. 10,200 km². Over the period that the system was being developed, scientific knowledge of the value of no-take areas increased dramatically and it was decided that the system should comprise no-take areas only and should cover 6% of the State's marine waters. In late 2002, 13 no-take marine national parks and 11 no-take marine sanctuaries were proclaimed, covering 540 km², or just over 5% of state waters. Recreational activities are permitted, and the sites cover examples of all marine habitats in the State. Bans on fishing took place immediately at most sites. However, at 5 sites, they will not come into force until 2004. A management strategy for the whole network is being developed, which includes a compensation system for those economically disadvantaged by the no-take areas (*MPA News* 4(7)).

Great Barrier Reef, Australia - Great Barrier Reef Marine Park, c. 340,425 km²

Of the c. 340,425 km², approximately 16,000 km² (4.7%) is zoned as no-take areas. Most of these areas are reefs or remote pristine areas and thus the network of no-take areas is not representative of all habitats in the Park. The Representative Areas Program (RAP) was established to develop a representative network of no-take areas within the Park (Day *et al.*, in press). Several working groups were set up: two Steering Committees (Scientific and Social/Economic/Cultural); an Analytical Working Group to assist with data analysis, and two panels of experts (reef and non-reef) to provide taxonomic expertise. The program is being implemented in phases: classification; review; identification; selection; drafting of the zoning plan; finalisation of the plan; and implementation and monitoring of the results. The classification phase involved gathering information in the form of GIS layers comprising 31 biological and 35 physical data sets.

Several regions are also looking at how national initiatives can be co-ordinated and integrated to form a regional network. Two examples are:

- The West African Marine Ecoregion (WAMER), which involves six countries and is assisting with the expansion of a regional network, through national efforts combined with a regional networking programme (Anon, 2003).
- The Mediterranean countries that are contracting parties to the Barcelona Convention (the Mediterranean equivalent of the Nairobi Convention); 12 sites have been designated ranging from small coastal sites to the 87,000 km² Pelagos Sanctuary for marine mammals (*MPA News* 5(3)).

There is now an extensive literature on methodologies and approaches (e.g. Kelleher and Kenchington, 1992; Kelleher *et al.*, 1995; Agardy, 1997; Nilsson, 1998; Roberts *et al.*, 2003a and b; Ward *et al.*, 1999; Davey, 1998; ANZECC, 1998; Lubchenco *et al.*, 2003). Most of the guidelines and methodologies propose a similar set of principles or key issues to be considered in designing a successful network.

These include:

- **Representativeness** - the network needs to include: all ecosystem/habitat types, including those that are rare or particularly vulnerable; **all** species and characteristic species communities; critical habitat for threatened, restricted range or endemic species; and areas important for vulnerable life stages, such as spawning aggregations, breeding sites and migration routes. The concepts of 'comprehensiveness' (the inclusion of sites representing all key areas and ecological processes), and 'coherence and complementarity' (the extent to which a potential site adds to the achievement of the overall aim of representativeness) must also be considered.
- **Size and shape** of individual units.
- **Connectivity** - the linkages between the individual components.
- **Resilience** - the ability of the network to survive natural catastrophes and major impacts.

These principles are discussed further in the following section, which analyses progress made in the EAME countries in the development of an MPA network.

3. AN MPA NETWORK FOR THE EAME

3.1. Commitments and targets

Over the last decade there has been increasing recognition that individual protected areas, managed on their own, will be less effective and in many cases unsuccessful at achieving their main objectives than if groups of protected areas are managed as systems. This is particularly true in the marine environment, where the necessity for MPA networks and the ecosystem approach is now a matter of expert consensus. Many nations, including Kenya, Tanzania and Mozambique have committed themselves under regional and international treaties to establishing protected area networks, and have set ambitious targets for achieving these.

All three countries are parties to (and thus have obligations under), or are about to ratify, 3 international conventions that play an important role in the establishment of protected area networks: the Convention on Biological Diversity (CBD); the World Heritage Convention; and the Wetlands Convention (Table 1). There are also two relevant regional conventions: the Nairobi Convention, which covers Eastern Africa and the Western Indian Ocean island states; and the African Convention on the Conservation of Nature and Natural Resources, which has recently been revised and adopted by the Assembly of the African Union, and will come into force with the ratification of 15 African states.

The marine environment, including protected areas, received particular attention at the World Summit on Sustainable Development

(WSSD) in 2001 (Table 1) and the World Parks Congress (WPC) in Durban in 2003. There was a strong emphasis on the need for national and regional ecological networks, ensuring connectivity between protected areas and protection of hot spot areas of high biodiversity. At the World Parks Congress, it was recommended that networks should be extensive and include strictly protected areas amounting to 20-30% of each habitat. These global deadlines and targets have become a focus for regional and national strategic planning, and have led several countries to make very specific commitments towards establishing MPA networks, such as:

- Bahamas: 20% protection of the marine ecosystem for fisheries replenishment purposes.
- Indonesia: 20% coverage of MPAs by 2013;
- Chile: 10% coverage of MPAs by 2006.
- South Africa: 20% coverage by MPAs.
- Tanzania: increase protection of its seas to 10% by 2012, and 20% by 2025.

Note that most of these commitments are for coastal waters, not for the entire EEZ for these countries.

In addition to binding conventions and the targets of the WSSD, there are three regional initiatives relevant to Kenya, Tanzania and Mozambique in terms of MPAs: the African Protected Areas Initiative (APAI), the East African Community (EAC) and the regional strategy of the International Coral Reef Initiative (ICRI). These all recognise the importance of MPAs in the context of sustainable development of the Eastern African region.

Table 1. Global and regional conventions and initiatives relating to MPA networks and relevant to EAME countries

Convention or initiative	Main focus	Role in promoting networks of MPAs
Convention on Biological Diversity/Jakarta Mandate	Lays out the measures to be taken by the parties for the conservation and sustainable use of marine biodiversity	Article 8a requires the establishment of a system of protected areas, or areas where special measures need to be taken to conserve biodiversity
Wetlands Convention (Convention on Wetlands of International Importance)	Conservation and wise use of listed freshwater and marine wetlands to 6m depth at low tide	Allows for designation of sites of international importance that meet criteria relating to representative, rare, unique wetland types or those especially important for conserving biodiversity; sites must be managed but may be subject to 'wise' use
World Heritage Convention	Protection of outstanding examples of the world's cultural and natural heritage	Allows for nomination of sites that have outstanding values that meet the criteria
Nairobi Convention (Convention for the Protection, Management and Development of the Marine and Coastal Environment of the Eastern African Region)	Protection of the marine and coastal environment in the Eastern Africa Region	Protocol on Protected Areas and Wild Fauna and Flora requires the establishment of a regional programme for the creation of a network of MPAs
African Convention on the Conservation of Nature and Natural Resources	Conservation and sustainable management of land, soil, water, biodiversity and other issues	Requires parties to promote the establishment of community-based protected areas and address gaps in biodiversity conservation; incorporates IUCN Protected Areas Management Category System
World Summit on Sustainable Development -Plan of Implementation	Sustainable development with relevance to conservation and the environment	Targets: -a significant reduction in the rate of biodiversity loss by 2010 -representative networks of MPAs to be established worldwide by 2012, consistent with international law and based on scientific information -the application of the ecosystem approach to ocean and fisheries management by 2010; -restoration of depleted fish stocks by 2015
African Protected Areas Initiative (APAI)	Pan-African process under the Algiers Convention and the New Partnership for African Development (NEPAD) to provide policy and technical advice on protected areas	Urges governments to promote protected area management systems that fully involve local communities, ensure transparency and guarantee the well-being of both humans and ecosystem; and to establish protected areas that are representative of all ecosystems and provide adequate coverage of all threatened species.
East African Community (EAC)	Tanzania and Kenya (and Uganda)	Committed to a regional approach to environmental management and agreed to collaborate over the management of shared ecosystems and natural resources (e.g. the Pemba Channel)
International Coral Reef Initiative (ICRI) - regional strategy	Coral reefs	ICRI Indian Ocean Regional Workshop (November 2001, Maputo) recommended the establishment of a representative, effective, comprehensive network of MPAs in the Eastern African region (Obura <i>et al.</i> , 2003)

3.2 Progress toward establishment of an EAME MPA network

Progress in the development of MPAs in Kenya, Tanzania and Mozambique has been described by Kelleher *et al.* (1995), Salm & Ngoile (1998), and Francis *et al.* (2002). In recent years progress has been particularly rapid with many national efforts involving governments, NGOs and increasingly local communities and the private sector, supported by a range of regional and international organisations and initiatives. These include:

- **WWF** - support to: Kiunga Marine National Reserve in Kenya; Mafia Island Marine Park, Menai Bay Conservation Area and Rufiji-Mafia-Kilwa Seascape in Tanzania; Bazaruto Archipelago National Park and Quirimbas National Park in Mozambique; and regionally through the EAME programme.
- **ICRAN** - a global initiative to protect coral reefs through the establishment and improved management of demonstration sites (in the EAME: Malindi/Watamu Marine National Park and Reserve in Kenya; Dar es Salaam Marine Reserves in Tanzania).
- **IUCN** - support to: Mnazi Bay-Ruvuma Estuary Marine Park and Tanga Coastal Zone Conservation and Development Programme in Tanzania, several initiatives in Kenya; and regional support through capacity building and assessing MPA management effectiveness under its programme to improve implementation of the Jakarta Mandate.

In Kenya, Tanzania and Mozambique, there are 23 MPAs plus a further two areas (Tanga Collaborative Fishery Management Areas in Tanzania and Vilanculos

Coastal Wildlife Sanctuary in Mozambique) that are included in this report as they are managed areas (Table 2; Figure 3). They range in size from small sanctuary areas of less than 1 km² to large zoned multiple use areas of over 1,500 km². Management arrangements also vary greatly, ranging from the government run system in Kenya to MPAs that are essentially community-managed in Tanzania, and others that are managed either by, or in collaboration with, the private sector.

Two Biosphere Reserves in Kenya cover the same locations as nationally designated MPAs: Kiunga Biosphere Reserve covers the area of Kiunga Marine Reserve while Malindi-Watamu Biosphere Reserve covers the area designated as Malindi Marine NP, Watamu Marine NP and Malindi-Watamu National Reserve.



Participants in one of the demonstrations to establish and improve management. (WWF)

Figure 3. Map of MPAs in Kenya, Tanzania and Mozambique

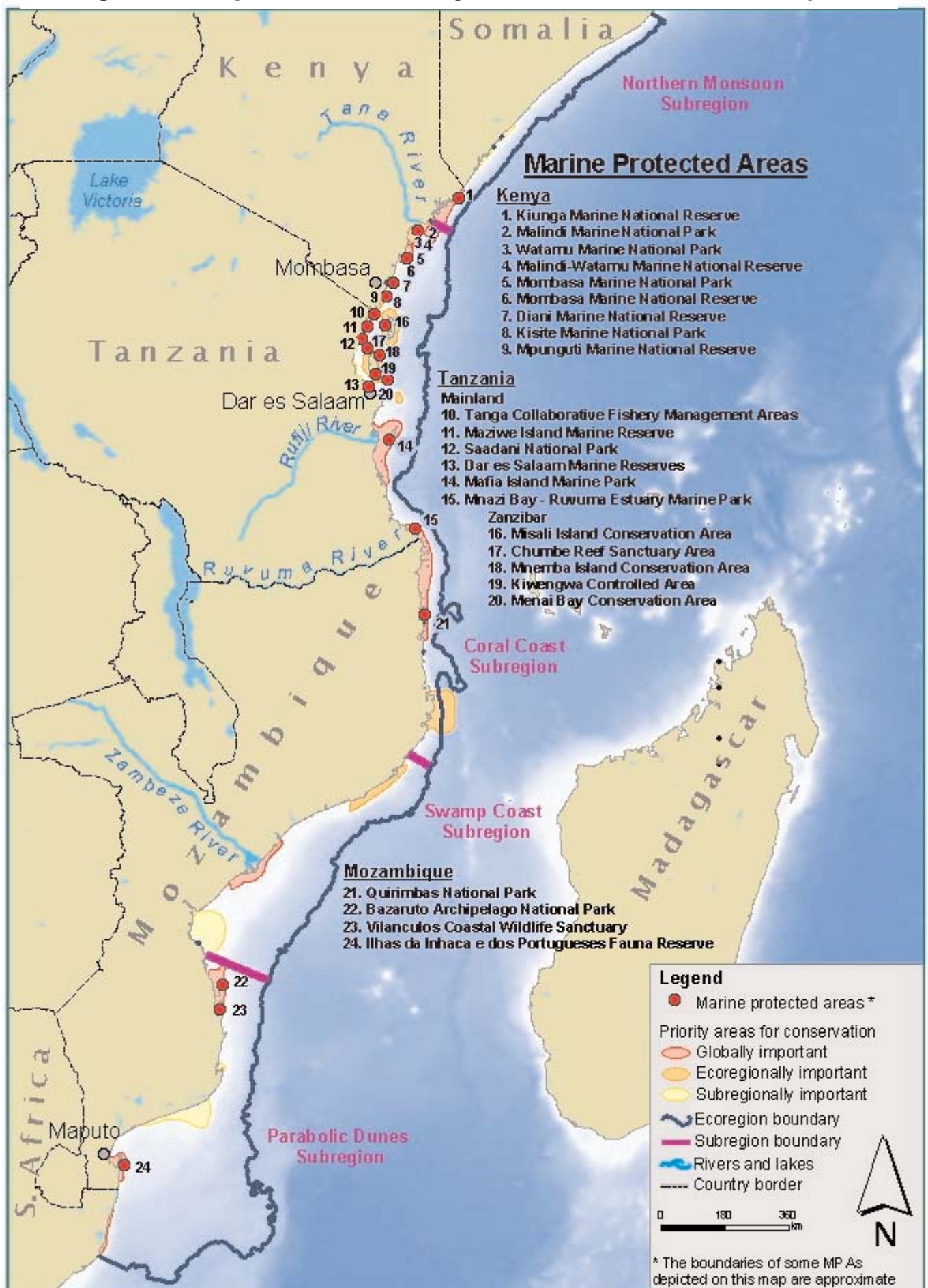


Table 2. MPAs in Kenya, Tanzania & Mozambique

Country	Marine Protected Area	Date Est.	IUCN Category	Subtidal Area (km ²)	Comments
Kenya	1. Kiunga Marine National Reserve (included in the Kiunga Biosphere Reserve)	1979	VI	250.0	Biosphere Reserve includes Dodori NR - total area of 600 km ²
	2. Malindi Marine National Park	1968	II	6.3	Reserve totals 213 + 32 km ² (Mida Creek); surrounds the 2 MNPs
	3. Watamu Marine National Park	1968	II	10.0	
	4. Malindi-Watamu Marine National Reserve (2-4 are included in the Malindi-Watamu Biosphere Reserve)	1968	VI	245.0	
	5. Mombasa Marine National Park	1986	II	10.0	
	6. Mombasa Marine National Reserve	1986	VI	200.0	
	7. Diani Marine National Reserve	1995	VI	75.0	
	8. Kisite Marine National Park	1978	II	28.0	
	9. Mpunguti Marine National Reserve	1978	VI	11.0	
Tanzania - mainland	10. Tanga - 6 collaborative fishery management areas	1996 -2000	N/A	25.4	total area 1,914; no take = 28 km ²
	11. Maziwe Island Marine Reserve	1981	II	2.6	
	12. Dar es Salaam Marine Reserves (Bongoyo I. (7.3), Fungu Yasini (7.5), Mbudya I (8.9). Pangavini I. (2.0))	1975	II	c. 26.0	
	13. Mafia Island Marine Park	1995	VI	615.0	total inc terrestrial = 822 km ²
	14. Mnazi Bay - Ruvuma Estuary Marine Park	2000	VI	200.0	total inc terrestrial = 650 km ²
Tanzania - Zanzibar	15. Menai Bay Conservation Area	1997	VI	470.0	
	16. Chumbe Reef Sanctuary	1994	II	0.3	
	17. Misali Island Conservation Area	1998	VI	21.6	total inc terrestrial = 23 km ²
	18. Mnemba Island Conservation Area	2002	VI	0.15	
	19. Kiwengwa Controlled Area	2000		17.5	
	20. Jozani -Chwaka Bay National Park	2004		25.0	
Mozambique	21. Quirimbas National Park	2002		1522.0	(total area 7,500; terrestrial 6,000)
	22. Marromeu Complex Ramsar Site and Marromeu Coastal Reserve	2004			
	23. Bazaruto Archipelago National Park	1971 2001	II	1430.0	(extended in 2001 from initial size of 600 km ²)
	24. Vilanculos Coastal Wildlife Sanctuary	2000		300.0	
	25. Ilhas da Inhaca e dos Portugueses Faunal Reserve	1965	VI	1.0	(total area 20 km ² ; 4 km ² mangrove)

3.2.1. How well designed is the existing MPA network?

This section looks at whether the existing MPAs provide a sound beginning for a regional network, and where the gaps are. It considers representation (in terms of biogeography, habitats and species), size, connectivity and resilience.

3.2.1.1. Biogeographic representation

Biogeographic representation is important because although habitats/ecosystems may look the same, they are often composed of very different species in different regions. For example Caribbean reefs have a different species composition to Western Indian Ocean reefs, although structure and composition at higher taxonomic levels are similar. Unlike the terrestrial environment, there is still no globally accepted biogeographical classification for the marine environment largely because there are so few data on species ranges and abundance. There are however, many different partial categorisations, such as the WWF marine ecoregions, Large Marine Ecosystems, FAO fishery regions, and the regions covered by the UNEP Regional Seas Conventions and Programmes.

WWF's system of marine Global 200 ecoregions provide one global categorisation, of which the EAME is a part. Within each ecoregion, further biogeographic subregions are identified, four in the case of the EAME (Table 3; Figure 1).

- The **Monsoon Coast** in northern Kenya is the smallest subregion, with a short coastline and relatively narrow continental shelf and slope. It has one MPA (Kiunga MNR), covering only 0.5% of the subregion.
- The **Coral Coast** extending from Kenya south to Mozambique is the second largest subregion and has the greatest number of MPAs (20), and also has the greatest protection (2.2%). This is perhaps not surprising since this is the region where coral reefs are a predominant ecosystem and many of the existing MPAs were set up with tourism promotion as important an objective as biodiversity protection.
- The **Swamp Coast** in Mozambique has 1 MPA (Marromeu), which incorporates subtidal and mangrove habitat and which is included within the Marromeu Complex Ramsar Site. This subregion lies entirely within Mozambique and is a high priority for the creation of further protected areas, as it includes the largest stands of mangrove in Eastern Africa and highly productive fisheries in the Zambezi Delta mouth and offshore gyre.
- The **Parabolic Dune Coast** also in Mozambique has a short coastline compared with the Coral Coast Subregion, but is the largest subregion by virtue of the fact that the 2,000m depth contour extends 80km from the coast (beyond the EEZ in the region of Maputo / St Lucia). There are three MPAs with subtidal habitat and a coastal Game Reserve (Pomene). These constitute a very small percentage (0.9%) of this biogeographic type.

Table 3. Subregions of the EAME

Subregion	Location	Size km ²	Main characteristics	No of MPAs & km ² prot	% subreg prot
Northern Monsoon Current Coast	Lamu (Kenya) north to Somalia	45,679	Fauna is WIO; gradual decline in coral diversity north from Lamu. Reversal in the flows of currents during the two monsoon seasons; southern boundary approximates to southernmost extent of this reversal.	1 (250)	0.5
Coral Coast	Angoche in Mozambique north for 2,300 km to Lamu in Kenya	162,113	Shallow sublittoral dominated by scleractinian coral communities and coral reefs; diverse range of habitats including mangroves, seagrasses, and sandy and rocky shores.	20 (3,511)	2.2
Swamp Coast	Central Mozambique, from Angoche to Bazaruto	134,981	Extensive sandy beaches, coastal swamps and estuaries with very large mangrove forests. Inshore waters very turbid (shallow sea floors are disturbed by waves; 24 rivers discharge sediment loads, inc. Zambezi, which drains over 1.3 million km ² and parts of 9 countries).	1	??
Parabolic Dune Coast	Bazaruto to Mlalazi R. in Natal, S. Africa	198,157	High parabolic dunes and north-trending capes and headlands, with coastal barrier lakes behind the dunes.	3 (1,731)	0.9

Table 4. Areas and species diversity of coral reefs and mangroves

	Kenya	Tanzania	Mozambique
Coral reef area (km ²)	630*	3,580*	1,190+
Mangrove area (km ²)	530*	1,150* or 1,272** or 1,335***	4,500x
Coral diversity (spp)	237*	314*	194 - 314*
Mangrove diversity (spp)	9*	10*	10*
Sea grass diversity (spp)	13*	10*	13+

* Spalding *et al.*, 2001

x Saket & Matusse, 1991

** Taylor *et al.*, 2003

+ MICOA, pers. comm. 2003

*** Wang *et al.*, 2003

3.2.1.2. Habitat representation

The first analysis of priority sites for MPA establishment in the WIO (IUCN/UNEP, 1984) used 38 marine and coastal habitat types. The EAME reconnaissance used only four key habitats/community groups to assess the relative importance of different areas:

- Coral communities and associated fauna.
- Mangrove communities.
- Seagrass, algae and sponge communities.
- Wetlands, coastal lakes, inland pools, sandy shores and dunes.

These are used below to attempt an assessment of habitat representation, but for a scientific analysis it would be necessary to carry out a more detailed study, perhaps using the 1984 scheme as a starting point. Despite considerable research and survey work over the last two decades, it is still only possible to assess representation within the current MPA

network on a presence/absence basis, as was the case in the 1980s. Global mapping programmes for coral reefs and mangroves (and in the case of Tanzania, a national mapping programme for mangroves) have provided estimates of the area of these two habitats in each country (Table 4), but this is at too coarse a level to allow assessment of the amounts of different habitats protected in the current MPA network.

Coral communities: Most MPAs in the EAME include reefs, but the proportion of the total amount for each country that is protected is not known, nor the extent to which different types of coral reef are protected. Since coral diversity was a criterion in the selection of EAME priority seascapes, the fact that many of these include MPAs suggests that the reefs with the highest biodiversity may be relatively well represented in the existing network.



Clown fish. (Matt Richmond)



Planted Mangroves. (Matt Richmond)

Mangroves: Many MPAs include mangrove habitat. The largest stand of mangroves in Eastern Africa, in the Zambezi Delta in Mozambique was declared a Ramsar site in 2004. The extensive mangrove forests of the Rufiji Delta in Tanzania have been nominated as a Ramsar site, and there is potential for nominating the Tana River Delta in Kenya.

Seagrasses: Although there has been much research on seagrasses in terms of their productivity, and the role they play in fisheries and providing food and habitat for other marine species (Gullstrom *et al.*, 2002), their distribution is poorly known. Seagrass beds probably occur in all MPAs in the region, and these may provide a refuge from damage through trawling (a major cause of seagrass bed decline in the region).

Wetlands, coastal lakes, inland pools, sandy shores and dunes: Insufficient data are available in a suitable format to make a meaningful analysis of these habitats.

3.2.1.3. Species representation

The lack of data on most of the 11,000 marine species in the EAME, particularly in terms of their distribution and population dynamics, means that it is very difficult to assess the extent to which existing MPAs protect representative populations. The EAME reconnaissance was based on two groups of species: mammals, turtles, elasmobranchs and island biota; and fish and squid. This brief review addresses dugong, whales and dolphins, turtles, birds, fish and invertebrates.

Dugong: This is probably the most endangered marine species in the region (IUCN global Red List category: vulnerable) and there are only remnant populations in the three countries. All known remaining populations receive some level of protection in MPAs but there is an urgent need for a more targeted dugong conservation programme, with the creation of dugong sanctuaries. A survey of this species in the WIO has been completed, funded through UNEP and WWF (WWF/UNEP, 2004).



Dugong caught in Rufiji Delta, Tanzania. (Jason Rubens and C. Muir)



Masked Boobies on Latham Island. (Matt Richmond)

Other marine mammals: Whales and dolphins occur in the EAME both as resident and migratory populations, and are often seen within MPAs. They are protected from exploitation as a result of the Indian Ocean Whale Sanctuary which includes the EAME. Data on overall distribution, and the extent to which MPAs protect resident populations, are not available. At several MPAs there are resident populations of dolphins that are increasingly becoming tourist attractions (e.g. Kisite MNP in Kenya; Menai Bay Conservation Area in Zanzibar).

Birds: BirdLife International's Important Bird Areas (IBA) programme identifies key sites on

the basis of criteria that take into account threatened, rare and endemic species and also those that 'congregate' in large numbers such as seabirds in colonies, and waders and shorebirds on migration. A total of 825 IBAs have been identified in Africa (Fishpool and Evans, 2001). There are 20 coastal/marine IBAs in the three main EAME countries; 4 of the 5 Mozambican IBAs receive partial or full protection within MPAs; 3 of the 5 Kenyan IBAs lie within MPAs; and all except one of the 10 Tanzanian IBAs are in or are partially protected by existing MPAs, or are in areas shortly to be designated. Thus of the 20 coastal/marine IBAs in the EAME, 80% are in MPAs or receive some form of protection.



Turtle. (Matt Richmond)

Marine Turtles: The existing MPAs protect a large number of key nesting beaches, but many others are unprotected (e.g. Kipini in Kenya, Mapanya and Shungi-mbili Islands in Tanzania and Ponto do Ouro in Mozambique). A strategy for turtle protection in the WIO has been prepared (IUCN, 1996). Many of the recommendations are being implemented at national level, but efforts to initiate a regional programme have been unsuccessful to date. Mortimer (2000) reviewed the status in all WIO countries but the report has not been published and the recommendations have not been disseminated and implemented.

Fish: Insufficient information is available on distribution to assess how well fish species and populations are represented in existing MPAs. Given their location in high diversity sites with reefs and mangroves, it can be assumed that there is reasonably good representation of the main fish communities. The EAME has relatively high levels of endemism since it is at the western extreme of the Indo-Pacific. The most important 'hot spot' for fish species in the region is south of the EAME, along the Natal coast of South Africa and this may extend into Mozambique; it is based on an analysis of species with ranges of less than 800,000 km which were defined as 'restricted range species' (Hawkins *et al.*, 2000).

Many important commercial fish species aggregate to spawn at certain times of year and in certain places; information on these locations is lacking in the EAME countries but a survey of the WIO is currently underway by the Seychelles Fishing Authority. Once key sites are known, it will be important to determine their level of protection and to increase this if necessary.

In relation to rare species and those of particular concern and scientific interest, the coelacanth probably attracts most attention. It has been known from Mozambique for many years but there are few if any recent records. More recently, single specimens caught by fishermen have been recorded from Kenya and Tanzania. A research and survey programme, led by South Africa, is currently underway to determine distribution and population size in the region. It is therefore not known if it occurs in any of the existing MPAs. The black marlin, an important game fish, also has a restricted range, and is known only from

Eastern Africa and Australia; its distribution in relation to MPAs is probably known but has not been documented.

Invertebrates: Existing information is insufficient to draw any conclusions.

3.2.1.4 High biodiversity areas

Given the lack of data at the level of individual species, a more useful approach for the EAME has been to look at sites of high biodiversity. Individual sites have a higher conservation value if they:

- Contain several key elements, such as rare as well as more common habitats, or.
- Contain a large number of habitats, and/or.
- Include 'high quality samples' i.e. habitats in as near pristine and least damaged state as possible, with fewer threats than other similar sites.

With more habitats in a site, a greater number of species will be protected, and there will be a greater chance of conserving ecological processes and exchange mechanisms between ecosystems.

Taking this approach, 21 priority sites or seascapes have been identified in the EAME, of which 18 occur in the three countries covered by this report: Kenya: 4; Tanzania: 7; and Mozambique: 9 (Table 5). Two of these sites are transboundary: one straddling the Kenya-Tanzania border; the other the Tanzania-Mozambique border.

All of the 7 globally (G) important seascapes have some level of protection. Of the 7 ecoregionally (ER) important seascapes, 40% (3 seascapes) have protection. None of the 4 subregionally (SR) important sites has an MPA. Only three MPAs (Mombasa MNP/MNR and Diani MNR in Kenya; and Dar es Salaam MR System in Tanzania) and one coastal Game Reserve (Pomene) lie outside EAME priority areas. In the case of the first three, these were established largely for tourism and are adjacent to major urban and/or tourism developments; many of the early MPAs in Eastern Africa were established with tourism as much in mind as biodiversity protection (Muthiga, 1998).

Table 5. MPAs within EAME priority seascapes - areas in brackets are sites not yet Gazetted

Country	Priority Area	EAME Cat	Area km ²	MPAs	Subtidal Area km ²	% area protected
Kenya	Lamu Archipelago	G	6,064	Kiunga MNR	250.0	4.1
	Tana R. Delta	ER	3,347	None	0.0	0.0
	Mida Creek-Malindi	G	1,563	Malindi MNP	6.3	16.7
				Watamu MNP	10.0	
Malindi-Watamu MNR				245.0		
Kenya - Tanzania	Msambweni - Tanga	ER	2,990	Kisite MNP/ Mpunguti MNR	39.0	2.3
				Miziwe MR	2.6	
				Tanga collaborative fishery management areas*	*25.4	
Tanzania	Pemba I.	ER	4,193	Misali I. Cons Area	21.6	0.5
				Ngezi Forest Reserve	0.0	
	Unguja I.	ER	5,557	Menai Bay Cons Area	470.0	9.2
				Mnemba I. Cons Area	0.1	
				Chumbe Reef Sanctuary	0.3	
				Kiwengwa Cont Area	17.5	
				Jozani-Chwaka Bay NP	25.0	
	Latham I.	ER	409	None	0.0	0.0
	Bagamoyo	SR	806	(Saadani Nat. Park)	(66.0)	(8.2)
Rufiji-Mafia Complex	G	9,490	Mafia Island MP	615.0	6.5	
Tanzania - Mozambique	Mtwara-Quirimbas	G	9,371	Mnazi Bay-Ruvuma Estuary MP	200.0	20.8
				N. Quirimbas Cons.Project	(230.0)	
				Quirimbas Nat. Park	1,520.0	
Mozambique	Nacala - Mossuril	ER	8,796	None	0.0	0.0
	Ilhas Primeiras e Segundas	ER	5,767	(Proposed Primeiras & Segundas Nat. Park)	(0.00)	0.0
	Zambezi Delta System	G	12,464	Marromeu Complex Ramsar Site and Marromeu Reserve	0.0	0.0
	Sofala Bay	SR	11,896	None	0.0	0.0

Country	Priority Area	EAME Cat	Area km ²	MPAs	Subtidal Area km ²	% area protected
Mozambique (cont.)	Sofala Bay	SR	11,896	None	0.0	0.0
	Bazaruto Archipelago	G	5,034	Bazaruto Archipelago Nat.Park	1,430.0	34.4
				Vilanculos Sanctuary	300.0	
	Inhambane Bay	SR	838	None	0.0	0.0
	Inharrime Complex	SR	8,519	None	0.0	0.0
	Maputo Bay - Machangulo Complex	G	4,153	Ilhas da Inhaca e dos Portugueses Faunal Reserve	2.0	0.04
Maputo Reserve				0.0		

* closed areas only (total area of collaborative management plans is 1,603 km²)

Although it is often stated that protected areas have been created in the past on an ad hoc basis, this analysis shows a good correspondence between the existing MPAs and priority areas for biodiversity conservation. This is largely attributable to the extensive review and preparation of national reports carried out by IUCN and UNEP in the early 1980s to provide background documentation for the development of the Action Plan for the Eastern African Region of the UNEP Regional Seas Programme (IUCN/IUCN, 1984), which made recommendations for MPAs. This does not mean that there are enough MPAs in these three countries, or that they are large enough, to ensure adequate representation, but it does indicate that the existing MPAs form a sound base for the development of a regional network.

Adequate protection of the EAME priority areas will go along way towards achieving protection of a representative set of samples of biodiversity. At present, a relatively small proportion of each priority area is protected (Table 5): an average of 12% for globally important areas, 1.6% for ecoregionally important areas and 0.3% for subregionally important areas. The priority areas with greatest MPA coverage are Mida Creek-Malindi in Kenya, and Mtwara-Quirimbas, and Bazaruto Archipelago in Mozambique.

The EAME priority areas range in size from 408 km² (Latham) to 12,464 km² (Zambezi River Delta) and in most cases are too large to be protected as a single MPA unit. The largest subtidal areas protected are in Mozambique, where both Quirimbas and Bazaruto

Archipelago National Parks are around 1,500 km². To increase protection of the large seascapes it will therefore be necessary to consider how MPA networks might be established within them. For example, WWF and relevant Tanzanian agencies are developing a type of marine conservation/management area for the Rufiji-Mafia-Kilwa seascape. In addition, certain areas outside the priority sites will also need protection if full representation is to be achieved and immediate concerns for some species are to be addressed.

3.2.1.5 Is the current network large enough?

Since targets for the percentage of marine ecosystems to be protected have been set globally and some countries have set their own national targets, it is becoming increasingly important to be able to measure the size of each MPA and thus the total area of the network. Should there be many small MPAs or a few large ones, or a mixture of both? Deciding how many MPAs are required and how large these should be is a major challenge in designing a network, although the basic principle should be that the network is large enough to cover the full range of ecosystems or habitats in the area, preferably with multiple samples of each. However, although conservation goals suggest protection of a large area, socio-economic demands are likely to reduce this (Possingham *et al.*, 2000).

In reality, the total amount of ocean protected is less important than whether appropriate amounts of each habitat type are included, and the level at which areas are protected. At

Table 6. Estimates of % cover by MPAs and no-take areas

	Kenya	Tanzania	Mozambique
Continental shelf (km ²) to 200 m depth	8,460.0	17,903.0	73,300.0
MPA coverage km ²	735.0	1,404.0	3,2520
% continental shelf protected	8.7	7.8	4.4
No-take area km ²	54.0	66.0	
% continental shelf no-take	0.6	0.4	
Coral reef km ²	630.0	3,580.0	
% coral reef no-take	8.6	1.8	

the WPC in Durban, it was recommended that networks should be extensive and include strictly protected areas that amount to 20-30% of each habitat. Countries and regions will have to decide how far they can go to meet this. Using the continental shelf to a depth of 200m, current MPA coverage is 8.7% in Kenya, 7.8% in Tanzania and 4.4 % in Mozambique (Table 6).

Much of the theoretical basis for 'how much should be protected' is based on current understanding of the role of no-take or exclusion areas in maintaining biodiversity and fishery biomass. Roberts *et al.* (2003a) recommend that networks of fully protected (no-extraction) MPAs should cover 20% or more of all biogeographic regions and habitats, many studies having shown that benefits from such MPAs are maximized when 20-50% of habitat is protected. Good data now exist to show that total species number, biomass, size of individual organisms, and abundance are all higher inside no-take zones compared with outside, or compared with the area before it was designated as a no-take zone. An analysis of 89 studies of no-take areas around the world (Halpern, 2003; Halpern & Warner, 2002) showed that in the majority of cases, they led to increases in abundance, biomass, size of individuals and species diversity within the area, even within a time as short as 3 years. In many places, biomass may be double that found outside the boundaries (Palumbi, 2003; Roberts & Hawkins, 2000; Cote *et al.*, 2001).

Theory also indicates that many small no-take areas should be better for the export of larvae and adults to fishing grounds because of the large edge-to-area ratio. However, a survey of studies carried out on no-take areas ranging

from 0.0002 - 846 km² (Roberts *et al.* 2003a; Halpern, 2003) found that benefits were independent of size. Gell & Roberts (2003b) found that reserves ranging in size from 1 km² to 5,000 km² all produce benefits for the species within them, and that the size effect probably depends on whether the species concerned are sedentary or mobile and, if mobile, how much they move. These studies focused on fish and invertebrates and did not look at large species or ecosystem processes that may be more size-dependent. On the Great Barrier Reef, the minimum size calculated as being necessary for effective no-take areas is 20 km along the smallest linear axis (Day *et al.*, in press). Elsewhere, a minimum of about 32 km has been suggested, and much larger areas may be necessary in the case of major commercial fisheries (Dayton *et al.*, 1995).

The disadvantages of small sites are that: populations of some species need a large area to be sustainable; they may only function if essential linkages to other habitats are maintained; and they are more vulnerable to disturbance e.g. low tides, algal blooms. The size of MPAs also influences management effectiveness: small areas are often easier to set up, enforce, monitor and develop good relationships with stakeholders; larger areas take much longer to develop, will be more costly, and will require much greater investment in developing relationships with the inevitably larger number of stakeholders.

Scientific research, as well as practical experience suggests that three levels of management are needed within a network, and the size of each of these components may need to be calculated separately.

- A core network of fully protected MPAs or zones (or no-extraction areas).
- A larger network of multiple-use MPAs.
- Overall integrated coastal area management programmes, which would cover 100% of the world's oceans and coasts.

In the EAME, early MPAs tended to be small (often less than 10 km²) and focused on individual species or habitats (e.g. turtle nesting beaches or attractive reefs such as the Marine Reserves initially established in Tanzania, Inhaca e Dos Portugueses Faunal Reserve in Mozambique; and the early Marine Parks in Kenya) (Francis *et al.*, 2002). Some of these, including core zones in multiple use areas (e.g. MIMP), and the closed reefs in collaborative fishery management areas in northern Tanzania, could form the basis for a network of no-take areas in the EAME. The closed reefs in the six Tanga collaborative fishery management areas cover 1.7% of the total area that is managed. The amount of each management area that is closed varies between 0.8 and 10.0%, with an average of 3.8%. In MIMP, it is 1.3% of the total area. There is no information on how much of each habitat type occurs in no-take areas, but most are on coral reefs. Making the assumption that no-take areas are essentially coral reef habitat, an 8.6% of reefs in Kenya and 1.8% of reefs in Tanzania are fully protected (Table 6) - a small proportion in relation to the recommended 20-30%.

By the 1990s, it was recognized that larger multiple-use MPAs would be more effective overall, and sites designated at this time tended to be over 200 km² (e.g. Bazaruto, Mafia). The newest MPAs have been an order of magnitude larger (e.g. Quirimbas National Park, Bazaruto Archipelago National Park). Consideration is also being given to linking small sites in a larger framework (e.g. Dar es Salaam MR System), on the expectation that such an approach will ensure that intact, self-sustaining systems will be incorporated. These sites in effect form the basis for a network of multiple use MPAs. The focus on no-take areas has tended to diminish attention on other major threats to the marine environment such as urban and rural run-off, and alien species, and the multiple-use MPAs being established in the EAME will help to ensure that these issues are kept in mind.

The third level, of broad ICM programmes, is also being addressed in each country. These initiatives were to a large extent stimulated by

a series of regional coastal management initiatives in the 1990s, involving three Ministerial level meetings and a series of reports (Linden & Lundin, 1996; Voabil & Engdahl, 2001). Subsequently, the political will for ICM was harnessed in the African Process which involved countries from WIO as well as the Atlantic coast of Africa. The African Process was incorporated into the NEPAD Environment Initiative that was endorsed by AMCEN in June 2003.

Tanzania and Mozambique have national ICM programmes, with co-ordinating national institutions, and a number of local plans and programmes being developed and implemented. Kenya has yet to develop a programme, but has recently enacted umbrella legislation allowing for such an initiative (see country sections for details).

3.2.1.6. How well connected are existing MPAs?

Connectivity between MPAs, and between MPAs and other areas, is very important given the characteristics of marine organisms (larval dispersal; reproduction through spawning, pelagic juveniles and adults) and of the marine environment (mixing of waters through wind, currents, tides, upwellings). Sediments, nutrients, plankton, animals, and pollution are re-distributed from their original sources along coastlines and across oceans, and different habitats are closely connected by the species that move between them. For example certain fish and crustaceans feed in one habitat but breed in another. The network must therefore take into account:

- Exchange of offspring between populations.
- Movement of juveniles and adults between the MPA and other sites.
- Ecosystem linkages through transfer of materials such as organic carbon.

For the EAME region, information relating to these factors is extremely limited or even absent, and it is not possible to say anything conclusive about the connectivity of the existing MPAs. However, it is useful to look at each factor to see what might be involved in future development of the network.

Larval dispersal: The extent to which larvae are exchanged between MPAs, or dispersed out of or into MPAs, will depend on their dispersal distances, local oceanography, especially currents, and the distances between an MPA and other MPAs or sites relevant to the species life history. For most species, there is

no information on how fast or how far their larvae travel, and for those for which data are available, there is great variation in dispersal characteristics. An MPA network that might suit the dispersal of one species is unlikely to be suitable for all others (Shanks *et al.*, 2001; Lockwood *et al.*, 2002; Grantham *et al.*, 2003). If larvae survive for a long time, this does not necessarily mean that they travel long distances. However, those that do so may play key roles in maintaining gene flow with populations at the extreme end of the species range. Isolated MPAs will benefit from larvae with short dispersal ranges as they will be retained within the area. Ideally, information on larval dispersal size is needed as it will help to dictate the size of individual units within a network, as well as how far apart they should be spaced.

Movement of adults and juveniles: The EAME provides breeding and feeding areas for a range of migratory species, including marine mammals, birds, turtles and fish. Within the EAME, turtles are known to migrate large distances; turtles tagged while nesting in Kenya, Seychelles, Comoros, Mayotte and South Africa have been found in Mafia and Zanzibar (Whitney *et al.*, 2003; Muir, 2004). Tagged sharks have been found to travel long distances in the WIO, and billfish and large schools of tuna migrate through the EAME each year. Migratory patterns of fish are starting to be understood through mark-recapture studies (e.g. Attwood, 2002) and studies of the genetic structure of populations along geographical gradients may provide an indirect method to assess long-term connectivity. This illustrates that national or even regional level MPA networks may not be able to protect all the key sites for particular species, and emphasises the need for ensuring that appropriate transboundary linkages are made.

Linkages between different ecosystems: In Australia, some progress has been made in determining the significance of connectivity across reef and non-reef areas (Cappo & Kelley, 2000). Small MPAs may only be sustainable if similar patches of habitat occur nearby, and on the level of protection of these patches. In the EAME, many existing MPAs already include several linked habitats, particularly the larger areas. In Tanzania and Mozambique, all the MPAs include land as well as a range of subtidal habitat (islands, or more

recently large terrestrial components - e.g. Mnazi Bay and Quirimbas). In Kenya, MPAs are subtidal, with the landward boundary at the high water mark, with the exception of a few small islands in Kiunga, Kisite and Watamu.

3.2.1.7 How resilient is the existing system?

Habitats that are especially vulnerable to disturbance (i.e. less resilient to threats) need special attention. These often depend on biological or living structures e.g. coral reefs and mangroves, as disturbance of the structure risks destroying entire ecological communities. Coral reefs have been most studied in the context of 'resilience' because the extent to which high sea surface temperatures affect them is proving to be very variable. The intensity of bleaching, the number of species affected, the depth to which bleaching occurs, and the extent of mortality vary according to where a reef is located and the local conditions affecting it. For example, bleaching events are sometimes less severe on reefs affected by cool oceanic water or by turbid water which reduces light penetration. If such patterns can be understood, it provides an opportunity for MPAs to be selected and designed to protect those reefs more likely to survive - i.e. those that are most resilient and have greatest 'survivability' (Salm *et al.*, 2001; Salm & Coles, 2001).

Guidelines for ensuring that resilience is taken into consideration when developing MPA networks have been produced (Salm *et al.*, 2003), the key principles being:

- Spreading the risk of damage or extinction by ensuring that habitat types are replicated in the network so that if one MPA is eliminated, others stay intact.
- Ensuring MPAs are effectively managed so that local threats are reduced or eliminated
- Building in good connectivity between MPAs, so that sites that survive a particular impact can provide a source of replenishment for those that have been damaged.
- Ensuring that some sites are fully protected, so that they are able to recover quickly from impacts such as bleaching.

Future bleaching events should be carefully documented so that data on resilient and resistant reefs is made available and can be incorporated into MPA network design.

3.2.2 How well are the existing MPAs meeting their objectives?

This section looks at how successful or effective the existing MPAs have been in achieving their objectives in terms of protecting biodiversity and contributing to sustainable livelihoods.

3.2.2.1 Are biodiversity objectives being met?

Very few, if any, MPAs in Kenya, Tanzania and Mozambique have the necessary quantitative baseline data from before protection started, the appropriate monitoring programmes, or sufficiently long datasets, to show trends in biodiversity that could be attributed to management. Kenya probably has the best monitoring programmes for ecological parameters and some of the longest established MPAs, but even so there are few conclusive results (most studies are comparisons between areas inside and outside MPAs). The best data are for coral reefs and reef fish.

Coral reefs: The impact of MPA establishment and management on coral reefs is difficult to judge because of the coral bleaching event of 1998 associated with El Nino which caused widespread coral mortality. Mortality was most severe in the north of the region (Kenya) where it reached 50-90% and least severe in southern Mozambique. Reefs inside and outside MPAs were both affected. In Kenya it was found that reefs within MPAs suffered greatest damage as these were the reefs with the more vulnerable coral communities, with species that are less tolerant to stress (McClanahan *et al.*, 2001). There are some indications that reefs within MPAs recovered faster than those outside, although this has been very variable. Recovery averages one third to one half pre-bleaching live coral cover levels (Obura *et al.*, 2002a). The key factors determining reef health thus seem to be coral bleaching, and in some areas (e.g. Tanzania) the use of destructive fishing gears, rather than the existence of MPAs *per se*.

Mangroves: In all three countries, mangroves come under Forestry legislation and are thus subject to specific controls on cutting. Tanzania probably has the most comprehensive mangrove protection programme, and a recent survey has found that the areal cover of mangroves has remained relatively constant over the last 10 years, although there has been a decline in quality. The lack of decline in cover may

however reflect more on the implementation of the Mangrove Management Programme, than of MPAs. In Tanzania all mangroves are gazetted as Forest Reserves, but cutting is allowed in all except one type of zone. For Kenya and Mozambique, there are no data to assess the extent to which MPAs have contributed to mangrove conservation.

Fish diversity and abundance: Analysis of data from no-take MPAs in the three countries (see country sections) suggests that these areas are indeed having a positive impact on fish populations (as opposed to fish catches - see below). McClanahan *et al* (1999) found that the no-take MPAs of Chumbe (Zanzibar) and Kisite (Kenya) have larger fish and a high diversity of fish species (sometimes 3.5 times more biomass) than reefs that were being fished off Dar es Salaam and in Tanga region. The abundance of three groups of economically important species (triggerfish, surgeonfish and parrotfish) is higher in no-take sites than in fished areas (McClanahan and Arthur, 2001). Another study (McClanahan, 2000) showed that the no-take areas at Malindi, Watamu, Mombasa, Kisite and Chumbe, have led to the recovery of the heavily overfished triggerfish *Balistapus undulatus* in those MPAs within 5-10 years (although 30 years may be necessary for full recovery). Some of these effects may be due to the fact that MPAs have generally been established in particularly diverse areas, but nevertheless it seems that well enforced no-take sites can have a positive impact.

3.2.2.2 Are socio-economic objectives being met?

Lack of comprehensive socio-economic monitoring programmes in and around MPAs means that it is not possible to assess their socio-economic benefits in any detail. However, there are indications that these can be significant.

Fisheries: As mentioned above, there is now substantial evidence to show that closed areas allow target fishery species within the MPA to grow older and larger, thus increasing biomass and fecundity, and that this can often happen very rapidly. This means that they should produce more young, and one would expect that these, plus surplus adults, would 'spill-over' the boundaries to replenish fished areas outside the MPA and ultimately lead to increased catches. Some studies have indeed shown this (see reviews by Ward & Heineman (2002) and Gell and Roberts (2003a and b)). For example, five closed areas around the



Sewing Nets. (Sue Wells)

Island of St Lucia in the Caribbean, covering 35% of coral reef fishing grounds, increased catches in adjacent waters by 46-90% depending on gear type (Roberts *et al.*, 2001); and similar results were obtained at MPAs in Egypt (Galal *et al.*, 2002). However, there are also many studies that have not demonstrated clear catch increases following closure of an area, or have found that the increase is not maintained and revenue from the fishery still remains lower than perhaps before closure of the fishery.

For many of the MPAs in Kenya, Tanzania and Mozambique, fishermen report that fish catches immediately outside closed areas are 'better', although monitoring data may not necessarily show significant changes. It is often difficult to separate the impact of closed areas from improvements that may be due to overall better management of fisheries (where this has occurred), such as decreasing use of dynamite and other damaging fishing methods. In Kenya, catches initially increased following enforcement of Mombasa MNP but total fish catch was about 30% lower than before the MPA was established as there were fewer fishermen (those previously fishing in the MNP location had to move fishing grounds or find other livelihoods) (McClanahan & Mangi, 2000 and 2001).

In Tanzania, many fishers perceive that catches have improved in Tanga Region since closed reefs have been established and the dynamite fishing ban enforced more effectively, but there are similar reports from Menai Bay where there is no closed area,

although similarly more effective enforcement of fishing gear restrictions.

No-take areas should therefore not be seen as an immediate solution to overfishing, but rather as one of several tools for fisheries management and indeed FAO is now recommending them in this way (FAO, 2002). In some cases, the 'spillover' effect may not be sufficiently large to

make up for loss of income due to reduction in the size of the fishing grounds. The success of an MPA may be affected by the extent to which fishermen are displaced and lose their livelihoods, or find that their catch is reduced. This will be a particularly important issue to look at in Kenya, Tanzania and Mozambique, where fishing is often the occupation of 'last resort' for people with no land or employment. Nevertheless, no-take areas should be included in any MPA network, not least because they will act as an 'insurance' mechanism to make the catch outside the area more diverse, sustainable and less vulnerable to collapse, and will at minimum help to maintain or slow declines in fish catches.

Tourism: There is some evidence, although poorly quantified, to suggest that MPAs can generate greater income from tourism than from the fisheries that they displace (in the case of no-take areas) or reduce (in the case of areas where fishing is allowed but in a more regulated fashion). Communities living adjacent to MPAs in Kenya benefit from a range of employment opportunities generated by tourism that is related to the MPA (e.g. providing boat services, managing tourist attractions such as boardwalks, etc). In Mozambique, an estimated 25% of local communities benefit from the tourism generated by Bazaruto Archipelago Marine Park and, at several of the new MPAs in the country, systems are being set up to ensure that some of the revenue generated goes directly to community development projects. Similar schemes are in place or being established at the community-managed and



Chumbe Coral Park. (Sue Wells)

privately operated MPAs on Zanzibar, and are planned for the government sites on the mainland. Such mechanisms tend to take time to develop and negotiate, but if a successful arrangement can be set up, local communities should be able to benefit significantly from MPA-generated tourism.

Other livelihood benefits: Donor support and technical assistance to MPAs often includes initiatives to introduce livelihood activities designed to benefit local communities and take pressure off marine resources. The successes and failures of these have not been well documented in the EAME, but there are a number of studies to suggest that these activities, if implemented appropriately, can improve livelihoods. In Kenya, women's groups have benefited from MPA-related enterprises, such as a mangrove boardwalk adjacent to Kisite Marine Park which is run by women, and a handicraft programme using recycled materials at Kiunga Marine Reserve. Fishermen affected by the existence of the MPAs at Mombasa and Diani have received assistance through government agencies such as CDA/Fisheries Dept/KWS in activities such as obtaining tenure of their landing sites, improving access to the landing sites, and building or renovating facilities. Such assistance might not have come about if the areas had not been designated MPAs. In Tanzania, community development has become a central feature of the management of many of the MPAs, with community development funds being established using revenue from the MPA, and a range of supplementary income generating activities being set up in adjacent local communities. It would be interesting to review this experience in order to develop a better understanding of the extent to which they have improved livelihoods and the extent to which the existence of the MPA has contributed.



Bwasini Women. (Sue Wells)

3.3 Opportunities and recommendations for improvement

There are two components to improving the network of MPAs in the EAME:

- Ensuring sustainable and effective management of existing MPAs.
- Expanding the network by creating new MPAs.

3.3.1 Management of existing MPAs

This analysis has shown that existing MPAs are already playing an important role in biodiversity protection and sustainable development, but lack sufficient capacity and financial support to meet their objectives fully. It will be essential to make sure that the growing interest in establishing new protected areas to fill gaps in the network does not erode the financial support that is still urgently needed for improvement of management effectiveness. Key areas requiring strengthening and support are:

3.3.1.1 Partnerships for management and promoting greater stakeholder involvement

All three countries had, in the past, a predominantly government-based approach to establishing MPAs, and all have experienced cases of conflict between the MPA management authorities and other stakeholders either during the set-up phase or in subsequent management. Steps are being taken in each country to address this but further work, to ensure appropriate sharing of management responsibilities and benefits from the existence of MPAs, is still required. New policies on natural resource use in Tanzania require the participation of civil society in decision-making and implementation which provides a good framework for developing more acceptable, and potentially more easily enforceable, MPAs with local implementation and co-management arrangements. In Kenya, an expert review of existing legislation is needed to clarify the types of MPA that can be set up (e.g. co-management arrangements, community conservation areas etc). Pilot sites where new approaches might be tested include Diani and Ras Tenewi. In Tanzania and Mozambique, MPAs are being set up with significant involvement of the private sector in the form of tourism operators; the development of these initiatives is revealing

the difficulties involved, but also the potential benefits. These models should be carefully documented and monitored and incorporated into any overall network to ensure that lessons learned from them are shared widely.

3.3.1.2 Improving MPA legislation and enforcement

In Kenya on-going review of the wildlife and fisheries legislation needs to look more closely at the needs of MPAs, so that more appropriate and specific MPA-related measures are included, particularly in terms of involving stakeholders and allowing for community involvement (the Tanzanian MPA legislation provides one model). In Tanzania, there is some evidence that enforcement is better in the smaller MPAs managed through communities or private tourism operators.

3.3.1.3 Linkage into wider integrated coastal management and fisheries management programmes

Global guidelines are being prepared that will emphasise the importance of developing an agreed approach on the relationship between MPAs and other forms of economic development, such as tourism, industry and port development, and setting MPAs more clearly within a framework of ICM (Cicin-Sain & Belfiore, 2003). Mainland Tanzania has the most well developed ICM programme and steps are being taken to ensure that the MPA system is a fundamental element in the overall plan; similar programmes are underway in Mozambique. In Kenya, however, the process for developing a national ICM policy needs to be accelerated.

None of the three countries has yet fully integrated their MPAs with their sectoral fishery management systems and in each country, the Fisheries Departments and MPA agencies need to work more closely together. A further study of the potential for no-fishing areas for both protecting biodiversity and as a fisheries management tool is required. Better monitoring and evaluation of existing no-take sites is required, and consideration given to establishing new or larger ones, bearing in mind the difficulty of doing this in countries of the EAME where there is high demand for fishery resources (a similar situation is found in the Philippines - Christie *et al.*, 2002). At the same time, there is an urgent need to develop policies and implement measures to provide livelihoods for fishermen displaced by closed areas.



Mnazi Bay, Mtwara. (Sue Wells)

3.3.1.4 Assessing management effectiveness as a regular procedure, and strengthening monitoring programmes

This attempt to assess how well MPAs are achieving their objectives demonstrates the urgent need to improve monitoring programmes at most if not all MPAs in the EAME, so that they are better designed for measuring management effectiveness and success. Coral reefs are being monitored in all three countries but this is not well integrated with MPA management. Greater attention should be paid to the analysis and interpretation of data, and to ensuring that MPA staff are involved in all aspects of monitoring, from planning through data collection to analysis. Methods should be refined so that they are appropriate for the skills, capacity and needs of each site. For most MPAs, and indeed the entire EAME, more comprehensive data collection and data management programmes for coastal and marine resources are required, including mapping, to establish a clear baseline from which management effectiveness can be measured. Ensuring that there is regular assessment of management effectiveness at each MPA (perhaps linked to revision of the management plans) will also

help to improve day-to-day management and to promote better use of management plans and the development of these where they do not exist. The IUCN-EARO supported initiative to develop a workbook for the region on assessment of management effectiveness, and the testing of the methodology, should be followed up.

3.3.1.5 The funding base

In Kenya and Tanzania, the government makes a regular but insufficient contribution to MPA management in terms of staff salaries and some of the recurrent costs of day-to-day



Mnazi Bay Sign. (Sue Wells)

management. All three countries have systems of visitor entrance and other user fees but only Kenya generates significant income in this way, and in this country the revenue goes to KWS central funds and helps to cover the cost of management of the terrestrial protected areas as well as MPAs. It is unlikely that any national MPA system could depend on revenue from visitor fees alone as the tourism industry in this region fluctuates considerably, and some MPAs are not attractive for recreation (Francis *et al.*, 2002). The current MPAs are thus far from being financially viable, and much of the management cost is met through donor funding, on a project basis, which inevitably leads to fluctuations in income and in focus (donor funds are often for specific activities or components of park management). The privately financed MPAs (for example those in Zanzibar) present interesting models in that they are by and large self-financing. Preliminary recommendations relating to sustainable financing resulting from recent World Bank studies in Tanzania should be looked at more closely; in particular, attention should be paid to attempting to diversify sources of revenue generation, for example through licensing and taxation of marine products.

3.3.1.6 Training and capacity building

Recent innovative regional training activities, spearheaded by WIOMSA, such as the MPA managers training course and the coastal leadership course have contributed

substantially to current capacity in the region, and funding is needed to continue these (Wells *et al.*, 2003). The production of a training manual (Francis *et al.*, 2002) and the 'Toolkit for MPA managers' (prepared by WIOMSA, with the support of IUCN-EARO) will also assist. Other useful approaches to capacity building include in-service training programmes and exchange visits and the introduction of management effectiveness assessments.

3.3.2 Expanding the MPA network

All three countries are taking active steps towards establishing national networks of MPAs, but as yet there is no co-ordinated approach to developing a regional network. A systems plan is a recommended first step in developing a network or system for a country (Davey, 1998), and perhaps should be considered for the EAME, recognising that the priorities at country level will be to develop national MPA networks. Key steps in a regional MPA network plan might be:

3.3.2.1 Developing a baseline

The WWF EAME programme has already made an important first step, but there is still a need to gather further information and map and ground truth ecosystems and species distributions to provide a sound scientific basis for the design of the overall network and selection of new sites. National level GIS mapping programmes are urgently needed.



Field Day in Chumbe. (Sue Wells)

Given that resources for full national surveys may not be available, consideration should be given to focusing on the EAME` priority seascape areas where these have not been surveyed in detail. The lack of primary distribution data for many key species needs addressing, and in some cases could be gathered using some sort of the Rapid Assessment methods that have been developed for other parts of the world. For some species such as turtles, data may be available but are not collated or available in a useful format.

3.3.2.2 Defining goals and objectives for a regional network

Such an exercise would need to be carried out by the agencies and bodies responsible for MPA establishment at national and regional level, such as GEMPA and the Ad Hoc Technical Committee of the Nairobi Convention.

3.3.2.3 Developing criteria for site selection

Generic criteria for MPA site selection have been drawn up by many authors, and more recently specifically for networks of no-take MPAs (e.g. Roberts *et al.*, 2003a). The latter can be applied equally well to the full range of MPAs, particularly since many are zoned to include no-take areas. The recent sets of generic criteria emphasize the role of a site in relation to other existing or planned MPAs and thus help with the establishment of networks.

3.3.2.4 Identifying sites and biodiversity components protection

The EAME process has helped to identify some of the priority areas for establishment of new MPAs (Table 5). 8 of the EAME seascapes discussed in this report do not have MPAs (1 in Kenya, 2 in Tanzania, 5 in Mozambique), and even in those where some form of protection exists, this often covers a small area. WWF will be facilitating initiatives in several seascapes under its EAME Strategic Framework 2004-2024, including the Rufiji-Mafia-Kilwa Seascape Programme in Tanzania. In addition, a number of national initiatives, supported by different donors, are underway. The two

transboundary EAME seascapes (Shimoni-Tanga and Mtwara-Quirimbas) are likely to receive special attention.

Several seascapes meet the criteria for nomination as World Heritage Sites. The following were identified as potential sites at the World Heritage Marine Biodiversity Workshop in 2002 (Hillary *et al.*, 2002):

- Four sites are considered to be of Outstanding Universal Value in terms of their coastal, marine and small island biodiversity attributes (A list): - 2 in Tanzania (Kilwa - ruins already designated a cultural World Heritage Site; and Mnazi-Bay/Ruvuma Estuary); and 2 in Mozambique (Bazaruto and Maputo Bay - Machangulo Complex).
- Four sites have significant components of Outstanding Universal Value but need further studies to determine whether they would meet the World Heritage criteria (B List): 1 in Kenya (Kiunga-Lamu), 1 Kenya/Tanzania transboundary area (Shimoni-Tanga), 1 in Tanzania (Pemba) and 1 in Mozambique (Zambezi River Delta).
- Two sites may be of Outstanding Universal Value but there is insufficient information and further research is needed (C list): both are in Mozambique: Ilhas Primeiras e Segundas and Nacala - Mossuril.

3.3.2.5 Identifying options for facilitating a co-ordination mechanism

Management efficiency can be increased by ensuring that mechanisms are set up whereby MPAs within a network can share resources, technical expertise, research facilities, and information sources. Some co-ordinating mechanisms already exist at the regional level (e.g. GEMPA; Nairobi Convention Coral Reef Task Force and other working groups; EAME Committees), and there is already much progress in networking and sharing of lessons learned. A network of MPA managers and practitioners has been established by WIOMSA, which has an electronic discussion group and a newsletter.

Table 7. Recommendations relating to EAME priority seascapes (See Section 5 for further details)

EAME priority area		Recommendations
KENYA		
Kiunga-Lamu	G	Increase the size of Kiunga MNR by extending seaward boundary to include outer reefs; find an appropriate mechanism for protection of Ras Tenewi and adjacent waters
Tana R. Delta	ER	Explore mechanisms for protection, particularly potential for a coastal wetlands reserve/Ramsar site; protect turtle nesting beach at Kipini using community-based management; (IUCN is involved in preparing a concept for a management plan for the area)
Malindi-Watamu	G	Possible nomination of Mida Creek as a Ramsar site (it is already a Biosphere Reserve and includes an IBA)
Shimoni-Tanga	ER	Possible extension of Mpunguti MNR to Tanzania border and development of a transboundary initiative with Tanzania
UNITED REPUBLIC OF TANZANIA		
Bagamoyo	SA	Gazettement of marine extension of Saadani proposed National Park
Rufiji-Mafia-Kilwa	G	Designation of a Ramsar site in the Rufiji Delta (proposed but not yet declared); establishment of a dugong sanctuary
Mtwara-Quirimbas	G	Development of a transboundary conservation area with Mozambique (feasibility study underway through current GEF project that supports the development of Mnazi Bay Marine Park)
Unguja	ER	Establish additional MPAs e.g. Mwaruga and Nyange reefs (recommended in 1993 according to Nassor, 1998); islands off Stone Town
Pemba	ER	Establish additional MPAs; Matumbini reef complex; Mtangani reefs; Muongoni Bay; Ras Kiuyu (recommended in 1993 according to Nassor, 1998)
Latham I.	ER	Establish a protected area
MOZAMBIQUE		
Mtwara - Quirimbas	G	Quirimbas (G) - establishment of transboundary conservation initiative with Mnazi Bay - Ruvuma Estuary MP in Tanzania; establishment of new MPAs in northern coastal provinces of Nampula and Cabo Delgado currently being considered as part of the IDA/World Bank/GEF/MICOA project.
Inhambane Bay	SR	Co-management MPA areas being identified under DANIDA project
Maputo Bay - Machangulo Complex	G	Ponta de Ouro (key turtle nesting site) - Cabo de Santa Maria (extension of Maputo Reserve is being considered - 3 miles offshore on the ocean side, 1 mile offshore on the bay side); Maputo Reserve is a potential Ramsar site; (project underway to identify MPAs along coast from Maputo Bay-Machangulo-Ponta de Ouro (with MICOA, DNAC, Univ. Eduardo Mondlane, South Africa and European partners) for submission to EU for funding. The new protected area would extend to the South African border and thus create a transboundary conservation area with Greater St Lucia Wetlands Park. Management of existing MPA at Islas Inhaca e Portuguese needs strengthening and supporting - there is a proposal for this protected area to become a National Park

4. REVIEW OF STATUS OF MPAs IN THE EAME

4.1 KENYA

Kenya has a National Biodiversity Strategy and Action Plan, as well as a National Environmental Action Plan, both of which recognise the importance of the coastal and marine environment. Kenya has the smallest coastline and EEZ of the three countries, but has one of the longer running government-supported coastal resources management programme, with some of the earliest MPAs in the region.

4.1.1 National MPA coverage

Kenya has two types of MPA:

- **Marine National Reserves (MNRs)**, of which there are 6: **Kiunga, Watamu** and Malindi (which form a single area, including Mida Creek), **Mombasa, Diani** (although gazetted in 1995, this has never been managed or implemented), and Mpunguti. Traditional forms of fishing, as well as recreation, are permitted within Reserves, and these essentially act as a buffer to the Marine National Parks.
- **Marine National Parks (MNPs)** of which there are 4: **Malindi, Watamu** and **Mombasa**, which lie within their respective MNRs; and **Kisite**, which lies adjacent to a MNR (Mpunguti). Kiunga and Diani MNRs have no associated MNPs. No extractive activities are permitted in MNPs, but recreation is allowed.

Mangroves are not specifically designated as reserves or forest reserves (cf Tanzania) but there is legislation regulating cutting, and currently a moratorium on commercial cutting for export. It is not clear whether mangroves within MPAs (e.g. Kiunga, Mida Creek and Diani) receive any special protection.

4.1.2 Long-term vision and objectives

Each MPA has a mission statement defined in its management plan, which is adapted to suit the MPA, and has the following general format:

"To protect and conserve the marine and coastal biodiversity and the related ecotones for posterity in order to enhance regeneration and ecological balance of coral reef, sea-grass beds, sand beaches, and mangroves to promote sustainable development, and to promote scientific research, education, recreation, and any other compatible resource utilisation."

Each MPA has the same three specific goals:

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

Under each goal, a series of objectives is laid out for each site.

4.1.3 Policy, legislation, institutional arrangements and management approaches

MPAs are established under the Wildlife Conservation and Management Act of 1976. The Amendment to the Act of 1989 established Kenya Wildlife Service (KWS) as the agency responsible for their management. At present there are no regulations specific to MPAs; however, the Act is being revised to bring it into line with the Environment Co-ordination and Management Act (see below) and should incorporate amendments that will make it more applicable to the marine environment. The Regional Assistant Director for Coast Region in Mombasa oversees MPA management (KWS headquarters are in Nairobi).

KWS is legally required to prepare management plans for each MPA, and all sites other than Diani MNR now have these. Apart from Diani MNR, each MNP/MNR complex has a full complement of staff, comprising a warden, rangers and support staff, all of whom receive training at the two KWS centres, one

of which is for enforcement activities and the other (Naivasha) for technical issues. The main management activities are revenue collection, conflict resolution with stakeholders, enforcement through patrolling (all KWS staff have military training) and monitoring. The MPAs are not zoned, but the two categories effectively form a larger zoned area where they occur together (e.g. Mombasa and Malindi/Watamu, where the MNPs lie within the MNRs; and Kisite MNP/Mpunguti MNR where they are adjacent to each other). MPAs are considered to play an important role in national security, which is one reason why a paramilitary approach to management is used.

In the past, MPAs were established and managed by the Government with relatively little input from other stakeholders. This approach is now changing, but full participation of stakeholders is hampered by legislation that makes no specific provisions for co-management, and by the lack of government policy providing real incentives for this. On the positive side, the increasing organisation of the stakeholders themselves (through fishermen and boat operator associations) is making it easier to develop partnerships for effective management interventions, and the 1999 Environment Co-ordination and Management Act provides for community participation. Relationships with the tourism industry are also improving; for example, the Tourism Department consults KWS before issuing any licences for activities that might impact an MPA.

Each MPA receives an annual budget from central government, which covers salaries but is currently insufficient for other recurrent costs and full implementation of the management plans (there has been a recent decrease in funding, partly due to the decline in tourism). Visitors to MNPs pay a daily entrance fee and boats using the area on a regular basis must pay an annual or daily fee. This revenue goes to KWS central funds, rather than directly back to the site (cf MPAs in Tanzania). Some sites (e.g. Kisite MNP) earn sufficient revenue to cover their management costs, but others outside the main tourist circuit do not (Emerton & Tessema, 2001). There has been little analysis of how current revenue from tourists is used and as a result there is little incentive for MPAs to increase revenue.

KWS still relies on substantial donor support. Recently this has included:

- The KWS/Netherlands Wetlands Conservation and Training Programme which has helped the entire MPA programme (assisted with preparation of management plans, development of infrastructure, training and capacity building).
- UNEP/ICRAN (support to Malindi and Watamu MNPs and MNR).
- WWF (Kiunga MNR).
- IUCN (Kisite MNR/Mpunguti MNP and Diani MNR).
- Other supporting NGOs (e.g. Birdlife/Arabuko Sekoke project), and the Coral Reef Conservation Project (CRCP) and CORDIO which contribute assistance in the form of monitoring and research activities in several MPAs, particularly in relation to coral reefs and artisanal fisheries.

KWS, with its partners, runs a wide range of education programmes and public awareness raising activities including an annual Marine Environmental Day, participation in the annual international coastal clean-up initiative, a mobile education unit, various leaflets and publications, and a training centre at Malindi that is used by schools, universities and researchers.

4.1.4 MPAs in the broader context of ICM

The 1999 Environmental Management and Co-ordination Act established the National Environment Management Authority (NEMA) that will play an important role in overseeing coastal management activities, once it is fully operational. There are long standing plans for development of a national coastal management policy. Integrated coastal area management is the responsibility of the ICAM Secretariat, which has membership of the Coast Development Authority (CDA), KWS, KEMFRI, Mombasa Municipal Council and the Fisheries Department. It is chaired by CDA which is responsible for co-ordination of coastal development planning (Mwaguni *et al.*, 2001). The Secretariat and CDA do not play a direct role in MPA management and establishment but assist with policy issues; closer linkages between the agencies are being forged. Pilot ICAM projects have been involved with MPAs: a project at Bamburi-Nyali, funded through US-AID, helped to improve management of Mombasa MNP/MNR through development of public facilities at the beach, and promoting stakeholder involvement in management activities with fishermen (CDA *et al.*, 1996); and a project in the Diani-Chale area was designed primarily to

Table 8. Kenya: MPAs and EAME priority seascapes

Priority Area	EAME Cat	Area km ²	Current MPAs	IUCN Cat	Date estab.	Area km ²	% area protected
Lamu Archipelago	G	6,064	Kiunga MNR(Biosphere Reserve estab in 1980)	VI	1979	250.0	4.0
Tana R. Delta	ER	3,347		--	--	--	0.0
Mida Creek-Malindi	G	1,563	Malindi MNP	II	1968	6.3	17.0
			Watamu MNP	II	1968	10.0	
			Malindi-Watamu MNR(Biosphere Reserve estab in 1979)	VI	1968	245.0	
--	--	--	Mombasa MNP Mombasa MNR	II VI	1986 1986	10.0 200.0	N/A N/A
--	--	--	Diani MNR	VI	1995	75.0	1.3
Msambweni - Tanga*	ER	2,990	Kisite MNP	II	1978	28.0	
			Mpunguti MNR	VI		11.0	

* = transfrontier priority seascape

resolve some of the conflict that developed over the establishment of the Diani MNR (ICAM Secretariat, 2002). The Kenya Marine Forum, which brings all coastal and marine stakeholders together, could potentially also play an important role.

4.1.5 Management effectiveness

Although there are still gaps in the Kenyan MPA network, considerable progress has been made. Total coverage by MPAs is 735 km², with MNPs covering 54 km² and MNRs covering 681 km². Kenyan MPAs are entirely subtidal and intertidal, apart from some small islets in Kisite MNP/Mpunguti MNR, Malindi and Watamu MNP/MNR and Kiunga MNR. About 8% of the continental shelf to 200 m depth (c. 8,460 km²) is now legally gazetted (although in the case of Diani MNR is unmanaged). Kenya includes two of the EAME biogeographical subregions: the Monsoon Coast and the Coral Coast. Kiunga MNR lies in the Monsoon Coast, and the remainder in the Coral Coast - the former biogeographical region is thus less well represented in the existing network.

There are four priority EAME sites in Kenya (Table 8). Two are globally important: 4% of the Lamu Archipelago is protected by Kiunga MNR; and 17% of the Malindi-Mida Creek priority area is protected by the Malindi-Watamu complex of MPAs. Two priority areas are ecoregionally important: the Tana River Delta has no legal protection; the Msambweni-

Tanga area includes Kisite MNP/Mpunguti MNR which covers 1.3% of the overall area (this is a transboundary site with Tanzania). The MPAs at Mombasa and Diani do not lie within priority EAME areas. Priority areas are thus fairly well represented in the existing network, with 3 out of 4 included, but the Tana River Delta is a significant gap.

There are no coastal and marine World Heritage Sites or Ramsar sites. Two MPA areas are designated under the UNESCO Man and the Biosphere Programme. Kiunga MNR is part of a Biosphere Reserve that includes the adjacent terrestrial Doodori National Reserve, and Malindi and Watamu MNP/MNR have also jointly been designated a Biosphere Reserve.

4.1.5.1 Management effectiveness - marine biodiversity protection

Kenya's MPAs cover a wide diversity of habitats and species of concern, although some sites were established as much for tourism purposes (e.g. Mombasa and Diani) as for biodiversity protection needs. An assessment of management effectiveness of each MPA (apart from Diani MNR), funded through NORAD and ICRAN-UNEP and with technical assistance from IUCN-EARO, has indicated that marine biodiversity is probably better protected within the MPAs than outside them (Muthiga & Wells, 2003).

Coral reefs: All the MPAs protect coral reefs and sandy beaches, among the principal attractions for tourists. The total area of reef

in Kenya is c. 630 km² (Spalding *et al.*, 2001) but the amount (and amount of each reef type) within the MPAs is not known. The assumption can be made that all the closed areas (MNPs) are essentially coral reef habitat; on this basis an estimated 8.6% of this habitat is fully protected. As in all countries in the Western Indian Ocean (WIO), the impact of MPA management on coral reef health is obscured by the heavy mortality and damage from bleaching during the 1997/98 El Nino event. In Kenya, live stony coral cover averaged 20-40% before the event, but is now only c. 11% (Obura *et al.*, 2002). Live coral cover in MPAs was originally above average (at 45%), but these sites suffered particularly high mortality (up to 70%), and density of genera per site declined by 30%. By contrast, unprotected reefs had lower live coral cover before the event (only c. 20%) and also lower mortality as a result of bleaching (c. 45%) (McClanahan *et al.*, 2001). This is largely because MPAs had coral genera and populations that were more vulnerable to bleaching and other stresses than coral reefs outside the MPAs, which have already lost such components of their reefs.

Mangroves and estuarine habitats: These ecosystems are probably not adequately represented in the current MPA network, reflecting the fact that some of the Kenyan MPAs were set up in response to tourism needs. Mangroves cover c. 530 km² (Spalding *et al.*, 2001) but the largest mangrove areas (the Lamu area - which is the third largest area of mangroves on the East African coast, covering 335 km² - and the Vanga-Funzi coastal system near the Kenyan-Tanzanian border) - are not protected. There are also no MPAs in the main estuaries of Tana and Sabaki.

Dugong: This species, although once present in small numbers along the entire coast, now occurs only in two small populations from Lamu north to Kiunga and the Somali border, and from Gazi south to Shimoni and the Tanzanian border. Both populations receive some protection within existing MPAs, but further specific work to protect these small numbers is required.

Other marine mammals: Dolphins and a number of whale species occur regularly in Kenyan waters, both as residents and passing through on migration. There is a resident population of dolphins in Kisite MNP which has become an important tourist attraction. There is no regular monitoring, but it seems unlikely

that any of the MPAs play a significant role in maintenance of marine mammal populations.

Birds: There are five Important Bird Areas (IBAs) for seabirds and migratory coastal wading birds (Bennun & Njorege, 1999):

- Kiunga (key population of Roseate Terns).
- Tana R. Delta.
- Sabaki R. Mouth.
- Mida Creek, Whale I. and Malindi-Watamu area.
- Kisite Island.

Three of these (Kiunga, Mida Creek and associated islands, and Kisite Island) lie within existing MPAs, but the extent to which their protection is effective is not known. It is to be expected that Kiunga MNR (initially established largely for bird protection) has played a role in the survival of the roseate tern colonies. Similarly, the existence of Malindi-Watamu MNR, where bird watching is a popular activity for tourists, has probably contributed to protection of the IBA in that area.

Marine turtles: In comparison with other EAME countries, Kenya has a very small turtle population, but has the most active turtle conservation programme. The green turtle is the commonest nesting species. Important turtle nesting beaches and foraging grounds occur in most of the MPAs, particularly Kiunga NMR, but Kipini, in the Tana Delta area which is one of the main nesting sites in Kenya has no protection although a turtle management project is underway there. A national marine turtle strategy emphasises the need to identify critical habitats and incorporate these in planning (KESCOM, 1996). Kenya has a strong national co-ordinating body, KESCOM, for turtle conservation, and this could play an important role in ensuring that data is collated at national level and made more widely available.

Fish: For most fish and invertebrates there is still insufficient information on distribution and population size to be able to judge the extent to which the MPAs are effective. Fish species distributions are still poorly known (one survey was carried out at the end of the 1980s (Samoiyls, 1988)) and have never been mapped in any detail. Of the larger species, it is known that certain areas are important for billfish and Marlin but, as with much species information, these 'informal' data are not collated in such a way that they can be easily accessed. Whale sharks are increasingly seen

on migration, and have become a tourist attraction at Watamu, Malindi and Diani. A single coelacanth was caught off Malindi in 2001, the first record of this endangered species in Kenya. Endemic species are very poorly known - Baensch's Damsel *Pomacentrus baenschii* is a coral reef fish that is endemic to East Africa; within Kenya, it has been recorded in Kisite and Mombasa only (this distribution may be an artefact of research and monitoring effort).

Monitoring of reef fish populations and some commercial fish species inside and outside MPAs has indicated that fish abundance and biomass is greater in some MPAs (Mombasa and Kisite MNPs and Kiunga MNR) than outside (McClanahan *et al.*, 1999). Fish density within MNPs ranged from 900-1200 kg/ha, much higher than in MNRs (500kg/ha) and unprotected areas of reef (100kg/ha). MPAs have also had an impact on the triggerfish *Balistapus undulatus* which had been heavily overfished, but whose populations in Malindi, Watamu, Mombasa and Kisite MNPs have recovered since their establishment (McClanahan, 2000). For Mombasa MNP, which is the best studied MPA, fish biomass increased from 180 kg/ha in 1987 to 610 kg/ha in 2000 (with a peak in 1994 of 1140 kg/ha); in the MNR, biomass remained fairly constant (180 kg/ha in 1987; 120 kg/ha in 2000); and at Vipingo, a site outside the Park and Reserve, biomass was even lower (60 kg/ha in 1987, 70 kg/ha in 2000) (Rodwell, 2001). Fish abundance data from Kiunga MNR, where there are no closed areas, indicates that abundance is correlated with fishing pressure, and is highest in the north where fishing pressure is lowest (Obura, pers. comm 2003).

Invertebrates: These taxonomic groups are even less well known, and new species are still being described (e.g. the recent discovery of a new sea cucumber species). There is some evidence that gastropod mollusc populations have increased within MPAs, presumably as a result of the reduction in shell collecting pressure at these sites. However, little can be concluded at present in terms of the role of MPAs in protecting invertebrates.

4.1.5.2 Management effectiveness - sustainable livelihoods and poverty alleviation

MPAs in Kenya have their landward boundary at the high water mark, with the exception of a few small, uninhabited islands in Kisite MNP/Mpunguti MNR, Malindi-Watamu MNR, and Kiunga MNR. Unlike Tanzania, therefore,

no people live within the boundaries of the MPAs. Nevertheless large human populations depend on the resources of these areas. As with other countries, fisheries and tourism are the principal benefits from MPAs.

Fisheries: Fish catches have not shown major increases since establishment of the MNPs in locations where these are being monitored, but there is a general feeling that the protection given to the fish populations by these no-take areas (see above) will at minimum be helping to maintain or slow the decline in fish yields. For example, once Mombasa MNP was enforced, catches per fisherman outside the park (i.e. in the MNR) increased by about 50%, with highest catches at landing sites closest to the park. However, total fish catch was about 30% lower than before the MNP was enforced as there were fewer fishermen (those previously fishing in the MNP location had to move fishing grounds or find other livelihoods) (McClanahan & Kaunda-Arara, 1996; McClanahan & Mangi, 2000). Landings at several sites near the Park continued to decline between 1994 and 1999 (McClanahan & Mangi, 2001). It is possible that this is because the closed area (MNP) is not large enough to supply sufficient 'spillover' for the size of the fishery.

In addition to increased (or more secure) fish catches, fishermen affected by the existence of the MPAs at Mombasa and Diani have received assistance through government agencies such as CDA/Fisheries Dept/KWS in activities such as securing tenure of and improving access to their landing sites, and building or renovating facilities. This might not have come about if the areas had not been MPAs, with the resultant concern about (and often conflict over) the rights of different user groups to the locality.

Tourism: KWS, through a range of projects (e.g. with ICRAN funding at Malindi MNP; and through a BMZ/IUCN project at Kisite MNP/Mpunguti MNR) has provided support to local boat operators in the form of training, development of codes of conduct, installation of moorings and provision of other facilities. For example, a mangrove boardwalk has been built on Wasini I., which is managed by the village women's group and has brought significant financial income from tourism to the village - the tourists come primarily to see Kisite MNP, but stop off to visit the mangrove board walk; over \$14,000 were raised for community projects in the two years after the boardwalk opened. Communities are similarly

benefiting from a bird hide at Mida Creek. Employment opportunities almost certainly increase in many areas where MPAs have been established; although this has not been well documented, there is some evidence for this from research carried out at Kisite MNP/Mpunguti MNR (Malleret-King, 1998; 2000).

At several MPAs, local communities have almost certainly benefited, if they live sufficiently close to them, through increased visitor numbers and demand for a range of services. Malleret-King (2000) found that communities living nearer Kisite MNP/Mpunguti MNR had greater 'security' than those living further away, in that they were able to obtain food more readily as a result of better cash flow. It was concluded that this was partly due to the fact that these families fished nearer the MPA (suggesting that there may be some 'spillover' effect from the MNP) and that some of these families earned additional income from tourism activities related to the MPA.

However, many MPAs have resulted in conflict, with large-scale tourism operators and local boat operators competing for snorkelling and diving clients. Efforts are underway to try and reduce this. Kenyan tourism has seen a decline over the last year, and MPAs may be able to play an important role in helping to attract tourists back to the country.

4.1.6 Constraints

- *Restrictive funding arrangements:* the retention of all revenue by KWS HQ does not provide any incentive for managing an MPA in such a way as to maximise its attraction to visitors and thus its income; alternative systems have been proposed (e.g. Emerton & Tessema, 2001) but have not as yet been acceptable to the government.
- *Declining donor support:* the long-running Netherlands KWS Wetlands Programme has ended, as have individual MPA-specific projects; US-AID funded ICM activities which also indirectly assisted MPAs are now greatly reduced. These major cuts are likely to reduce significantly the capacity and resources available for the development and effective management of the MPA system.
- *Insufficient management capacity:* although Kenyan MPA staff in general have good technical capacity, training is needed on specific MPA management skills, particularly community involvement,

- partnership development, and conflict resolution, as well as issues relating to management planning, reporting, monitoring, and proposal development.
- *Conflict with stakeholders:* although much improved, conflict with fishermen and local communities (a result of inadequate consultation when the MPAs were first established), still impedes effective management. The issues are largely related to the use of destructive fishing techniques, and competition between large-scale tourism operators and local operators. The EMCA allows for community participation but mechanisms are not yet in place to support this approach.
- *Re-allocation of KWS management staff to other posts:* one of KWS's policies (appropriate under certain circumstances) has had and continues to have a negative impact on MPA management - that of re-allocating staff to other protected areas, often at very short notice. Many KWS staff who have gone through extensive training in skills specific to MPAs (boat handling, fisheries, coral and fish monitoring etc) have been transferred to terrestrial protected areas.
- *Instability within KWS* in terms of leadership and overall direction, with frequent changes of management approach and policy, and lack of clear internal guidance on protected area management impedes effective management.
- *Conflicting mandates between KWS* and the Fisheries Dept (both responsible for enforcement of fisheries legislation in MNRs), KWS and the Forest Dept (both responsible for enforcement of mangrove legislation within MNRs), KWS and the Tourism Dept (the latter is responsible for issuing permits for tourism activities), and KWS and local authorities has been an obstacle to effective management. KWS has a full management mandate only in MNPs. MOUs have been developed with some agencies (CDA, KEMFRI, NMK, Forestry), in an effort to ensure that all partners know their responsibilities and contribute effectively, given that KWS does not have the necessary capacity, but these are not being fully implemented. Furthermore the existing protected area legislation lacks clear and specific provisions for MPAs. The Wildlife Act is currently being revised and there is an urgent need for those involved in MPA management to play an active role in this revision to ensure that appropriate provisions are introduced.

4.1.7 Recommendations

Kenya already has a relatively unified network of MPAs, managed to a large extent as a single system. However, it is recognised as being incomplete in terms of representativeness. To date there has been no overall scientific assessment of marine diversity that would provide the basis for a system plan, although additional priority areas for biodiversity protection are known. Lack of capacity in KWS for effective management is another reason why additional areas have not been established.

The following are general recommendations to improve Kenya's MPA network:

- Ensure that the on-going review of the wildlife and fisheries legislation takes account of the needs of MPAs, and results in the inclusion of more appropriate and specific measures relevant to them, particularly in terms of involving stakeholders and allowing for community involvement (the Tanzanian MPA legislation provides one model); KWS to meet with other relevant agencies (see above) to discuss this; develop specific regulations to implement the Wildlife Act at each MPA.
- Identify clearly the range of types of MPAs that might be feasible under Kenyan legislation and the mechanisms involved in implementing them (e.g. co-management arrangements, community conservation areas etc) - this may require a study of the legislation by a lawyer. Pilot sites where new mechanisms might be tested are Diani and Ras Tenewi.
- Accelerate the process for developing a national integrated coastal management policy.
- Initiate a comprehensive data collection and data management programme for coastal and marine resources, including mapping, to establish a clear baseline from which management effectiveness can be measured.
- Improve management of MPAs by incorporating periodic assessments of management effectiveness into the management cycle (preferably linked to revision of the management plans); improving capacity through appropriate training; and identifying more sustainable financing mechanisms.
- Strengthen monitoring programmes so that they provide data that can be used to assess progress made towards achievement of objectives, and ensure that MPA personnel are trained to participate in, and ensure the continued sustainability of the monitoring programmes.

Site specific recommendations are as follows (brackets = EAME priority rating):

- **Kiunga-Lamu (G)** - increase size of Kiunga MNR by extending seaward boundary to include outer reefs; find an appropriate mechanism for protection of Ras Tenewi and adjacent waters (this area is important for seabirds and turtles, has high coral diversity, and varied ecosystems - dunes, coastal lagoons - but the beach has already been sold off).
- **Tana River Delta (ER)** - explore mechanisms for protection, particularly potential for a coastal wetlands reserve/Ramsar site; protect turtle nesting beach at Kipini using community-based management (IUCN is involved in preparing a concept for a management plan for the area).
- **Shimoni-Tanga (ER)** - possible extension of Mpunguti MNR to Tanzania border and development of a transboundary initiative with Tanzania.
- **Malindi-Watamu-Mida Creek (G)** - possible nomination of Mida Creek as a Ramsar site (it is already a Biosphere Reserve and includes an IBA).
- **Feasibility studies for World Heritage Site** nominations in Kiunga-Lamu and Shimoni areas.

4.2 UNITED REPUBLIC OF TANZANIA (URT)

Tanzania has the second largest coastline and EEZ of the three countries being considered, but a relatively recent history of marine and coastal resource management. Nevertheless, rapid progress is being made and there are now many programmes and initiatives underway. By starting rather later than some countries, it has been able to benefit from lessons learned elsewhere and thus establish policies and institutional frameworks that are more 'modern' in outlook.

4.2.1 National MPA coverage

Mainland Tanzania and Zanzibar are autonomous for environmental issues, including wildlife and fisheries, and are thus discussed separately where appropriate.

4.2.1.1 Mainland Tanzania

Two categories of MPA² can be designated on mainland Tanzania under the 1994 Marine Parks and Reserves Act:

- **Marine Parks (MPs):** relatively large multiple-use zoned MPAs. Two have been gazetted: **Mafia Island Marine Park (MIMP)** and **Mnazi Bay-Ruvuma Estuary Marine Park (MBREMP)**.
- **Marine Reserves (MRs):** smaller areas in which extraction of any marine resource is prohibited. These are the oldest MPAs in the country, designated in 1975 under fisheries legislation. Two (Chole Bay and Tutia Reef) were subsequently included as strictly protected zones within MIMP when this was gazetted in 1995. In 1998, management of the other MRs was also transferred to Marine Parks & Reserves Unit (MPRU). **Maziwe Island MR** is managed with assistance from Pangani District (in close collaboration with the Tanga Coastal Zone Conservation and Development Programme). The **four Dar es Salaam MRs** around (Bongoyo, Fungu Yasini, Mbudya and Pangavini) are now being managed as a single system. The site of Tanga Coral Gardens was planned for designation as an MR, but the order was not published; this area lies within one of the collaborative fishery management areas in

Tanga Municipality and thus receives some degree of protection.

Discussions are underway about designating all small islands as Marine Reserves; this is general policy at present as far as the terrestrial part is concerned, but further discussion will be held before legislation is introduced, and before consideration is given to including marine waters.

- A third category of protected area is National Park. National Parks are gazetted under the Wildlife Conservation Act of 1974, and are managed by the parastatal, the Tanzania National Parks Authority (TANAPA). National Parks are primarily terrestrial; however the Saadani Game Reserve is to be upgraded to National Park status and will include a marine area with mangroves, two creeks and an offshore coral reef.

In addition to the MPAs under central government mandate, in three Districts (Tanga, Muheza, Pangani) in Tanga Region, selected reefs have been closed to fishing under fishery management plans that are developed and implemented collaboratively by local villages and the Districts through the Tanga Coastal Zone Conservation and Development Programme (TCZCDP). The closed areas are enforced through village by-laws. The management areas have not been designed as MPAs but have objectives and management systems that are similar to the multiple-use MPs.

Furthermore, the Rufiji-Mafia-Kilwa (RMK) Seascape Programme is currently being developed and implemented with funding from WWF and in partnership with Rufiji, Mafia and Kilwa Districts, MIMP at local level and the National Environment Management Council (NEMC) and the Vice-President's Office at national level.

All mangrove areas are gazetted as Forest Reserves (Wang *et al.*, 2003) and are managed by the Mangrove Unit of the Forest and Beekeeping Division of the Ministry of Natural Resources and Tourism.

4.2.1.2 Zanzibar

The first proposals for MPAs in Zanzibar were in the 1980s (UNEP, 1989), followed by proposals in 1993 by the Institute of Marine

²Note that although both Kenya and Tanzania designate Marine Parks and Marine Reserves, these have different management in the two countries; Marine Parks in Kenya are no-fishing areas, but in Tanzania they are multiple use areas with fishing allowed in some zones. Marine Reserves in Kenya allow traditional forms of fishing; in Tanzania, these are closed areas.

Science (IMS) and in the Biodiversity Strategy report. Four of these early recommended sites were gazetted under the 1988 Fisheries Act:

- **Chumbe Reef Sanctuary**, gazetted as a no-take Sanctuary in 1999; forest protected as a 'closed forest'.
- **Mnemba Island Conservation Area** initially protected in 1992, extending 200m offshore round the island as a no-take area, and with formal gazettement in 2002 of a larger area.
- Menai Bay Conservation Area gazetted 1997; certain types of fishing are allowed.
- Misali Island Conservation Area, gazetted in 1998; part of it (1.4 km²) is protected as a no-take zone; forest protected under Forest Resources Management Act.

Other existing and proposed marine and coastal protected areas are:

- **Jozani Forest Reserve** (Unguja), gazetted in the 1990s; and extended to include intertidal and subtidal habitat when it was gazetted as Jozani - Chwaka Bay National Park in 2004.
- Ngezi Forest Reserve (Pemba), which includes mangrove forest and beach (but no subtidal habitat), gazetted in 1959 but with no real protection until the 1990s; soon to be redesignated as a Nature Reserve.
- Kiwengwa Controlled Area (Unguja), established in 2000 but never managed - (previously an important turtle nesting area although numbers of nests have been reduced by hotel development).

As on the mainland, all mangroves are designated as Forest Reserves.

4.2.2 Long-term vision and objectives

The long-term vision, as stated at the World Parks Congress in Durban in September 2003, by the Minister for Natural Resources and Tourism is:

'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.'

For mainland Tanzania, the purpose of a MP or MR is laid out in the Marine Parks and Reserves Act 1994 and in summary is to:

- Protect and restore marine and coastal biodiversity and ecosystem resources.

- Stimulate rational development of under-utilised resources.
- Manage marine and coastal areas to promote sustainability of existing resource use and recovery of over-exploited/damaged areas and resources.
- Ensure involvement and benefit sharing of local communities.
- Promote education and information dissemination.
- Facilitate research and monitoring.

MPAs may add additional purposes as required; for example, Mafia Island MP has two further purposes: conservation of historic monuments and cultural resources; and facilitation of ecotourism development.

For Zanzibar, the Environmental Management for Sustainable Development Act 1996 states the purpose of Zanzibar's protected area system as being:

- Preservation.
- Sustainable utilisation by those living in or near the protected area.
- Propagation of genetic resources for conservation in other areas.
- Education.
- Management of biological diversity;
- Scientific research; and.
- Environmentally sound tourism and recreation.

In addition, each site has stated management objectives in its management plan or legislation.

4.2.3 Policy, legislation, institutional arrangements and management approaches

The involvement of stakeholders is recognised as a key issue in all aspects of governance in URT, and mechanisms for this are laid out in the Public Sector Reform Programme and the Local Government Reform Programme. These are aimed at ensuring that civil society, local communities and the private sector assume more responsibility for development and greater involvement in decision-making. This approach is reflected in many of the MPA initiatives underway.

4.2.3.1 Mainland Tanzania

The Marine Parks and Reserves Act (No 29 of 1994) provides for the establishment, management and monitoring of MPAs and establishes the Marine Parks and Reserves Unit (MPRU) as the responsible agency (within

the Fisheries Department, Ministry of Natural Resources and Tourism (MNRT)) and a Board of Trustees, with representation from key government agencies, the private sector, and NGO and academic communities. The Act requires that each MPA has an Advisory Committee (like the Board, with representation from the key stakeholder groups including private sector and local communities), and that village councils of the villages that affect or are affected by the MPA participate fully in management. A General Management Plan (GMP) is also required; a GMP has been produced for MIMP (MPRU, 2000), and preparations for GMPs are underway for MBREMP (through a UNDP/GEF project) and Dar es Salaam MRs (Roxburgh *et al.*, 2002). The GMP lays out the zoning arrangements, for which regulations are subsequently gazetted: four types of zones are allowed for: core (no extractive use), specified use, general use and buffer. The legislation also requires EIAs for developments that might affect the MPA although this is not yet being enforced.

Each MP has a Warden-in-Charge and other permanent staff such as rangers, community development officers and administrative staff. The MRs have no permanent staff, but individuals from local communities on the mainland adjacent to the Dar es Salaam MRs have been trained by MPRU as Honorary Wardens; and the District fisheries officer has been made an Honorary Ranger for Maziwe MR in Pangani.

The government pays the salaries of all MP staff and some recurrent costs for both MPs and MRs. Entrance fees are charged for visitors to MPs (\$10.00 for international tourists) and MRs (\$5.00 for international tourists) which will eventually go into the Revolving Fund that has been set up under the Marine Parks and Reserves Act; there are also fees for boats, sport fishing, filming, concessions etc. The success of this will depend on increased tourism visitation, which is low in both MIMP and MBREMP. Fees are collected at both MPs but are currently held locally. The Dar es Salaam MRs are already generating considerable funds, but not yet sufficient to cover their recurrent management costs. The private sector is making a significant in-kind contribution. For example, for the Dar es Salaam MRs, the Dar es Salaam Yacht Club provides radio communication, private companies and hoteliers provide ferry services for visitors, and a hotel has helped with the provision of visitor facilities on the

islands. Substantial donor support is still required however: support for MIMP is being provided by WWF and NORAD; for MBREMP by a UNDP/GEF project and the Government of France (FFEM) with technical support from IUCN; for the Dar es Salaam MRs from UNEP/ICRAN; and for the proposed Saadani National Park from the German Government (GTZ).

The six collaborative fisheries management plans in Tanga, Muheza and Pangani Districts are being implemented through the Tanga Coastal Zone Conservation and Development Programme (TCZCDP) with technical support from IUCN. Financial support comes from Development Corporation Ireland, small annual contributions from each District, Central Government (through the Fisheries Dept and MPRU for Maziwe Reserve), and the villages themselves through in-kind contributions. Each management area has at least one reef closed to fishing (for variable lengths of time - the plans are reviewed every 2-5 years), and villages jointly patrol the management areas with the support of the Districts. District and village bye-laws are being used to zone areas (i.e. establish closed reefs) and define roles and responsibilities of villages in resource management (Horrill, *et al.*, 2000). Mechanisms for sustainable financing of the management plans are being investigated - the Districts already make a contribution; another potential source is to introduce a new fisheries levy collection mechanism which will ensure that the full amount of tax is collected (a large proportion is not collected at present).

Mangrove Forest Reserves are designated under the amended Forestry Act (1991) which provides for joint management of mangroves (and other forests) with local communities. The Reserves are zoned according to the uses allowed, and those designated as 'core zones' might technically qualify as 'protected areas'. In other zones, controlled harvesting of poles (selective cutting) is permitted where mangroves are ecologically stable and have sufficient regeneration potential. The Mangrove Management Unit is responsible for implementation of the National Mangrove Management Plan. Collaborative mangrove management plans have been prepared under the TCZCDP for areas of mangrove in Pangani District and Tanga Municipality and are being partially implemented.

4.2.3.2 Zanzibar

The Environmental Management for

Sustainable Development Act (Environment Act), 1996 and the Forest Resources Management Act, 1996 provide the legal framework for protected area establishment. The former addresses protected areas in general and defines categories (Controlled Areas (subsequently referred to as Conservation Areas), Reserves, Parks, and Sanctuaries). The 1988 Fisheries Act also allows for the establishment of MPAs in territorial waters.

The overall mandate for protected areas lies with the Ministry of Agriculture, Natural Resources, Environment and Co-operatives (MANREC). Under this the Department of Commercial Crops, Fruits and Forestry (DCCFF) and the Department of Fisheries and Marine Products are primarily responsible for management, their role varying in different MPAs (Dept Fisheries - Menai Bay, Mnemba, and Kiwengwa; DCCFF - Misali I. and the Forest Reserves).

The Environment Act requires the establishment of a National Protected Areas Board as a consultative authority to provide policy guidance. The board draws members from ministries responsible for natural resources, environment, local government, finance as well the scientific community and Tanzania mainland counterparts; it recently convened its first meeting. The functions of the Board include to:

- Formulate, advise and coordinate the implementation of the policies of the government on PAs.
- Recommend to the Minister responsible for the national PA system those areas which are suitable for national protected area status.
- Approve management plans for national protected areas.
- Designate the appropriate lead institution to manage the national PA system established under the Act.

Under a 1999 supplement to the Environment Act, a Zanzibar Nature Conservation Areas Management Unit is to be set up that will manage protected areas. At present, there is no harmonised approach to management of MPAs, and separate protected area units are being established in the DCCFF and Dept Fisheries. The Environment Act allows for a variety of approaches to protected area management and two main structures have evolved to date: co-management arrangements between local communities and

the government (Misali I., Menai Bay and Kiwengwa); and agreements with tourism companies which manage lodges within the MPAs (Chumbe I. and Mnemba I.). Details of each are as follows:

- **Misali Island**, initiated as a community effort to resist tourism investment which would have threatened their livelihoods, is managed jointly by the Misali Island Conservation Association (MICA), which comprises some 700 members from the 36 villages that use the island and its surrounding waters, and the DCCFF (Chernela *et al.*, 2002; Cooke and Hamad, 1998). The government provides six rangers, managed by MICA, who are stationed on the island and additional staff, office space and electricity in Wete on the Pemba Island. There is a 5 page outline management plan. There is a no-extraction zone which protects the turtle nesting beach, the adjacent reefs, and an islet important for migrant birds; diving and snorkelling are allowed here. The rest of the MPA is a low impact use zone, with an area for fishermen to camp, and non-destructive fishing methods are allowed.
- **Menai Bay** was initiated as a community attempt to regulate over-exploitation; WWF was requested to assist and the MPA is now managed through a WWF project under the Fisheries Dept, with 14 government staff seconded by the Dept; it involves 17 villages, each of which has an Environmental Committee; villagers assist with patrolling; there is a Steering and a Management Committee; a draft Kiswahili management plan has been prepared. The MPA does not have a no-take zone but patrolling against illegal fishing methods is greater within the MPA than outside, fishermen from outside the area are excluded, and fishing camps are only allowed at certain times on payment of a fee.
- **Chumbe Reef Sanctuary** is managed by Chumbe Island Coral Park Limited (CHICOP) under two separate agreements with the government, one for the marine sanctuary (1994-2004) and a second for the forest (1994-2027); there is an Advisory Committee with a range of stakeholder representatives (government, IMS, local villages); a management plan has been prepared by CHICOP. Villagers are trained as park rangers; there is no government support for enforcement. The MPA is a no-extraction area.
- **Mnemba Island Conservation Area** is

now managed by Conservation Corporation Africa (CCA) (following an unsuccessful phase with a previous private investor), in collaboration with the Dept Fisheries. There is a Management Committee which should meet quarterly and has a range of stakeholder representatives (government, District authorities, etc); there is also a high level Advisory Committee which should meet twice a year, and has just had its first meeting. CCA has been requested to prepare a management plan and has provided a boat for patrolling; Dept Fisheries staff are seconded to assist. The area immediately around the island is a no-take zone.

- **Kiwengwa Controlled Area** - draft management plan prepared with support from Dept Fisheries, and management committee established, but the process stalled, for a variety of reasons including lack of financial support.

Neither the villagers at the community-managed sites, nor the rangers at the privately managed sites, are able to apprehend people caught carrying out illegal activities, but they are able to patrol and infractions are reported to local officials or village leaders who then bring in the enforcement agencies.

The Environment Act establishes a National Fund for Protected Areas Management, which once implemented will receive government subventions, donations, entrance fees and permits, and fines for violations of the Act. The 1999 supplement allows for the establishment of a Nature Conservation Development Fund that will help to support the work of the Nature Conservation Areas Management Unit. Neither of these Funds is operational and currently revenue from entrance fees is managed at each site under separate arrangements.

At present, the two community MPAs are financed largely through donor support:

- Misali is supported by CARE International which helps to raise donor funds from various sources; tourists and researchers are charged a daily entrance fee (\$5.00 for international visitors, \$2 for residents) - 60% of this goes to conservation activities (e.g. patrolling the MPA) and 40% goes to local community development projects. The government covers some in-kind costs (salaries, office etc).
- Menai Bay is supported mainly by WWF

(90%), which assists with raising donor funds from a variety of sources. A revenue collection system has been developed but this is not fully implemented - tourists should pay a \$5 entrance fee (there are some 12,000 visitors a year) - 30% of revenue is to go to community development activities. The government provides some support (salaries, and a small budget for 2003-4).

The two privately managed MPAs are financed primarily through tourism:

- On Mnemba Island, Conservation Cooperation Africa (CCA) aims to make conservation pay for itself through high income (rates are \$625 per night), low impact tourism; they tend to have over 90% occupancy; only hotel guests are allowed onto the island but divers can use the reefs for a \$1/day fee which goes to a community fund - fee collection started in November 2002.
- Chumbe Island had a major initial investment from the private sector to develop the hotel and MPA; since then several donors have contributed and volunteers have assisted with the management; revenue from the hotel currently covers basic management and recurrent costs; rates are c. \$200 per night, there is lower bed occupancy than Mnemba, but day visitors are permitted for \$70 per head.

The Jozani Chwaka Bay National Park was developed through a project supported by CARE International, with DCCFF. Two management plans exist (1997; 2002). To date, Chwaka Bay has been managed through various integrated coastal management projects with support from a variety of donors. Activities are currently being supported through a UNDP/GEF project. Management activities at Ngezi Forest Reserve have only recently started, through a collaborative initiative of DCCFF, Misali Island Conservation Association, and CARE; village conservation committees have been established.

4.2.4 MPAs in the broader context of ICM

- The Tanzania Coastal Management Partnership (TCMP) was established in 1997 under the National Environment Management Council (NEMC) with a mandate to promote integrated coastal area management. TCMP is not yet a government institution but was responsible for developing the National Integrated

Coastal Environment Management Strategy. This was adopted by the government of URT in 2002, to provide guidance on how the National Environment Policy and other related sectoral policies are to be implemented on the coast, with its main emphasis on the mainland (TCMP, 2003). It provides guidance on integration of MPAs with the broader policy framework on use of coastal and marine resources for sustainable food security, economic growth and poverty alleviation. It has conservation and restoration of critical habitats and areas of high biodiversity as one of its seven specific strategies (which have a target implementation date of 2025). It thus recognises the need to balance conservation and development interests by protecting areas of high biodiversity and steering large-scale economic development to suitable areas. TCMP also produces the 'State of the Coast' report (Whitney *et al.*, 2003) which makes specific reference to MPAs and their importance in overall coastal management.

- For the mainland, there is much debate about the relative merits of the Marine Park approach (as being implemented at Mafia and Mnazi Bay) and the ICM approach. A few efforts are underway to integrate the two approaches, notably.
- The TCZCDP has ICM as its primary mandate, with institutional arrangements such as the Tanga Coastal Consultative Forum (TCCF) to ensure that integration takes place. The importance of biodiversity protection is understood and the management of closed reefs is a first step in this direction, as well as the integration of Maziwe I. MR into one of the fishery management plans.
- The Dar es Salaam MRs are linked with the Kinondoni Integrated Coastal Area Management Programme (KICAMP), which was set up in 2000 to develop a local ICM strategy. Part of the MR system lies within the local ICM area.
- The Rufiji-Mafia-Kilwa (RMK) Seascape programme is facilitating the development of sustainable, collaborative and equitable management and protection of coastal and marine natural resources in these three Districts. This follows on from an ICM initiative undertaken at Kilwa, through the District, with support from the Pew Foundation. These initiatives will take into account the need to establish MPAs in this area; istrict ICM plans have been prepared for Bagamoyo and Pangani with support from TCMP and CRC/URI as pilot initiatives

under the national ICM strategy. The Pangani plan is integrated into the Tanga Coastal Programme (Torell *et al.*, 2002).

- The Rufiji Environmental Management Programme has developed a plan for the Rufiji Delta, with support from IUCN and the Netherlands; a Ramsar site is being established in this area.

On Zanzibar, the Environmental Management for Sustainable Development Act allows for national ICM planning and village level ICM plans, co-ordinated by the Department of Environment. There is one demonstration site to date:

- The Chwaka Bay-Paje area where a Coastal Resource Management Committee has been established, as an activity related to the development of the new National Park. Project activities in the Jozani-Chwaka Bay area are currently supported by GEF through UNDP, with co-financing from the Government of Austria, Ford Foundation and government support. The project is implemented by CARE International and a local NGO, the Jozani Environmental Conservation Association.

4.2.5 Management effectiveness

Although considerable research has been undertaken in URT, and individual ecological surveys have been carried out at some MPA sites, there has been no national marine biodiversity survey or mapping and it is not possible to assess to what extent the existing network protects different habitats and species. Assessing the effectiveness of management of the MPAs is only possible if appropriate monitoring programmes are underway to show trends and changes that may have occurred as a result of management, and that indicate the progress being made in achieving objectives. Data from monitoring programmes such as Tanga (corals and reef health, fish abundance), Dar es Salaam MRs, MIMP and Mangrove Management Project, should be collated for this purpose. Assessments of management effectiveness of the two Marine Parks on mainland Tanzania have taken place, funded through NORAD and ICRAN-UNEP, and with technical assistance from IUCN-EARO. However many sites do not have such programmes, and much of the following assessment is based on anecdotal information only.

4.2.5.1 Management effectiveness - biodiversity protection

Total coverage of subtidal waters in MPAs in URT is 1,447 km² (including only the closed reefs in the Tanga collaborative fishery management areas). This is equivalent to 7.9% of the continental shelf (to 200 m depth). No take areas cover 66.4 km² (0.37%). When the marine area proposed for inclusion in Jozani-Chwaka National Park is taken into account, these figures will be 8.2% for MPAs in general and 0.74% for no-take areas.

In terms of biogeographical representation, Tanzania has only one of the EAME biogeographical subregions: the Coral Coast, and thus its MPAs all lie within this. For development of a national network of protected areas, a finer scale biogeographical classification of the coastline is required.

In terms of priority representative areas, there are seven EAME seascapes in URT - four on the mainland, two covering Unguja and Zanzibar, and one an isolated offshore island (Latham I.). All except Latham Island have some protection (Table 9):

- Both globally important areas have MPAs (covering 7% of the EAME area in the case of MIMP; and 2% in the case of MBREMP note that the latter is a transboundary EAME area and the % is increased if Mozambique MPAs are included).
- Of the three ecoregionally important areas with MPAs, Misali I. protects 0.5% of the Pemba priority area; MPAs on Unguja cover c. 8.7 %; and the closed areas within the collaborative fishery management areas contribute 0.9% to protection of the Tanga priority area.
- Bagamoyo is a subregionally important priority area, and receives c.8% protection under Saadani National Park.

Table 8. Kenya: MPAs and EAME priority seascapes

Priority EAME Area	EAME Cat	Area km ²	Current MPAs	IUCN Cat	Date estab.	Subtidal km ²	% area protected
Msambweni	ER	2,990	Maziwe MR (all no-take)	II	1981	c. 2.6	0.9
Tanga**			Tanga collaborative fishery management areas (total c. 1603; 28 = no-take)	----	1996-2000	*25.4	
Pemba I.	ER	4,193	Misali I. Cons Area (total 23; no-take = 1.4)	VI	1998	21.6	0.5
			Ngezi Forest Reserve (1959) (14.4 km ²) - proposed Nature Reserve			--	
Unguja I.	ER	5,557	Menai Bay Cons Area	VI	1997	470.0	9.2
			Mnemba I. Cons Area (no-take ?)	VI	2002	0.15	
			Chumbe Reef Sanctuary (all no-take)	II	1999	0.3	
			Kiwengwa Controlled Area		2000	17.5	
			Jozani-Chwaka National Park		2004	25.0	
Latham I.	ER	409	----	---		---	0.0
Bagamoyo	SR	806	Saadani proposed National Park			(66.0)	8.2
---	---	----	Dar es Salaam MRs (all no-take)	II	1975	26.0	-
Rufiji-Mafia Complex	G	9,490	Mafia Island MP (822 of which 75% is 'marine'; 11 km ² = no-take)	VI	1995	615.0	7.0
Mtwara-Quirimbas**	G	9,371	Mnazi Bay-Ruvuma Estuary MP (650)	VI	2000	200.0	2.0

- Date estab. = refers to date that subtidal area was included - some sites were designated as terrestrial protected areas earlier
- * = excluding Maziwe which is listed separately
- ** = transboundary priority seascapes

Only one MPA in URT - the Dar es Salaam MR System, lies outside a priority EAME seascape. This indicates that the existing system, although small, is nevertheless a good foundation, in that the priority biodiversity sites are being addressed.

There are no natural World Heritage Sites in the marine and coastal environment of URT, although Kilwa ruins are a cultural World Heritage Site. There is a proposed Ramsar Site in the Rufiji delta, and no Biosphere Reserves.

The following paragraphs describe representativeness and effectiveness of the MPAs in terms of specific components of biodiversity:

Coral reefs: These cover an estimated 3,580 km², with the main areas of reef in Tanga, Pemba, Unguja, Mafia, Kilwa, Mtwara and Songo Songo. They occur in all the MPAs with subtidal habitat, but the total amount protected is not known. However, it is a reasonable assumption that most of the existing no-take areas are predominantly coral reef. Based on this, an estimated 1.9% of the coral reefs are totally protected. It seems that the key factors determining reef health are destructive fishing and coral bleaching, rather than the existence of MPAs. In the MPAs and the Tanga collaborative management areas, much of the destructive fishing has been stopped, particularly dynamiting, although it still tends to resurface periodically, as well as illegal beach seining and other damaging methods. Many of the reefs were severely affected by the coral bleaching event of 1997/1998; average coral cover (for both mainland Tanzania and Zanzibar) before bleaching was 52%; after it was 26-27%. Recovery is reported to be slow for most sites and there are no reported significant differences inside and outside MPAs (Obura *et al.*, 2002).

The reefs of Zanzibar are generally in good condition and those within the MPAs seem to have largely escaped the serious bleaching mortality seen on the mainland. Chumbe I. is considered to be one of, if not the highest biodiversity reef sites (although it is also the most intensively studied); other reefs off Stone Town also have high coral cover. Effective enforcement of no-fishing regulations at Mnemba and Chumbe (both small MPAs with tourist resorts which make patrolling relatively easy) may account for the good quality of the reefs and fish populations. Reefs at Menai Bay, where destructive fishing methods still occur are less good. McClanahan

et al., (1999) found that Chumbe (and other well managed sites in the region) had larger fish and higher diversity fish populations than fished reefs such as those off Dar and in Tanga. Within the Tanga collaborative fishery management areas, coral cover and fish abundance on the reefs is increasing in the closed areas compared with reefs where fishing is still permitted. Coral mining still occurs in several areas e.g. Mtwara and Mafia and has a major impact on reef health, but no data have been gathered on this.

Mangroves: Total area of mangrove in URT is between 1,000 and 1,400 km², but there is immense variation in quoted figures, and the amount within MPAs (as opposed to Forest Reserves) is not known. The main areas on the mainland are Rufiji Delta (480 km² - 90% of the unique *Heritiera* stands and highest species diversity here; said to have mangroves in the best condition although there is much cutting), Kilwa (217 km² - reported to have mangroves in the second best condition), Mtwara (94 km²), Tanga-Muheza (93 km²), Bagamoyo (50 km²), Kisarawe (42 km²), Lindi (40 km²), Pangani (38 km²), and Dar es Salaam (25 km²). Wang *et al.*, (2003) analysed remote sensing data and concluded that there has been relatively little decline in mangrove coverage over the past 10 years, with a few exceptions such as the Dar es Salaam area. This can probably be attributed to the existence of the mangrove Forest Reserves and to relatively effective implementation of the National Mangrove Management Plan, preventing coastal development and total clearance of mangroves. However, quality is said to be declining as, despite Reserve designation, there is still extensive cutting, and there is concern that the selective removal of large straight tree trunks will ultimately alter the ecological functions within the mangroves.

On Zanzibar, mangroves are protected through the forest legislation and there is considerable investment in their protection and sustainable use through activities at Menai Bay MP and the proposed Jozani-Chwaka Bay National Park (which has the largest single mangrove forest in Zanzibar).

Seagrasses: There is no data available on the distribution of seagrass beds, but all MPAs include this habitat type. MPAs may represent a refuge for seagrasses, as beds are being damaged outside these areas through prawn trawling.

Dugong: this species is now restricted to very small localised populations, some of which are in MPAs. Probably the largest population is in the Rufiji - Mafia - Kilwa area where management activities are underway at Mafia (MIMP) and through the RMK Seascape programme. In Muheza District dugongs are still found off Moa village within the Boma-Mahandakini collaborative fisheries management area, but are not yet subject to any specific management measures. Dugongs may still occur in the Mnazi Bay area and the new MP will be looking at potential conservation measures; and possibly on the north-west coast of Pemba, where there is currently no protection (Muir *et al.*, 2003).

Other marine mammals: Eight species of dolphin occur in Tanzania and are caught accidentally in tuna/billfish/marlin nets, particularly off Nungwi (Unguja) where there is no MPA. Menai Bay has a significant population of 150 resident bottlenose and 75 humpback dolphins which are probably benefiting from the presence of this MPA, although some of the dolphin watching activities for tourists need better management. Humpback and other whale species pass through Tanzanian waters on migration (and may calve in Mnazi Bay). It seems unlikely that existing MPAs have any impact on cetaceans but further research is needed and is being planned (Whitney *et al.*, 2003).

Birds: International Bird Areas (IBAs), designated by BirdLife International through a widely accepted scientific process, provide an indication of priority bird conservation areas. 10 IBAs have been designated in the marine and coastal environment of URT (Baker & Baker, 2002). The majority of these are in sites that:

- Are already protected as MPAs (Mafia I., Mnazi Bay).
- Have some degree of protection (the Dar es Salaam IBA is partially protected by the Dar es Salaam MRs; Pemba Island IBA receives a very small amount of protection through Misali; Tanga -North (salt pans near Moa village) and Tanga-South (salt pans near Kigombe village) both lie within areas managed for their fisheries, although no specific attention has yet been paid to birds by the Tanga Coastal Zone Conservation and Development Programme); Zanzibar South Coast IBA is partially protected by Chumbe Island and Menai Bay; Zanzibar East Coast IBA is protected by the Jozani-

- Chwaka Bay National Park; or
- Are proposed for protection (Rufiji as a Ramsar Site).

Latham Island IBA as yet has no protection, although it is of critical importance for its masked booby colony.

Marine turtles: 5 species have been recorded in Tanzania. Green turtles are most common and nest along the mainland coast (including Mafia Island) and Zanzibar. Hawksbills also nest but in very small numbers and mainly on islands. Loggerheads and olive ridleys also occur; and the leatherback is occasionally seen. Maziwe MR was an important turtle nesting site in the 1970s for olive ridleys and greens; currently the island is totally submerged at spring high tide and nesting usually fails, although green turtles still attempt to nest. A turtle nest protection and incentive scheme on Mafia Island has been successful with 140% increase in the number of nests and a significant decline in egg poaching (Muir & Abdallah, 2002). A turtle conservation initiative was recently established in MBREMP, using experiences from Mafia. The Saadani proposed National Park is being established in part for its population of nesting green turtles at Madete. Activities are also underway in Zanzibar at Misali and Mnemba. Kiwengwa, on Unguja was established because of its nesting turtle population but no recent nests have been recorded probably because of the extensive hotel development. Although some of the key nesting beaches (e.g. MIMP, Maziwe) are benefiting from the presence of MPAs, a more detailed analysis is necessary to assess the full role that current MPAs are playing.

Fish and invertebrates: As elsewhere in the region, there is very little information on fish and invertebrates in a form that can be used to determine the representativeness of the current MPA system. The coelacanth has recently been discovered in URT, in Tanga and Kilwa districts, which emphasises the importance of this EAME priority seascape. The threatened Coconut Crab occurs on Misali and Chumbe and is thus protected; it is not known whether there are other important populations of this species in Zanzibar meriting protection.

4.2.5.2 Management effectiveness - sustainable livelihoods and poverty alleviation

Many of the MPAs in Tanzania have large numbers of people living within the boundaries

or in adjacent areas who are dependent on the MPA resources. MIMP has 19,000 people living within the park in 14 villages, of which half are estimated to be dependent on marine resources; MBREMP has 30,000 people in 17 villages within its boundaries. The three Districts in Tanga region have some 400,000 people that use marine resources. All MPAs on Zanzibar are used to a greater or lesser extent by local communities although they do not live within the boundaries (Menai Bay has 17 villages involved; 12 villages use Misali Island regularly and 24 use it occasionally; at least four villages use the waters around Mnemba Island).

Fisheries: There is some evidence that MPAs and closed areas in Tanzania may be having a beneficial impact on fisheries:

- In Tanga, commercial fish species have increased on both open and closed reefs in Tanga since the collaborative management plans were implemented and dynamite fishing reduced.
- At Menai Bay on Zanzibar, there are indications from fishermen's catches and the number of boats that enter the area that the number and size of fish have improved since enforcement of the Conservation Area started, presumably as a result of reducing pressure and eliminating damaging methods.
- At Misali, there is anecdotal evidence of better fishing since implementation of the MPA.

As with trends in coral reef health described above, it is possible that improved fish catches could be due more to effective enforcement of legislation banning destructive fishing methods such as dynamite and seine nets, than to the existence of MPAs themselves. A further problem is the conflict that seems to be arising between MPA authorities and local communities over the issue of reduced fishing areas. It is vitally important that such measures are accompanied by interventions that will help to provide livelihoods to those displaced or affected by the MPA, so that they do not simply move away and contribute to increased fishing effort elsewhere.

Tourism: As shown below, greatest community benefits from tourism may be accruing where hotel and tourism operators are involved and are ensuring implementation of Community Development Funds, but all MPAs are attempting to ensure that local communities receive some benefits:

- MIMP is important for tourism but visitor

numbers are low. Under the GMP, park entrance fees are to be shared with communities (not less than 10%) for activities in line with MPA objectives (e.g. development of under-utilised resources or improving resource sustainability etc).

- In MBREMP, tourism is still in its infancy but is scheduled for development, and there are a few visitors already; it is expected that these will increase as knowledge about the Park increases.
- The Dar es Salaam MRs have been important for tourism and recreation since the late 1980s and some local communities benefit by providing vending services and local transport; MPRU has provided basic tourism facilities on the two islands most frequently visited.
- Maziwe MR in Pangani District is bringing some benefit to local fishermen who provide transport to the island for tourists.
- Both Menai Bay and Misali receive considerable numbers of visitors, who contribute directly through entrance fees, and indirectly through purchase of services such as accommodation. Dolphin watching is a particular attraction at Menai Bay; Misali attracts divers and snorkellers.
- Mnemba Island charges divers \$1.00 to use the reefs of the MPA - the money from this goes to a Community Development Fund that will be used to patrol the reef but also for village development projects; the Management Committee will decide the %. A separate fund from the CCA Foundation is also used to fund development projects in the local villages - the lodge helps the villages prepare proposals; US\$36,000 has been disbursed in this way. In addition, villagers have employment in the lodge and receive training, but very little local produce is purchased from them; there are however plans for AIG activities such as handicrafts and vegetable growing.
- Chumbe employs local people to work in the hotel, and buys local produce, but the extent to which tourism revenue generated through the existence of the MPA benefits the local people is less clear. Chumbe has however played a major role in education of local school children.

On mainland Tanzania, although the MPA legislation requires revenue sharing, mechanisms are still being identified for implementing it and as a result communities at MIMP and MBREMP feel that they are not fully benefiting from these MPAs. At most sites in Zanzibar, the aim is to ensure full revenue retention at the site, with income to be shared

between management of the protected area and benefits for the communities. The national tourism development plan for URT identifies coastal tourism as amongst the highest priorities for the future, and it is to be expected that MPAs will play an important role in this.

Community Development: Community development is a feature of the management of most sites, with a wide range of alternative income generating (AIG) activities (e.g. beekeeping, seaweed farming, agriculture), often accompanied by savings and credit schemes, being tested or introduced through the supporting agencies. AIG activities have received much attention through the donor and technical assistance provided to MIMP and Menai Bay by WWF, to Misali and Jozani-Chwaka Bay by CARE International, and at Tanga through the Tanga Coastal Zone Conservation and Development Programme. Similar activities are planned for MBREMP, the main objective being to diversify livelihoods and take pressure off marine resources, particularly those within the MPA. At Mafia, the benefit to communities of these activities (introduction of alternative fishing gear; more recently aquaculture trials) is not yet evident. In the long term however, the role of MPAs in providing supplementary or alternative income generating activities may need to be considered in relation to the objectives of each site and of the MPA network as a whole.

4.2.6 Constraints

- *Lack of capacity and trained staff:* possibly the main constraint and in large part due to the fact that MPAs are relatively new in Tanzania.
- *Conflict with communities:* particularly in the mainland Marine Parks over existing and potential closed areas, and at some sites on Zanzibar e.g. Chumbe (and previously Mnemba).
- *Delayed implementation of revenue sharing mechanisms:* e.g. for MPA entrance fees; mangrove product revenue.
- On the mainland, *lack of clarity in roles and responsibilities* of Districts/Municipalities in relation to that of MPRU - e.g. MIMP, MBREMP, Dar es Salaam.
- *Funding* - c. 90% of the funding for MPA management in Tanzania comes from donors on a project basis; this can lead to major fluctuations in revenue (e.g. MBREMP has received a large injection of funds through a GEF project which terminates in 2006, with the expectation that the MPA will

be self-financing through the government and other mechanisms to be developed during the project; this expectation is unlikely to be met).

- *Damaging exploitative activities are proving difficult to halt* - notably coral mining (for lime production), dynamite fishing and beach seining; all require full bans, but where this has been attempted it has been difficult to enforce, unless national enforcement agencies are brought in as was the case with the navy for dynamite fishing.
- For Zanzibar, there is *no overall integrated framework yet for MPA (or any protected area) establishment and management*, although the basic legislation and institutional arrangements are being put in place.
- *Lack of monitoring programmes* and data for many of the sites that can be used to demonstrate their value and benefits.
- *Lack of publicity material* to inform visitors and tourists (apart from at Menai Bay and Chumbe).
- *Lack of tourism policy addressing environmental issues* created by the industry - optimal numbers may be exceeded.
- *Failure to complete court case prosecutions* in cases concerning contraventions of fisheries legislation which hampers community motivation.
- Although the two privately managed MPAs on Zanzibar are considered successes in terms of biodiversity protection and increasingly in providing benefit to communities, the fact that they pay normal business fees and taxes and receive little recognition by the government of their conservation investments is perceived to be a disincentive by investors who feel that it shows a lack of government commitment to partnerships with the private sector.

4.2.7 Recommendations

Recommendations for MPAs in URT were made in the 1960s (Ray, 1968) and many of the sites proposed then are now subject to management or are part of proposals for management. The World Bank has initiated a programme, the Marine & Coastal Environmental Conservation Management Project (MACEMP), to assist with livelihood improvement of coastal communities, with a collaborative management approach, and this will also address MPAs. Desk studies have been carried out to review and analyse the legislative context and identify sustainable

financing options, and a study is underway to look at options for a national system of MPAs. It is becoming increasingly important to develop a strategic plan for MPAs, given the wide range of approaches that are being introduced. Such a plan could address two components: improving and strengthening the existing network; and expanding the national network.

4.2.7.1 Improving and strengthening the existing network

- For the MPAs managed on the mainland by MPRU, greater involvement of local communities and local government is required, to ensure that the legislation is fully enacted in the spirit in which it was designed. Conflicts and lack of trust should be addressed and arrangements developed to ensure cost and benefit sharing mechanisms are implemented.
- Preliminary recommendations relating to sustainable financing resulting from the World Bank studies should be studied further and implemented as appropriate; in particular, attention should be paid to attempting to diversify sources of revenue generation, for example through licencing and taxation of marine products.
- For Zanzibar: continue the development of a co-ordinated approach to MPAs and implement the Environment Act fully with respect to its requirements for protected areas (e.g. harmonisation of entrance fees to MPAs - \$1.00 at Mnemba, \$5.00 at Misali and Menai Bay, etc).
- Improve protection of Dar es Salaam MRs: (there have been suggestions of redesignating the area as a Marine Park for multiple-use, whilst retaining the MR core no-take areas).

4.2.7.2 Expanding the national network

At the World Parks Congress in Durban in 2003, the URT committed to increasing protection of its marine waters to 10% by 2012, and 20% by 2025. This commitment links to Strategy 3 of the national ICM strategy which requires conservation and restoration of critical habitats and areas of high biodiversity by 2025, whilst ensuring that coastal people continue to benefit from sustainable use of marine resources.

Currently, some 7.7% of the continental shelf to 200 m depth is protected. Potential priority

sites for designation of MPAs, which will help to meet the World Parks Congress commitment, include (brackets = EAME priority site rating):

- **Rufiji-Mafia-Kilwa complex (G):** Increase the area under protection. WWF is developing the Rufiji-Mafia-Kilwa (RML) Seascape Programme which is aimed at improving the socio-economic well-being of coastal communities in Rufiji, Mafia and Kilwa Districts by facilitating the development of sustainable, collaborative and equitable management and protection of marine and coastal natural resources. Implementation partners are the 3 Districts and MIMP, with NEMC/Vice-President's Office at national level; designation of a Ramsar site in the Rufiji Delta (proposal development supported by DANIDA support through the Wildlife Dept); possible linkage of these sites through a Biosphere Reserve approach.
- **Mnazi Bay-Ruvuma (G):** development of a transboundary conservation area with Mozambique (feasibility study underway through GEF project supporting the development of MBREMP).
- **Unguja (ER):** establish additional MPAs e.g. Mwaruga and Nyange reefs (recommended in 1993 according to Nassor, 1998); islands off Stone Town.
- **Pemba (ER):** establish additional MPAs; Matumbini reef complex; Mtangani reefs; Muongoni Bay; Ras Kiuyu (recommended in 1993 according to Nassor, 1998).
- **Latham Island (ER):** Establish a protected area.
- **Implement a programme to protect the dugong,** including sanctuaries at key sites (e.g. Rufiji, Kilwa,) where management would focus on regulation of use of gillnets and prawn trawling, and development of incentives and alternatives for the fishermen affected (Ray, 1968; Muir *et al.*, 2003).
- Carry out a feasibility study of sites with potential for nomination as natural World Heritage sites; priorities include Kilwa (ruins already designated a cultural World Heritage Site), Mnazi-Bay/Ruvuma Estuary; and Pemba.

Careful consideration should also be given to the decision to gazette all small islands as Marine Reserves, as this will need to be done with the agreement of all stakeholders.

4.3 MOZAMBIQUE

With its long coastline and large EEZ relative to the size of the country, the Mozambican government places considerable emphasis on sustainable management of coastal and marine resources. Both the Strategy and Action Plan for Biological Diversity Conservation, which was approved in July 2003, and the National Environmental Management Plan highlight the importance of the coastal zone and marine resources. The Policy and Strategy for Tourism Development, approved in 2003, emphasise the importance of conservation areas for tourism development. A Strategy for Sustainable Development under development also refers to the marine and coastal environment.

4.3.1 National MPA coverage

Two MPAs were gazetted before independence - Ilhas da Inhaca e dos Portugueses, and Bazaruto (Sousa, 1998), but recently large areas of marine waters have been gazetted or established as informal MPAs. There are:

- Three National Parks with subtidal habitat: Bazaruto National Park was gazetted in 1971, and in 2001 was incorporated into the new and much larger **Bazaruto Archipelago National Park**; the **Quirimbas National Park**, gazetted in 2002, which is primarily terrestrial (total area 7,500 km²); the marine component covers c. 25-30% of the park and includes the offshore St Lazarus Bank and the 11 southernmost islands of the Quirimbas archipelago.
- A Faunal Reserve: **Ilhas da Inhaca e dos Portugueses**, gazetted in 1965, and thus the oldest MPA in the three countries covered by this report; this covers about 20 km² of which about 15 km² is forest, 4 km² is mangrove and 1 km² is marine (in three separate coral reef areas).
- Three coastal game reserves - **Reserva de Maputo Reserva do Pomene**, and **Reserva de Marromeu**; at present the first two do not include subtidal habitat, the seaward boundaries lying at the high tide mark, but beaches, coastal lagoons and dunes are included; in Marromeu, mangroves and subtidal habitat is present; the Reserva de Maputo is to be extended to include subtidal habitat (see below).

There are also two conservation areas, established as private sector initiatives:

- **Vilanculos Coastal Wildlife Sanctuary**, adjacent to and south of the Greater Bazaruto Marine Park, reportedly established by the Council of Ministers, is managed by a private tourism company called East African Wildlife.
- A conservation area covering the two northernmost Quirimbas islands (**Vamizi and Rongui**) about 50 km from the Tanzanian border with a coastal area to the south including the Messalo R. estuary; this is being developed jointly by tourism operators, local communities, and local government agencies with the support of the Natural History Museum (Maputo), the Fisheries Research Institute and the Zoological Society of London under the Cabo Delgado Biodiversity and Tourism Project. Low impact tourism is being developed and a turtle monitoring project is underway.

Sites for 'local' co-management have been identified in the Inhambane area under a regional ICM programme supported by DANIDA.

There are no internationally designated marine or coastal protected areas in Mozambique yet, but the Zambezi Delta system was declared a Ramsar site in 2004 (see below).

Both mangroves and coral reefs are protected as 'sensitive' habitats but are not gazetted as reserves as in Tanzania; mangroves are also designated as third quality commercial timber and can be harvested.

4.3.2 Long-term vision and objectives of MPAs

National Parks, according to the Forestry and Wildlife Law are "zones of total protection, clearly defined, with the aim of dissemination, conservation, protection, and management of wildlife and vegetation, as well as for the protection of landscapes or geological formation of particular scientific, cultural and aesthetic value in the interest of public recreation, and representative of the national patrimony".

The objective of Quirimbas National Park is "to conserve the diversity, abundance, and ecological integrity of all physical and

biological resources in the park area, so that they may be enjoyed and used productively by present and future generations" (Management Plan, draft, 2001). For Ilhas da Inhaca e dos Portugueses Faunal Reserve, there are also objectives "to promote research and education and to encourage, promote and enhance public awareness and understanding, appreciation and enjoyment of natural resources" (Muacanhia, 2000). The Bazaruto Archipelago NP plan addresses livelihoods with a reference to "the improvement of social well being through sustainable management systems".

4.3.3 Policy, legislation, institutional arrangements and management approach

National Parks and Reserves are declared under the Forestry and Wildlife Act 1999. Hunting, logging, agriculture, mining or livestock rearing are prohibited, as well as any modification of landscape or vegetation, pollution or introduction of exotic species. Decree 16/96, the Marine Fishery Regulation, allows for the establishment of National Marine Parks, Nature Marine Reserves and "protected marine areas", under article 95. To date, all MPAs (and other protected areas) have been set up under the Forestry and Wildlife Act. Specific MPA regulations have not yet been enacted.

The National Directorate for Forestry and Wildlife (DNFFB) was previously responsible for protected areas, including MPAs and mangrove protection. In 2000, the protected area mandate (except for Ilhas da Inhaca e dos Portugueses) was transferred to the new Ministry of Tourism, under the DNAC (National Directorate for Conservation Areas) as tourism is seen as one way of financing protected areas. The National Directorate for Environmental Management, including the Dept for Coastal Management and the Centre for Sustainable Development for Coastal Zones, within the Ministry for Co-ordination of Environmental Affairs (MICOA) helps to identify MPAs and strengthen management. The National Fisheries Research Institute (IIP) and the Institute for Development of small scale Fisheries (IDPPE) deal with fishery issues in relation to MPAs.

The Bazaruto Archipelago and Quirimbas National Parks are thus managed by DNAC, with assistance from other partners, notably WWF. Bazaruto has an approved 5-year management plan for 2001-2006 that is being

implemented, and one is being prepared for Quirimbas National Park by DNAC. Both Quirimbas and Bazaruto have people living within the protected area boundaries, and establishment of both protected areas has involved extensive consultation.

Bazaruto Archipelago National Park has 5 different zones (Wilderness, Total Protection - both of which are no-take zones; and Limited Community Resource Use, Multiple-use, Extensive Use in which a range of activities including exploitation are permitted). There is a Management Committee with representation of stakeholder communities, NGOs, and the private sector. There are also interest-specific Community Management Committees and private sector committees, from which representatives are selected for the main Management Committee. The model developed for Bazaruto will be used and adapted for Quirimbas.

Quirimbas National Park has three zones in the marine area at present: total protection or 'sanctuaries' in which fishing is banned, but where tourism and scientific research can be carried out under licence from MICOA and with approval of the Park authorities (and which are set up in consultation with and with agreement of the local communities); Special use zones such as St Lazarus Bank, lying 42 km off the coast, which is a Special Use area for sportfishing; 'community use and development zones', where people live but some fishing methods are now restricted; and a 10 km wide buffer zone all round the park. Four sanctuaries have been set up and a fifth is being developed (Ibo Mangroves - 20 sq.km; Ibo Port; Matemo I. for seagrass; Mossemuco Bank for mollusc restoration; Quilalea and Sencar Is; and Rolas I - coconut crabs - and Zala Bank). The planned closed areas will cover c 30%, of which it is proposed to close 10% totally as reference/no-go areas, as requested by the fishing communities. Rangers (*fiscais*) and community wildlife guards (*mugonsisses*) generally come from the local communities (and the latter are chosen by the communities themselves); the former should be paid government salaries.

Management of Ilhas da Inhaca e dos Portugueses Faunal Reserve has been delegated to Eduardo Mondlane University, through its marine biological station which is situated adjacent to the protected area. A management plan is being prepared by the University with the support of DNAC. The marine component is entirely no-take. Inhaca

has large numbers of people living around the protected area, and there has been much conflict as a result of lack of adequate consultation, both initially and in the development of what were more recently designed as participatory approaches, such as incentive schemes. Boundaries at Inhaca are not well marked and are an issue. In 1998, an Environment Awareness Board was established for Inhaca with representation from a wide range of stakeholder groups.

Funding from the government is minimal for all protected areas. It covers only the Warden's salary for Bazaruto and, through the University, salaries for Inhaca rangers and some basic maintenance; there is no government financial support (or training) for staff at Quirimbas NP at present. A fee system for the National Parks and Reserves has been approved, and this will also be implemented in Inhaca once the management plan has been completed. Resorts/lodges pay an annual fee based on the land they use; tourists pay an entry fee. The fee is being collected in Bazaruto, where 40% is retained for park management, and the remainder is divided between funds for community development activities and tourism development. WWF is supporting management activities in Bazaruto and Quirimbas, working through local NGOs (FNP/EWT in for Bazaruto; 3 NGOs for Quirimbas). Donor support to Inhaca (mainly from NORAD) has recently ceased.

The management areas being established around Vamizi and Rongui Islands, and the nearby Messalo R. estuary, in northern Quirimbas will be established through co-management arrangements with local government, local communities and scientific institutions. The marine areas will be zoned, probably with no-take areas for research and recreation, specified-use zones, and buffer zones.

Management activities have not started at the Vilanculos Coastal Wildlife Sanctuary, but a 'bio-business' plan has been prepared. The major part of the area is terrestrial and activities will include re-introduction of terrestrial species and up-market tourism, but there will also be a significant marine and coastal component.

4.3.4 MPAs in the broader context of ICM

The National Directorate for Environmental Management, through its Dept of Coastal Zone Management, is responsible for ICM. A draft

National Policy for Coastal Zone Management and a draft ICM programme have been prepared. The National Policy for Integrated Tourism and National Policy for Forestry and Wildlife also promote and enhance coastal developmental projects (Motta, unpub). Mozambique recognises the role of MPAs in ICM in these policies.

Local ICM projects are underway in the north (Nampula/Cabo Delgado) and the south (Inhambane south to the border). The northern programme (Coastal and Marine Biodiversity Management Project) is supported through a GEF/World Bank project with MICOA and involves survey work that is assisting with the identification of new MPA sites, as well as the development of a monitoring and evaluation system for ICM activities. The southern programme, supported by DANIDA, involves a Strategic Environmental Assessment of the coast and will also result in the identification of MPA sites. Sites for local management have already been selected and approved by Inhambane Municipality, including reefs (for diving and fishing) and dunes. Local coastal co-management committees are being established. An Integrated Management Plan was prepared in 1990 for Inhaca, which integrates protected area management with broader development issues, but there have been problems implementing it, due to insufficient consultation during the development; MICOA will now assist with its implementation.

4.3.5 Management effectiveness

The total area of marine habitat protected is some 3,251 km² (see Table 10 for areas of each site). The area designated as no take includes the MPA at Ilhas da Inhaca et dos Portuguese Faunal Reserve, the closed areas in Bazaruto Archipelago and Quirimbas National Parks, and will include the no fishing areas to be established in the northern Quirimbas and in the Vilanculos Coastal Wildlife Sanctuary. Mozambique has the two largest MPAs in the three countries under consideration - both Bazaruto and Quirimbas protect c. 1,500 km² of marine habitat each (islands included).

4.3.5.1 Management effectiveness - marine biodiversity protection

Mozambique has one of the longest coastlines in Eastern Africa, with a wide range of ecosystems (reflected in the fact that it covers three of the EAME subregions). Not surprisingly, the existing network is not yet

Table 10. Mozambique: MPAs and EAME priority seascapes

Sub-regions	Priority Area	EAME Cat	Area km ²	MPAs	IUCN cat	Date	Subtidal km ²	% area prot.
Coral Coast	Mtwara-Quirimbas*	G	9,371	North Quirimbas conservation programme - areas not yet designated	--	---	(230)	16.2
				Quirimbas National Park (total area 7,500 km ²)		2002	1,520	
	Nacala-Mossuril	ER	8,796	---	--	---	---	0.0
Swamp Coast	Ilhas Primeiras e Segundas	ER	5,767	Proposed Ilhas Primeiras e Segundas National Park	--	---	---	0.0
	Zambezi Delta System	G	12,464	Marrromeu Reserve (total area ?10,000? km ²) - Ramsar site	IV	1969	---	64.0
	Sofala Bay	SR	11,896	---	--	---	---	0.0
Parabolic Dune Coast	Bazaruto Archipelago	G	5,034	Bazaruto Archipelago NP (original Park was 600 Km ²)	II	2001	1,430	34.0
				Vilanculos Coastal Wildlife Sanctuary		2000	300	
	---	---	---	Pomene Game Reserve (total area 100 km ²)	IV	1972	---	---
	Inhambane Bay	SR	838	---	---	---	---	0.0
	Inharrime Complex	SR	8,519	---	---	---	---	0.0
	Maputo Bay - Machangulo Complex	G	4,153	Ilhas da Inhaca e dos Portugueses Faunal Reserve (total area 20 km, inc forest and mangrove)	VI	1965	1	.02
Maputo Reserve (total area 900 km ²)				IV	1969	---		

* transfrontier seascape

fully representative at the biogeographical level. The northern Coral Coast subregion and the southern Parabolic Dune Coast are both poorly represented within MPAs in Mozambique. The central Swamp Coast has one MPA, Marrromeu Game Reserve, which incorporates tidal and sub-tidal habitat and is included in the Marrromeu Complex Ramsar site.

There are 9 priority EAME sites in Mozambique. Three Globally important sites all have some MPA coverage (16.2% for Mtwara-Quirimbas; 34.0% for Bazaruto Archipelago; 0.02% for Maputo Bay-Machangulo Complex). The fourth globally important site, the Zambezi Delta System, now includes a Ramsar site, which covers the Marrromeu Game Reserve. No Ecoregionally or Subregionally important areas have any protection yet, although proposals are being developed.

There are currently no marine or coastal natural World Heritage Sites.

The following paragraphs provide a brief assessment of representativeness in terms of habitat type and species.

Coral reefs: Mozambique has a total of c 1,860 km² of coral reef, with an average coral cover of 40% (Obura *et al.*, 2002). All the MPAs with subtidal habitat have reefs, but this is likely to be only a small proportion of the total amount (figures for the amount within MPAs are not available). Reef monitoring is carried out by WWF-Mozambique and the Centre for Sustainable Development for Coastal Zones at Inhaca, Bazaruto and Quirimbas National Park with support from DANIDA, CORDIO and SIDA/SAREC, and monitoring is to be initiated in the Cabo Delgado area. Preliminary results suggest that reefs in MPAs are in better condition and are recovering faster from the El Nino-related

bleaching event which caused over 90% mortality on northern reefs, but less in the south although Inhaca was badly affected (Rodrigues *et al.*, 1999; Motta *et al.*, 2000). Corals are said to be improving in the Quirimbas (Pereira *et al.*, 2003).

Mangroves: Total coverage of mangroves in Mozambique is 4,500 km² (Saket & Matusse, 1991) (although Spalding *et al.*, 2001 give a figure of 925 km²; and it is not known what figure Barbosa *et al.*, 2001 give). Most, if not all of the MPAs have mangroves. Mangrove coverage at Inhaca has increased from 200 ha to 400 ha since the MPA was established (SEACAM). A number of surveys and assessments of mangroves has been carried out but there is no regular monitoring; DNFFB with the Faculty of Agronomy is currently assessing mangrove and coastal dune vegetation from Xai-Xai southwards.

Dugong: Mozambique has the most important (and perhaps only viable) dugong population in the EAME with the greatest numbers, estimated to be around 100 animals, occurring within the Bazaruto Archipelago NP. Aerial surveys confirm that dugong populations are declining, although it is likely that the population is in a significantly better state than if there had been no protection. Dugongs have been sighted in the southern part of the Quirimbas Archipelago and they may still be present around Inhambane Bay and Mozambique Island which is currently unprotected (WWF/UNEP, 2004). Two surveys are underway - one by WWF and the University (Museum), the other by NGOs.

Other marine mammals: 17 other marine mammals occur in Mozambique. The Bazaruto and Quirimbas Archipelagos are known to be important for bottlenose and humpback dolphins and whales. The Zambezi Delta (part of which is now a Ramsar site), is also important, as is the Inharrime Complex which is a calving area for humpback whales (and possibly southern right whales). A survey of marine mammals is underway as part of the South African led coelacanth survey programme.

Birds: Five coastal Important Bird Areas (IBAs) have been identified in Mozambique, primarily for wintering Palaearctic waders, shorebirds, and certain seabird species (Fishpool & Evans, 2001): Maputo Reserve and Bazaruto IBAs lie within existing protected areas; the Pomene IBA is likely to be partly protected by Pomene Reserve; the Zambezi

Delta IBA receives protection through Marrromeu Reserve and the Ramsar Site; but the conservation status of the Moebase Region IBA (an area of mangroves and dunes between Moebase and Notocoto) is not known. All of the MPAs, including the coastal Reserves, are important sites for wading and migratory shorebirds. Another key site is Puga Puga I. in Islas Primeiras e Segundas, where 10,000 sooty terns nest - it is unprotected.

Marine turtles: Five species of marine turtle occur in Mozambique - nesting beaches occur all along the coast but the most important ones are Ponto de Ouro, Maputo Reserve, Inhaca Is, Quewene Peninsular, and Bazaruto (Mortimer, 2000). Of these 5 areas, four are protected (Inhaca, Maputo Reserve, Bazaruto, and Quewene which is within the Vilanculos Sanctuary), and there are active turtle protection programmes at Inhaca, Bazaruto and Vilanculos (Motta unpub). Vamizi and Rongui Is in the new Cabo Delgado conservation project are nesting sites for green and hawksbill turtles.

Fish and invertebrates: Data are not available to assess representativeness within the current system of MPAs. It has been suggested that the 'Eastern South Africa' centre of endemism identified by Roberts *et al.*, (2002) may extend up in Mozambique, but the published information indicates that this covers the area between Natal and East London in South Africa; further analysis of species records is required.

4.3.5.2 Management effectiveness - sustainable livelihoods and poverty alleviation

Many of the MPAs in Mozambique are adjacent to large populations dependent on marine resources, and Bazaruto and Quirimbas have sizeable populations within their boundaries. Some 60 communities live within the Bazaruto MPA and are dependent on fishing, tourism services etc. In addition to fishing for their own food, they sell marine produce to the lodges and hotels. It is considered that their quality of life has improved as a result of the MPA and the project assistance that this has brought into the area, including improved school facilities, credit systems for obtaining legal size fishing nets, and boat building tools (Wells and Gawler, 1999).

Fisheries: Although it is too early to determine any statistically significant socio-economic changes as a result of the establishment of the Quirimbas National Park,

fishermen say that fishing is improving in the areas adjacent to the sanctuary, with mullet spilling over from the no-take areas (Motta, unpub). Before the National Park and marine sanctuary zones were established, data were being collected as this area is one of the national coral reef monitoring stations, and there are some indications that since the closed areas were put in place, the size of fish has increased. Data has been gathered for Bazaruto but has not been published. There is however some conflict between the Park and the fishing communities as some fishing grounds have been lost as a result of the gazettment of the larger Bazaruto Archipelago NP and the Vilanculos Coastal Wildlife Sanctuary.

Tourism: MPAs in Mozambique may already be generating significant tourism revenue, and in some cases this may be helping local communities. Bazaruto and Inhaca are important tourist destinations for fishing, snorkelling, diving and also cruise ships (Rodrigues & Motta, in prep), and Quirimbas is likely to become important for tourism. Tourism on Bazaruto generates US\$6,126,600 a year, of which c. \$1,912,000 is spent locally on the islands. Only 10% of the lodge employees are from the local population, but 25% of the population are estimated to benefit from the tourism generated by the park (e.g. selling produce). Local communities also benefit from a revenue sharing system with the lodges - from 1997-2001, some \$20,000 was made available to local communities for community development projects (Engdahl *et al.*, 2001). A similar system is being introduced to the Quirimbas. Significant numbers of local people in the Quirimbas have reportedly benefited from activities associated with the National Park, including employment in tourism, construction (building of a lodge) and as rangers.

4.3.6 Constraints

- Lack of understanding at the level of government decision makers of the need for no-take zones, which are perceived as excluding local people.
- *Lack of alternative livelihoods* that could become the focus of appropriate programmes to reduce fishing pressure; there is some conflict between local fishermen in the Bazaruto/Vilanculos area as a result of designation of the Vilanculos Sanctuary.
- Expectation within government that tourism and/or private sector will fund MPAs.

- *Legislation* - outdated for Inhaca; for Quirimbas and Bazaruto, wildlife legislation is ambiguous in relation to use rights of local communities.
- *Lack of capacity*, particularly within government agencies responsible for MPA management.

4.3.7 Recommendations

Mozambique has the largest number of priority seascape areas in the EAME, several of which have no protected areas at all. Although there is an urgent need for the establishment of new MPAs, it is also recognised that the existing ones need improved management. Given the low capacity within the government, the agencies concerned are actively looking for mechanisms by which MPAs can be managed through the private sector and by NGOs, in collaboration with local communities.

The following activities have been proposed to expand and strengthen the national MPA network (brackets = EAME priority seascape rating):

- **Maputo Bay - Machangulo Complex (G):** Ponta de Ouro (key turtle nesting site) - Cabo de Santa Maria (extension of Maputo Reserve is being considered - 3 miles offshore on the ocean side, 1 mile offshore on the bay side); Maputo Reserve is a potential Ramsar site; a project is underway to identify MPAs along coast from Maputo Bay-Machangulo-Ponta de Ouro (with MICOA, DNAC, UEM, South Africa and European partners) for submission to EU for funding. The new protected area would extend to the South African border and create a transboundary conservation area with Greater St Lucia Wetlands Park. Management of existing MPA at *Ilhas da Inhaca e dos Portugueses* needs strengthening and supporting - there is a proposal for this protected area to become a National Park.
- **Quirimbas (G)** - establishment of transboundary conservation initiative with Mnazi Bay - Ruvuma Estuary MP in Tanzania; establishment of new MPAs in northern Quirimbas and Cabo Delgado Province currently being considered as part of IDA/World Bank/GEF/MICOA project.
- **Primeiras e Segundas archipelago (ER)** - a marine park has been proposed and is awaiting gazettment.
- **Nacala - Mossuril (ER)** - MPA sites for Nampula province currently being considered as part of the IDA/World Bank/GEF/MICOA project.

- **Inhambane Bay** (SR) - co-management MPA areas being identified under DANIDA project.
- **Feasibility studies** to be carried out for nomination of World Heritage Sites at Ilhas Primeiras e Segundas (ER), on the C list of potential WH sites; Bazaruto (G) on the A list; Nacala - Mossuril (ER) on the C list; Zambezi R. Delta (G) on the B List; Maputo Bay - Machangulo Complex (G) on the A list.
- **A national dugong assessment.**
- **Further work on coral taxonomy.**
- **Introduce the concept of assessment of MPA management effectiveness.**

At present there are no recommendations or MPA activities underway for the subregionally important priority seascapes at Sofala Bay, and Inharrime Complex.

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