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Proceedings of the National Workshop on

**INTEGRATED COASTAL ZONE
MANAGEMENT IN MOZAMBIQUE**

Proceedings of the National Workshop on

INTEGRATED COASTAL ZONE MANAGEMENT IN MOZAMBIQUE

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FOREWORD

Eastern Africa and the island states of the Western Indian Ocean is a diverse region – culturally, politically and ecologically. The region consists of the mainland states Somalia, Kenya, Tanzania and Mozambique and the island states Madagascar, the Comoros, Mauritius, La Réunion and the Seychelles. Approximately 30 to 35 million people live in the coastal areas of the region, and the shoreline extends a distance of some 11 000 kilometres. Widespread poverty, together with rapid population growth and inappropriate or poorly planned development, have resulted in environmental degradation and resource depletion in many areas along the coast. This has resulted in increasing conflicts among coastal inhabitants.

To address issues of coastal destruction and resource overuse, better methods for environmental and natural resources management are needed. Such methods and principles have already been used in other parts of the world, and are generally referred to as Integrated Coastal Zone Management (ICZM) or Integrated Coastal Area Management (ICAM). These methods were one of the topics at the Earth Summit (*UNCED*) in Rio de Janeiro in 1992 (Chapter 17 of Agenda 21). Furthermore, the governments of the region agreed to adopt and implement the concept of ICZM in their countries at the *Policy Conference on Integrated Coastal Zone Management in Eastern Africa including Island States*, held in Arusha, Tanzania, in April 1993 (*The Arusha Resolution on Integrated Coastal Zone Management*, see page XX of this volume). In order to reassess the successes and failures of the Arusha Resolution, the governments of the region met again in October 1996 in the Seychelles. The outcome of that meeting was an agreement on further actions to improve the situation (*The Seychelles Conference Statement*, see page XY of this volume). To address the issues of coastal management in Eastern Africa, a joint program was initiated between the Swedish Government through Sida (the Swedish International Development Cooperation Agency¹) and the Environment Department, Land, Water and Natural Habitats Division at the World Bank. The objective of the program is to initiate a national process in the countries of the region, to improve the management of the coastal areas and assist in capacity building in this field.

One way of increasing awareness of the need for improved coastal management at the political and executive level in the countries of the region, is to arrange seminars and workshops, where policy-makers, heads of government agencies and others

¹ The program was originally started by SAREC (the Swedish Agency for Research Cooperation with Developing Countries). In 1995, SAREC merged with several other Swedish agencies to form Sida.

can meet to discuss the issues. At these workshops, with the assistance of international experts, various national experts, interest groups and local stakeholders are invited to discuss, exchange information and apply the concepts of Integrated Coastal Zone Management in a local setting. An example of the outcome of these workshops is the inclusion of coastal management programs in national and environmental action plans, and making them part of national investment priorities. Another outcome is the establishment of pilot activities for the implementation of ICZM. A series of workshops are now being held in Eastern Africa and the island states of the Western Indian Ocean. So far, national workshops have been carried out in the Seychelles, Tanzania, Madagascar and Mozambique. This volume presents the proceedings of the fourth national workshop, which was held on Inhaca Island and in Maputo, Mozambique.

On behalf of Sida and the World Bank, we wish to thank the organisers, the Ministry for Coordination of Environmental Affairs (MICOA) and the University Eduardo Mondlane, for their preparatory work which made the workshop a success. One proof of this success is the fact that several of the recommendations from the workshop are presently being implemented by MICOA and other concerned parties.

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STATUS OF THE COASTAL ZONE OF MOZAMBIQUE

ALFREDO MASSINGA AND JOHN HATTON

Introduction

Background

Mozambique is situated between latitudes 10°20'S and 26°50'S. Its coastline of ca. 2 770 km is characterised by a wide diversity of habitats, including sandy beaches, coral reefs, estuarine systems, bays, mangroves and seagrass beds. The coast is the country's most valuable natural resource. Coastal resources – fisheries, agriculture, tourism and forestry – contribute significantly to the national income, and provide social and economic benefits to an estimated two-thirds of the population. These resources are allocated and managed on a sectoral basis with little coordination between the sectors – especially in the coastal areas, where both land and marine resources are involved. Consequently, there are overlaps and gaps with regards to institutional roles, jurisdictional competence, powers of enforcement etc., resulting in haphazard and uncontrolled development along much of the coastline.

The National Environmental Management Plan (NEMP), approved by the Government of Mozambique and currently under review, highlights "the management and use of the coast and coastal marine resources" as one of three critical areas warranting special attention. Hopefully, the integrated management and sustainable development of Mozambique's coastal zone may be achieved once the NEMP is implemented.

Coastal Regions

The Mozambique coast is a compound shoreline and can be divided into three main natural regions with one additional type of limited occurrence (Fig. 1).

Coral Coast

The northernmost section, extending about 770 km from the Rovuma River in the north to the Primeiro/Segundo Archipelago in the south (17°20'S), is essentially a coral coast. These reef-forming corals are classified as hermatypic, requiring a mean annual sea temperature of about 21°C. Corals also occur at intervals offshore from Bazaruto Island southward to South Africa, but these are found in relatively deeper waters than the reef corals and play little part in modifying the direct action of the sea and storms. The southern limit for shallow water fringing coral is reported from Inhaca Island, at latitude 26°S.

Swamp Coast

The central section of Mozambique, ca. 978 km between Angoche (16°14'S) and Bazaruto Island (21°10'S), is classified as a swamp coast, with simple linear to arched beaches, swamps and estuaries. The sea along this coast is shallow and the waves are high but short, disturbing the bottom materials close to the beach; this is one of the causes of the high turbidity found in this region. Twenty-four rivers discharge into the Indian Ocean along this central section of the coast, each with an estuary supporting well established mangrove swamps. The beaches between Pebane and the Zambezi River mouth are of black sand and consequently fairly rich in the minerals ilmenite and rutile. The shore is characterised by low dunes known as cheniers, which run parallel to the coast.

Parabolic Dune Coast

The third coastal region stretches from Bazaruto Island southward to Ponta de Ouro and beyond to Natal at Mlalazi River (28°57'S) and is classified as a parabolic dune coast. This is a section of coast about 850 km long and is characterised by high parabolic dunes and north-oriented capes and barrier lakes. These dune systems attain heights of 120 m and are considered to be the highest vegetated dunes in the world.

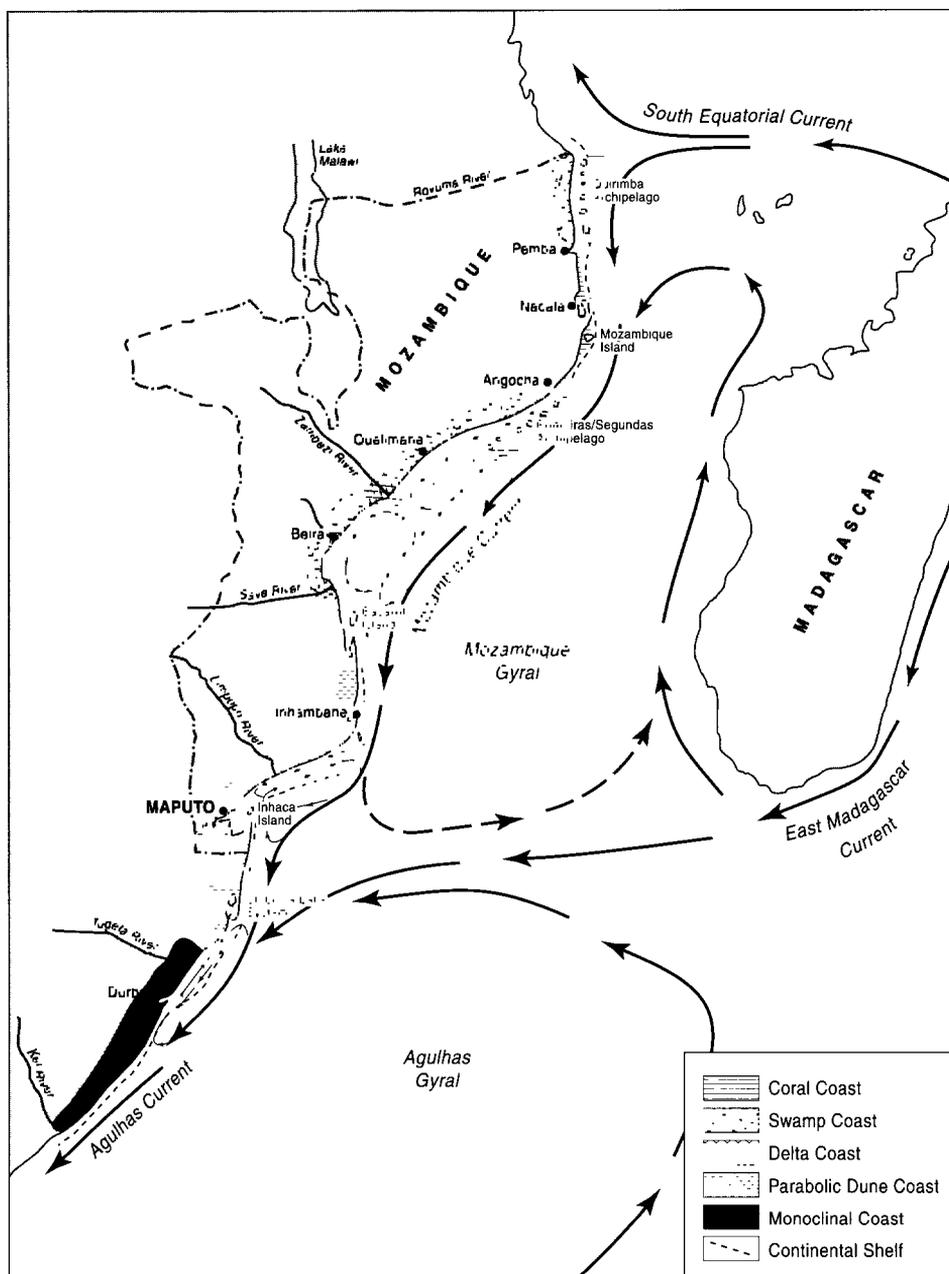
Delta Coast

There are only two sections of the Mozambique coast that can be classified as delta coast, namely the Zambezi and Save River deltas.

Currents

Mozambique lies is separated from Madagascar Island by the Mozambique Channel, which is 400 km wide at its narrowest point. Madagascar Island blocks off the influences of the open ocean, except in the extreme south (south of latitude 25°S) and in the extreme north, where Cabo Delgado lies open to the direct influence of the Indian Ocean and forms the dividing point of the South Equatorial Current (Fig. 1). The warm southward flowing branch of this current, known as the Mozambique Current, and further south as the Agulhas, has far-reaching influences on the climate and life of Southern Africa. The Mozambique Current passes close to the shore near Mossuril and Cabo das Correntes, attaining its greatest velocity of more than six kilometres per hour during the north-east monsoon (October to November). Large counter currents occur in the Bights of Sofala and Maputo, forming, in the latter case, the characteristically northward-oriented peninsulas, most notably the Machangulo (Santa Maria), Inhambane and Sao Sebastiao (Bazaruto) Peninsulas. The islands of the Bazaruto Archipelago and Inhaca Island were once peninsula headlands of the present mainland and subsequently severed and isolated by wind and sea action.

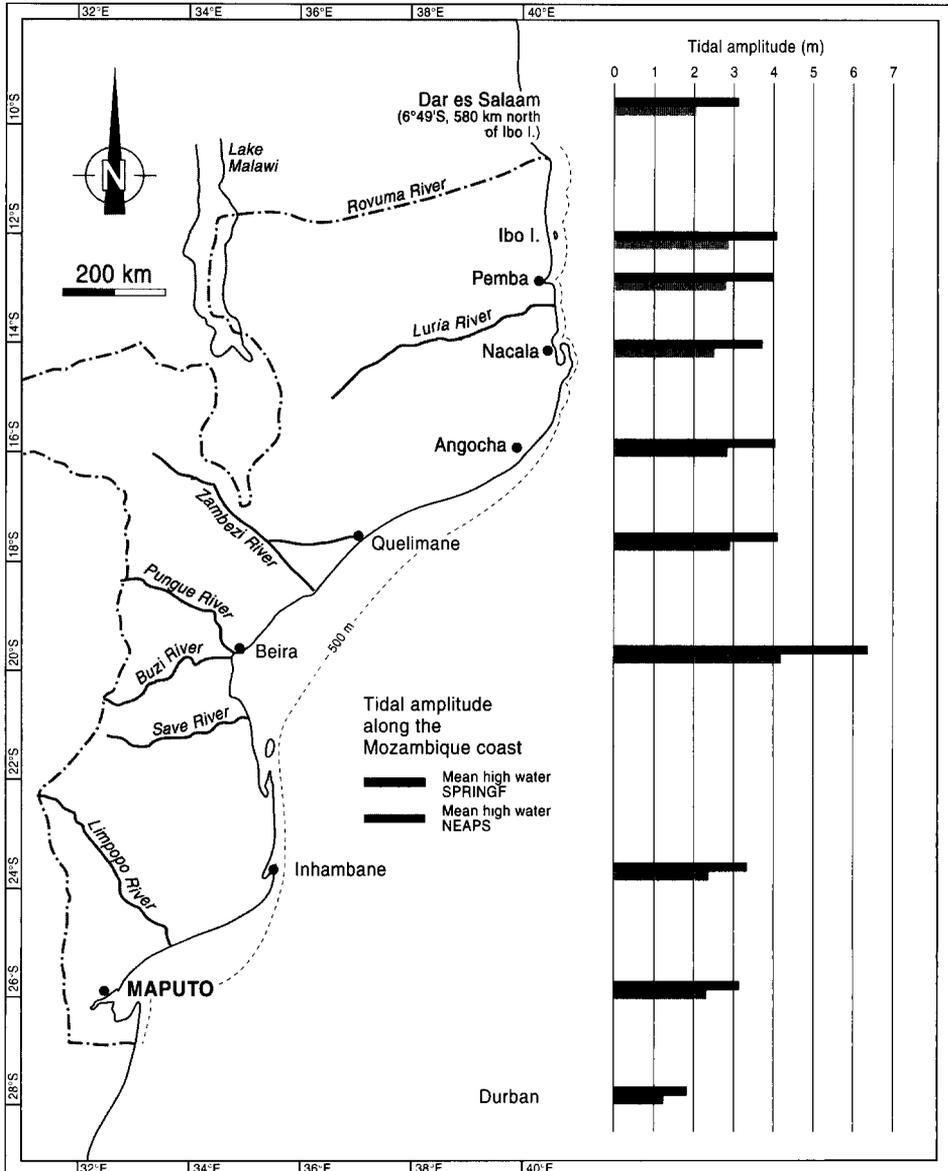
Figure 1. Main coastal regions and ocean current systems of Mozambique.



Tides

The tidal range along the Mozambican coast is shown in Figure 2. One of the highest ranges along the entire African coast is found at Beira (6.3 m) and is caused by the broad (140 km wide) shallow continental shelf.

Figure 2. Tidal ranges along the Mozambique coast.



Climate

The major part of the Mozambique coast has a tropical humid to sub-humid climate. The coast experiences rainfall in all months, with the maximum in the summer months (November to March). The highest annual average rainfall is recorded for the central sector of the coast (e.g. Beira 1 418 mm/year) and the lowest along the southern sector (e.g. Maputo 775 mm/year). Average annual rainfall for the coast is given in Table 1.

Table 1. Average rainfall for selected coastal sites

LOCATION	COORDINATES	ANNUAL AVERAGE (MM)
Mocimboa da Praia	11°19'S, 40°22'E	953
Pemba	13°00'S, 40°38'E	895
Mossuril	14°57'S, 40°40'E	952
Pebane	17°16'S, 38°09'E	1 209
Chunde	18°37'S, 36°30'E	1 100
Beira	19°50'S, 34°51' E	1 418
Vilanculos	22°00'S, 35°20'E	967
Inhambane	23°52'S, 35°23'E	1 000
Maputo	25°50'S, 32°36'E	775

Geomorphology

The coastal zone from Ponta de Ouro in the south to latitude 16°S immediately north of Angoche is composed of unconsolidated Quaternary to recent sediments, mostly sand (dunes and sandy plains), but interspersed with heavier textured soils (alluviums) at the larger river mouths. At latitude 16°S and at Mocambo, Nacala and Memba Bays, small areas of Tertiary basalts occur. From Angoche northwards heavily faulted Cretaceous to Tertiary sediments line the coast.

Coastal Zone Biota

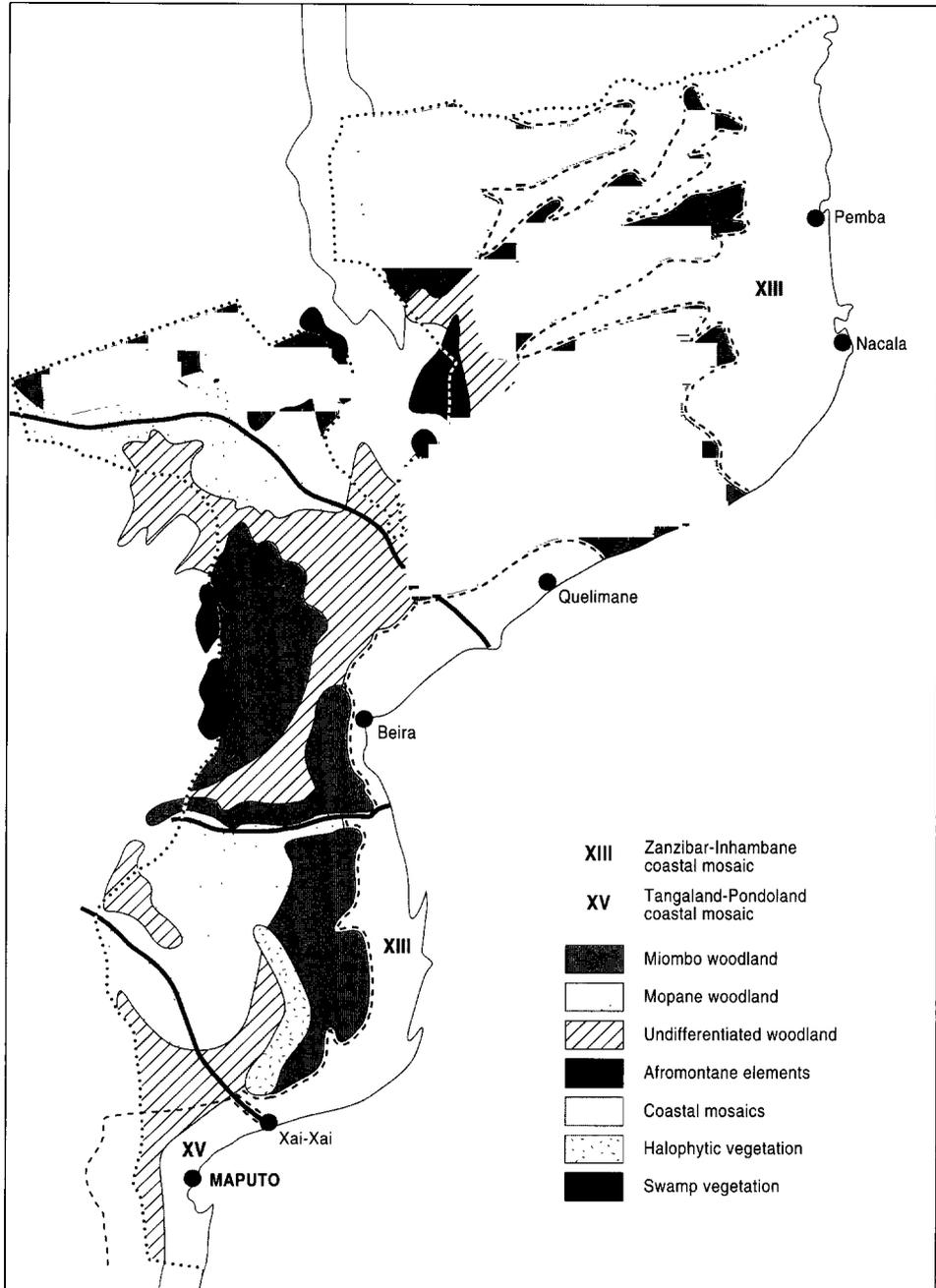
Coastal Vegetation Types

Conventionally, in phytogeographic terms (White, 1983) the coastal zone traverses two phytogeographical regions (Fig. 3):

- The Zanzibar – Inhambane regional mosaic extending from the mouth of the Limpopo River (Latitude 25°S) to the Rovuma River (and northwards).
- The Tongaland – Pondoland regional mosaic (TPRM) extending southwards from the Limpopo River.

Although the two phytochoria differ floristically, both comprise a complex matrix of forest, wooded grassland, secondary grassland, edaphic grassland and mangrove communities. Due to the long history of anthropogenic land use along the coast, much of the landscape today comprises a mosaic of agricultural fields, with grassy fallow and orchards of exotic tree species, such as coconut (*Cocos nucifera*), cashew (*Anacardium occidentale*) and mango (*Mangifera indica*).

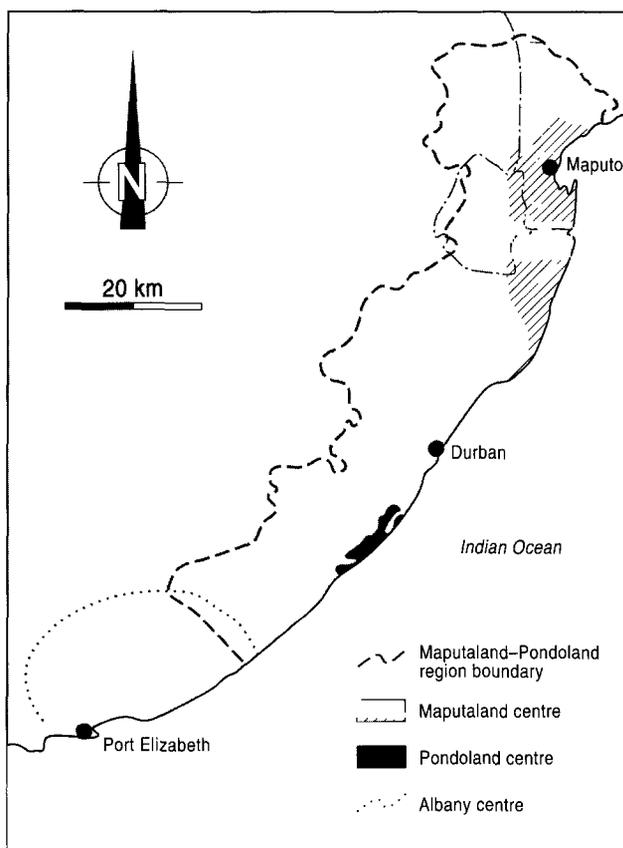
Figure 3. Main vegetation types of Mozambique.



A more or less continuous cover of dune forest occurs between Ponta do Ouro in the south and Bazaruto in the north. Behind the dune forests the vegetation is characterised by grasslands, wooded grassland, swamp forests (in the south), and woodland. Between Maputo and Inhambane much of the indigenous coastal vegetation behind the dunes has been cleared for agriculture. The high bio-diversity value and uniqueness of these southern coastal formations is gaining increasing recognition.

The TPRM, as defined by White, was not recognised as a true centre of endemism but rather as a transitional zone with many linking elements. However, more recently, van Wyk (1994) has proposed an Indian Ocean coastal centre of plant diversity (CPD) *viz.* the Maputoland-Pondoland Region (MPR). This region roughly approximates to the TPRM but excludes the area of the Great Kei River, which is treated as a separate CPD, *viz.* the Albany CPD (Fig. 4). The MPR extends along the Indian Ocean from the Olifants and Limpopo Rivers in the north (24°S) to just beyond the Great Kei River in the south (33°S). The western boundary is formed mainly by the Great Escarpment. The flora is a mixture of several floristic elements and communities, including tropical (particularly in the north and along

Figure 4. Maputoland – Pondoland region (van Wyk, 1994).



the coast), afroalpine (at relatively low altitude owing to the compensating effect of increasing latitude on temperatures), Cape, afroalpine and palaeoendemic (notably the Pondoland Centre, see below) elements. The total number of vascular plant species for the MPR is estimated to be between 6 000 and 7 000, almost twice the number of species estimated by White (1983). About 1 222 species/infraspecific taxa and 58 genera of vascular plants are endemic or near-endemic to the region. In addition, several hundred species have their centre in the MPR. The MPR is floristically very diverse and complex. However, there are two clear foci of high endemism in the region: the Maputaland Centre (MC) and the Pondoland Centre (PC) (Fig. 4). The MC (ca. 26 734 km²) is defined as the part of southern Mozambique and north-eastern Natal bounded in the north by the Inkomati-Limpopo River, in the west by the western foothills of the Libombos, in the south by the St. Lucia estuary and in the east by the Indian Ocean. The Ponta do Ouro – Xai-Xai coastline is almost entirely situated in this centre of endemism, emphasising the high bio-diversity value of this stretch of coast. The MC contains extensive wetlands, notably Lake St. Lucia (ca. 350 km²), Lake Sibaya (ca. 65 km²) and the Kosi Lake System in South Africa and Lakes Piti, Xingute and Satine in Southern Mozambique. The MC flora is very distinct from that of the rest of the MPR. Van Wyk (1994) suggested that at least 1 100 species of vascular plants occur in the MC. However, this figure may be as high as 2 000 to 3 000 species (van Wyk, pers. comm.). Of these, at least 168 species/infraspecific taxa (this is probably also an underestimate) and four genera (*Brachylochia*, *Ephippiocarpa*, *Helichrysopsis* and *Inhambanella*) are endemic/near-endemic to the centre. Several of the endemics are rare and known only from a few collections.

The associated fauna of the MPR, and particularly of the MC, is interesting and rich. Of the more than 472 species of birds in the MC (57% of South Africa's total), 47 subspecies are endemic/near-endemic to the centre. The MC corresponds with the southern part of the South-East African coast Endemic Bird Area (EBA). This has three endemic restricted-range birds species, which occur in a wide-range of habitat types (van Wyk, 1994). As with its flora, the MC is the southernmost part of the range of many components of the East African fauna. The centre is of exceptional bio-geographical interest because of the sharp bio-geographic transformation in the region. Other endemic/near-endemic species and infra-specific taxa (total indigenous to the centre in brackets) include 14 mammals (102 species, about four locally extinct) 23 reptiles (about 112 species/subspecies), three frogs (45 species/subspecies) and seven freshwater fishes (67 species) (van Wyk, 1994) (Table 2).

The new evidence presented by van Wyk (1994) has clearly established the importance of Maputaland as an area of high bio-diversity and endemism. Whereas southern coastal Mozambique was considered to be a transitional zone, it is now, as part of the Maputaland centre, recognised as an area of high biological value. Although much of the northern coast has undergone anthropogenic change, extensive coastal woodlands and forests may still be found, for example between the

Table 2. Endemism among selected groups of plants and animals in the Maputaland-Pondoland region, Maputaland centre and Pondoland centre (From Van Wyk, 1994)

	MAPUTALAND- PONDOLAND REGION	MAPUTALAND CENTRE	PONDOLAND CENTRE
Total number of vascular plant & infra-specific taxa	6 000-7 00	1 100	1 500
Endemic/near-endemic vascular plant (genera)	58	4	6
Endemic/near-endemic vascular plants (specific & infra-specific taxa)	1 222	168	118
Endemic/near-endemic mammals (subspecies)	41	14	1
Endemic/near-endemic birds (subspecies)	148	47	6
Endemic/near-endemic reptiles (specific & infra-specific taxa)	38	23	1
Endemic/near-endemic frogs (specific & infra-specific taxa)	17	3	0

Megaruma and Lurio Rivers in Cabo Delgado province. A number of endemic tree species occur in these forests (Tinley, 1971). However, baseline information on the northern coastal forest formations is urgently required.

Seagrass Beds

Some of the most important and unique neritic habitats of the Mozambican coast are formed by seagrass beds, dominated by marine flowering plants or seagrasses. These seagrasses form extensive swards in the protected shallow seas between offshore islands and the mainland, or in estuaries with suitable substrate. Ten species have been recorded: *Cymodocea ciliata*, *C. serrulata*, *C. rotundata*, *Syringodium isoetifolium*, *Halophia stipulacea*, *H. ovalis*, *Halodule wrightii*, *Thalassadendron ciliatum*, *Thalassia hemprichii* and *Zostera capensis*. The seagrasses form the main food of two large herbivores, a marine mammal, the dugong (*Dugon dugon*) and the green turtle (*Chelonia mydas*). Dugong distribution on the coast closely follows that of seagrass beds.

Mangroves

Mangrove forests are floristically well developed in the northern and central sectors of the coast and less so along the southern sector. They are seldom very extensive between their landward and seaward faces (except at the Zambezi River delta) and are semi-continuous along the coast. Generally, *Sonneratia alba* (which occurs north of Xai-Xai) is the seaward pioneer adapted to the open coastal and coral platforms, occupying sites that are deeply flooded every day. *Pemphis acidula* is a beach tree that thrives on old coral within reach of the waves and often intrudes into the *Sonneratia* fringe if it is interrupted by a coral outcrop. A zone of *Rhizophora mucronata* usually occurs behind the *Sonneratia* zone. Towards the back of the

swamp, where tidal flooding is less deep and frequent, *Rhizophora* is replaced by *Bruguiera gymnorrhiza*. *Xylocarpus granatum* is a common associate of both *Rhizophora* and *Bruguiera*, occurring close to creek banks, and in muddy depressions in the *Bruguiera* zones. In drier sites, thickets of *Ceriops tagal* form broad belts. These may give way to an *Avicennia marina* zone. Often the typical sequence *Rhizophora/Sonneratia*, *Bruguiera* and *Ceriops* is telescoping along creeks where narrower bands of the different species follow one another in quick succession.

Sea Turtles

All five species of Indian Ocean turtles nest on beaches along the Mozambique coast, namely, the loggerhead turtle (*Caretta caretta*), leatherback turtle (*Dermochelys coriacea*), green turtle (*Chelonia mydas*), hawksbill turtle (*Eretmochelys imbricata*) and olive Ridley turtle (*Lepidochelys olivacea*). The green turtle is widespread but only nests north of the Tropic of Capricorn. The hawksbill is found mainly in the northern part of the country, as is the less common olive Ridley turtle. The loggerhead and leatherback turtles are mainly located south of the Tropic of Capricorn where they nest, but are known further north (Hughes, 1971; Costa, 1989).

The loggerhead and leatherback turtles nest along the coast from Ponta do Ouro to the Bazaruto Archipelago. The most important areas are the Ponta do Ouro region, Maputo Game Reserve, Inhaca Island, Qewene Peninsula and the Bazaruto Archipelago (Hughes, 1971). The peak nesting season is between November and January (Hughes, 1971; Costa, 1989; Data from Marine Biological Station of Inhaca). At Inhaca Island they nest on a 12 km strip of beach with an average of 40 nests per year. The green turtle nests from Qewene peninsula to Quirimbas Archipelago. The biggest concentration appears to be in the Primeiras e Segundas Islands (Hughes, 1971). Nests of this species were found recently in Bazaruto (Magane, pers. comm.). Small and immature green turtles are concentrated around Bazaruto archipelago and Inhassoro (Hughes, 1971) and some are found in Maputo Bay (Costa, 1989). The hawksbill and olive Ridley turtles appear to occur on the northern coast (Hughes, 1971) but their nesting areas are unknown. No information is available on the other species.

Marine Mammals

Guissamulo and Cockcroft (1996) have listed eighteen marine mammals occurring in the coastal waters of Mozambique (Table 3). The dugong (*Dugon dugon*) is herbivorous and attains a mass of up to 170 kg, with a body length of 2.5 to 3 m. One of the largest populations of dugong along the East African coast inhabits the littoral waters of the Bazaruto Archipelago (estimated at ca. 300 individuals; Guissamulo, 1993) while a smaller population occurs in Inhambane Bay. It is believed that a few individuals still inhabit Maputo Bay, although this population appears to be on the verge of extinction. Several species of dolphins inhabit the

Table 3. Marine mammals registered in coastal Mozambique (Guissamulo & Cockcroft, 1996)

COMMON NAME	SPECIES NAME
Spinner dolphin	<i>Stenella longirostris</i>
Common dolphin	<i>Delphinus delphis</i>
Spotted dolphin	<i>Stenella attenuata</i>
Bottlenose dolphin	<i>Tursiops truncatus</i>
Humpback dolphin	<i>Sousa chinensis</i>
Striped dolphin	<i>Stenella coeruleoalba</i>
Rough-toothed dolphin	<i>Steno bredanensis</i>
Pygmy killer whale	<i>Feresa attenuata</i>
Pygmy sperm whale	<i>Kogia breviceps</i>
Short-finned pilot whale	<i>Globicephala macrorrhynchus</i>
Killer whale	<i>Orcinus orca</i>
False killer whale	<i>Pseudorca crassidens</i>
Minke whale	<i>Balanoptera acutorrostrata</i>
Humpback whale	<i>Magaptera novaeangliae</i>
Southern right whale	<i>Eubalaena australis</i>
Dugong	<i>Dugon dugon</i>
Crabeater seal	<i>Lobodon carcinophagus</i>
Sub-antarctic fur seal	<i>Arctocephalus tropicalis</i>

littoral waters off Mozambique: the humpback dolphin (*Sousa chinensis*), bottlenose dolphin (*Tursiops truncatus*), spinner dolphin (*Stenella longirostris*), spotted dolphin (*Stenella attenuata*), common dolphin (*Delphinus delphis*), striped dolphin (*Stenella coeruleoalba*), rough-toothed dolphin (*Steno bredanensis*) and the false killer whale (*Pseudorca crassidens*). The coast of Mozambique is known as a winter breeding ground for whales who migrate from the Southern Ocean. Maputo Bay and adjacent waters were known as breeding grounds for southern right whales (*Eubalaena australis*). However, this species has not been sighted in the bay recently.

A survey for assessing the right and humpback whales' breeding ground along the Mozambican coast was carried out in 1991 (Best, 1991). Interestingly, right whales were not observed during this survey. Humpback whales occur in the stretch between Ponta do Ouro and Inhambane. However, they do not enter the Maputo or Inhambane bays. The largest number of humpback whales is recorded for the coast off Zavora (100 km south of Inhambane Bay). Minke whales also occur along the coast between Ponta do Ouro and Inhambane Bay.

Other Marine Biota

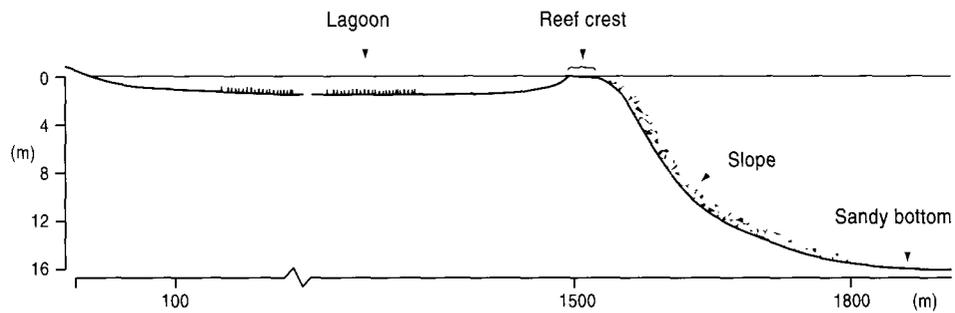
Although corals occur along the entire coast at intervals, the true coral coast is confined to the north of Mozambique, from the Primeiras Islands in the south to the Rovuma River in the north (Fig. 1). Despite their importance, relatively few studies have been carried out on corals, and little documented information is

available except for those of Inhaca Island. A French-Mozambican scientific expedition carried out a survey of the coral reefs of Ibo Island, northern Mozambique, in January 1996. It resulted in the production of a Licenciatura thesis (Rodrigues, 1996), and a final report of the French-Mozambican expedition is under preparation. The coral reef systems of Ibo Island characteristically comprise a landward shallow lagoon bounded by a reef crest which falls off steeply to a sandy bottom at ca. 16 m depth (Fig. 5). Rodrigues (1996) identified 30 genera occurring in the Ibo Island reef systems (Table 4). The littoral waters of coastal Mozambique are recognised for the high diversity of marine fish, crustaceans and molluscs, which

Table 4. Corals identified at Ibo Island (Rodrigues, 1996)

Order SCLERACTINIA	Order ALCYONACEA
Acroporidae <i>Acropora</i> sp. <i>Montipora</i> sp.	Alcyoniidae <i>Alcyonion</i> sp.(?) <i>Litophytum</i> sp. <i>Lobophytum</i> sp.
Agariciidae <i>Pavona</i> sp. <i>Pachyseris</i> sp.	<i>Sarcophyton</i> sp. <i>Sinularia</i> sp.
Faviidae <i>Echinophora</i> sp. <i>Favia</i> sp. <i>Favites</i> sp. <i>Goniastrea</i> sp.(?) <i>Oulophyllia</i> sp. <i>Platygyra</i> sp.	Xenidae <i>Anthelia</i> sp. <i>Xenia</i> sp. (?) <i>Dendronephthya</i> (?) <i>Nephthia</i> (?)
Fungidae <i>Fungia</i> sp. <i>Cycloseris</i> sp. <i>Herpolitha</i> sp.	
Merulinidae <i>Hydnophora</i> sp.	
Mussidae <i>Lobophyllia</i> sp.	
Dendrophylliidae <i>Turbinaria</i> sp.	
Pocilloporidae <i>Pocillopora</i> sp. <i>Seriopora</i> sp. <i>Styphora</i> sp.	
Poritidae <i>Porites</i> sp.	
Oculinidae	

Figure 5. Transect of a coral reef system, Ibo Island.



has evolved with the great variety of habitats. Fifty fish species are believed to be endemic to the littoral waters between Beira and St. Lucia in northern Natal (Tinley, 1973).

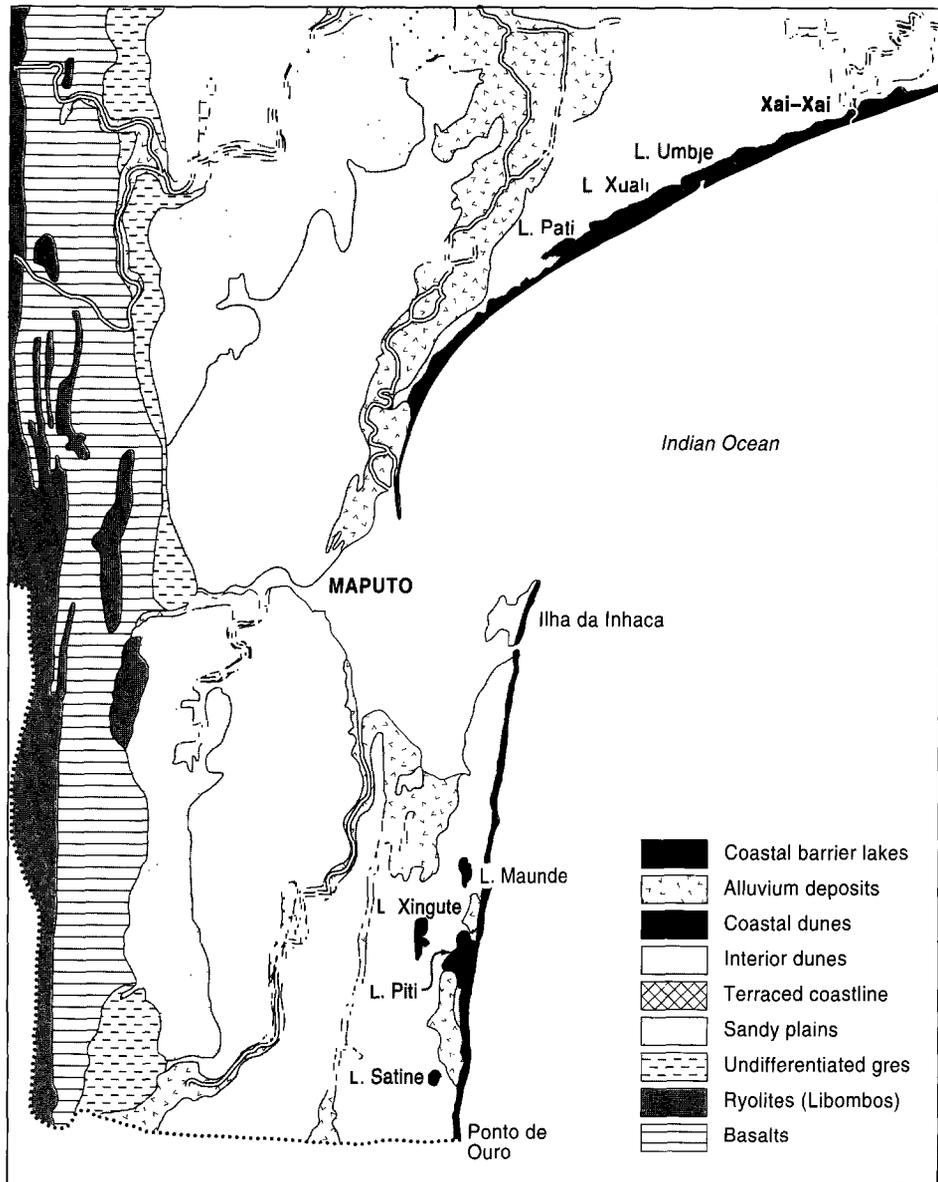
Coastal Barrier Lakes

Characteristic features of the Ponta do Ouro – Bazaruto coastal zone are the extensive coastal lakes, swamps and temporarily rain-filled pans which occur behind the dune systems. The most important coastal lakes from north to south are: Sauce (>200 ha), Uembje (Bilene) (3 200 ha), Muandje (2 250 ha), Pati (1 850 ha), Piti (2 700 ha), Xingute (1 150 ha), Satine (500 ha) and the smaller lakes Maundo, Zuali, Nela, Umalati and Machai, all less than 300 ha (Fig. 6). These lakes are located on a plain of low elevation and most are separated from the sea by a well developed longshore dune system. They have a maximal depth of 5 m. The bathymetry and limnology of these lakes are not well studied. The origin of coastal lakes has been discussed by several authors, namely, Martin (1962), King (1951), Day *et al.* (1953) and Hill (1969). More recently, King (1972) and Hill (1975) postulated that the Mozambican coastal plain is Pliocene in age and was cut by a marine transgression. In the succeeding regression, the sea left a series of longshore dunes as sandy ridges running parallel to the present shore. The present coastal longshore dune is backed over long distances by narrow coastal lakes behind which is a second series of longshore dunes.

Lake Bilene, unlike the other coastal barrier lakes, is linked to the sea via a channel. This channel may occasionally be closed by the formation of a sand bar. The sand bar was opened in 1994 to gain access to the sea for local fishermen and tourists. In March 1996, the sand bar opened, due to natural coastal processes. The other barrier lakes, by contrast, do not have links with the sea and typical freshwater or brackish fish species occur in these water bodies.

Tello (1973) lists 30 different freshwater and estuarine species occurring in the coastal lakes of southern Mozambique, whilst van Wyk (pers. comm.) considers at least twelve fish species to be endemic/near-endemic for the Maputaland region.

Figure 6. Geological formations and coastal barrier lakes in southern Mozambique.



These are:

- *Aplocheilichthys myaposae*
- *Barbus brevipinnis*
- *Chetia brevis*
- *Chiloglanis anoterus*

- *Chiloglanis bifurcus*
- *Chiloglanis emarginatus* (near-endemic)
- *Chiloglanis swierstrai*
- *Croilia mossambica* (near-endemic)
- *Hypseleotris dayi*
- *Serranochromis meridianus*
- *Silhouettea sibayi*
- *Varicorbinus nelspruitensis* (near-endemic?)

Three of these species were reported for southern Maputo by Tello, (1973):

- *Aplocheilichthys myaposae* (endemic)
- *Croilia mossambica* (rare, near endemic)
- *Serranochromis meridianus* (rare, near endemic)

The fishery resources of the coastal lakes have long been exploited by local inhabitants for subsistence and commercial purposes. Interestingly, shortly after the opening of the sand bar at Lake Bilene, 90% of tilapia (*O. mossambicus*) caught showed pathological symptoms termed anophthalmia (loss of one or both eyes). It is surmised that this was due to rapid changes in salinity levels following the opening of the low dune ridge linking the lake to the open sea.

Coastal Conservation Areas

Considering the diversity of habitats along the length of the Mozambican coastline and the economic importance of the littoral waters, remarkably few coastal areas are protected (Fig. 7). The largest proclaimed area, the Marromeu Reserve (150 000 ha) located in the Zambezi River delta system, comprises mangrove swamps, freshwater swamps and flood plains. The large populations of buffalo that once inhabited the flood plain system in this reserve have largely been decimated. The Maputo Elephant Reserve (70 000 ha) was proclaimed a reserve in 1960 in order to protect the elephant populations – these too were decimated during the recent civil unrest. The only other coastal areas which have conservation status are the Bazaruto National Park (8 000 ha), the Pomene Reserve (20 000 ha) and the Inhaca and Portuguese Islands Reserve. The main features of each coastal conservation area are given in Table 5.

Problems Caused by Land Use

A major portion of the population of Mozambique (estimated ca. 2/3 of the total) is concentrated in the coastal areas. This is due to migration during the country's civil war (1976–1992) and to economic opportunities from urban services. As a result, population density in urban and peri-urban areas rose rapidly, e.g. the population of Maputo City rose from 0.6 million before the war to its present level of 1.2 million. Small-scale farming on land derived from slash and burn agriculture is common on

Figure 7. Conservation areas (national parks and reserves) in Maçambique.

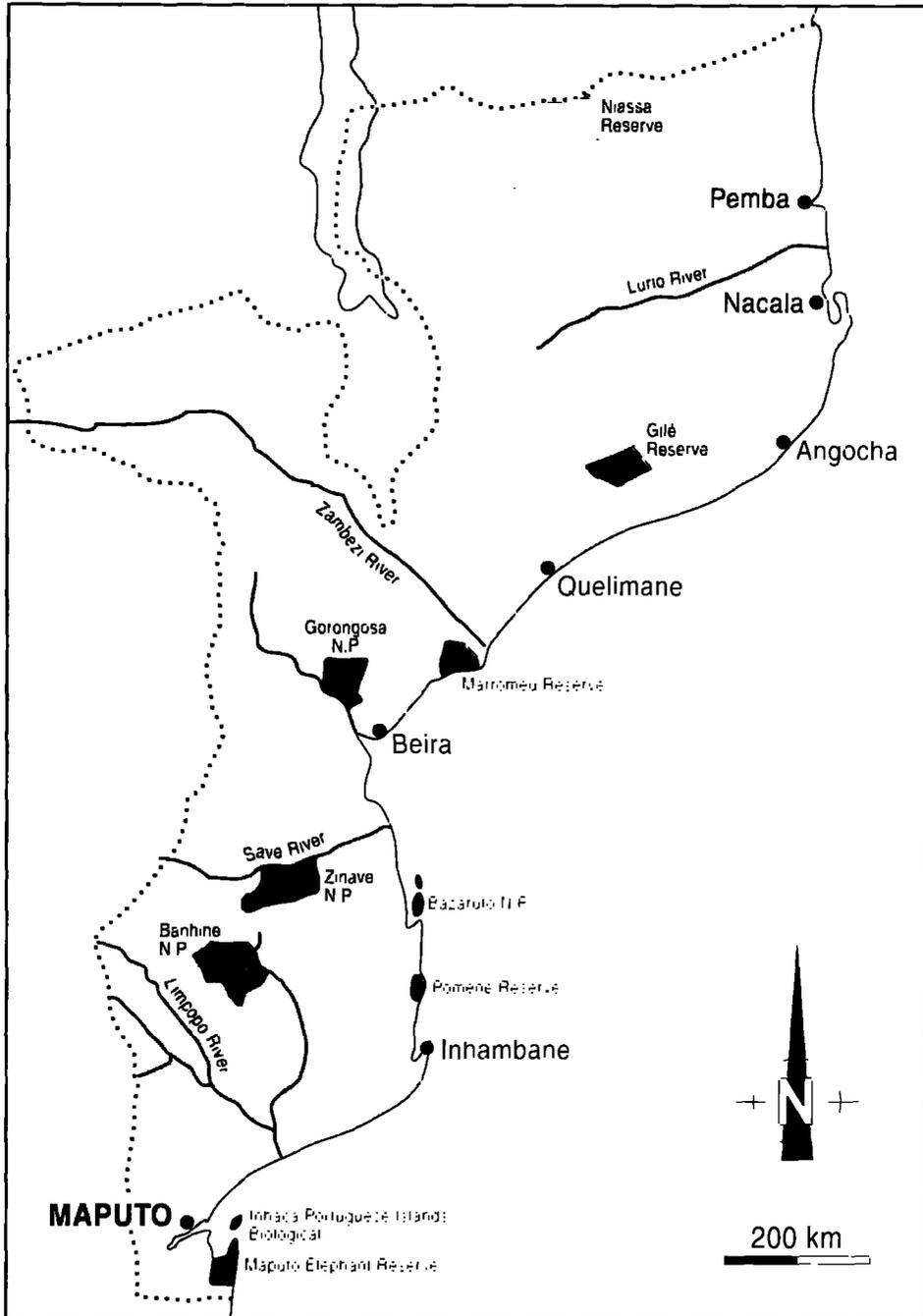


Table 5. Coastal areas currently with protection status

CONSERVATION AREA	AREA (HA)	OBSERVATIONS
Maputo Reserve (Maputo Province)	70 000	Dune forests, grasslands, floodplains, swamp forests, mangroves. Elephants decimated. Turtle and dugong status unknown. Conservation measures being undertaken by Direcção Nacional de Florestas e Fauna Bravia (DNFFB) with assistance of Endangered Wildlife Trust (South Africa)
Inhaca and Portuguese Islands Biological Reserve (Maputo Province)	ca. 750	Protection of dune forests, turtle nesting beaches and coral reefs. Conservation measures enforced by the Department of Biological Sciences, Eduardo Mondlane University
Bazaruto National Park (Inhambane Province)	8 000	Two islands and adjacent littoral waters proclaimed a National Park (Bazaruto not included). Dugongs and turtles. Conservation measures enforced by DNFFB with assistance of WWF – emphasis on local community participation.
Pomene Reserve (Inhambane Province)	20 000	Conservation measures currently lacking: encroachment. Confusion regarding eastern boundary, the dune ridge, beach and littoral waters may fall outside the reserve! Status of dugongs and turtles unknown.
Marromeu Reserve (Sofala Province)	150 000	Flood plains and mangroves. Buffalo and elephant populations decimated. Conservation measures currently lacking

the nutrient-poor sandy soils throughout the coastal region. The most commonly grown crops are maize, cassava, beans and groundnuts. After three to four years, cultivated land is given over to fallow and a new cropping area (usually from secondary regenerating fields of various ages) is prepared. Where forest has been cleared for agriculture only the more important fruit bearing trees are left standing, e.g. *Sclerocarya birrea* ("kanyu"), *Strychnos spinosa* ("massala") and *Garcinia livingstonei* ("imbebe"). On Inhaca Island, along the coastal strip from Maputo to Xai-Xai and in northern coastal Mozambique, much of the indigenous vegetation has been substituted by exotic trees such as cashew (*Anacardium occidentale*), coconut (*Cocos nucifera*) and mango (*Mangifera indica*).

Slash and burn agriculture involves slashing of plant cover in June/July. The residues are left to dry and are burnt shortly before the onset of the rainy season (October/November). Mainly secondary (fallow) vegetation is slashed although areas of intact dune forest are being cut and burnt. Data from Inhaca Island shows that slashing of intact forest results in decline (after one year) in organic nutrients,

e.g. organic carbon and total nitrogen (Fig. 8) with a concomitant, initial increase in inorganic nutrients, e.g. extractable P, Ca, K, and Mg (Fig. 9). However, in the second year following slash and burn, inorganic nutrients already show a significant decline. This trend continues until, after 15 years, soils are impoverished with respect to both organic and inorganic nutrients. Following abandonment, natural vegetation succession proceeds slowly. Although wood biomass increases over time, soil nutrient status fails to increase even after 15 years of abandonment (Campbell *et al.*, 1990; 1991; Serra King, 1995) – see Figures 8 and 9.

In addition to these agricultural activities, coastal communities exploit a wide variety of plant and animal resources for their livelihood. Tree resources are used for house building, boat construction, fencing, fruits, wine-brewing, foodstuffs and medicinal plants. In a recent study, Barbosa (1995) identified 79 tree species utilised by residents of Inhaca Island.

Since the early 1990s, the situation in the southern Africa sub-region has changed significantly, due to the improved political situation throughout the sub-region, as well as the gradual return of peace and stability to Mozambique. These inter-related events have led to an increase in tourism activities along the coastal area. The majority of tourists are campers bringing in their own equipment and supplies. The illegal activities of these tourists are a cause of increasing concern, especially south of Inhambane, e.g. the widespread catching and export of fish including reef fish, the driving of 4x4 vehicles on the beach above the high-water mark, posing a threat to nesting turtles, and the harvesting of coral. This type of tourism brings few economic benefits to Mozambique or Mozambicans, while causing maximum environmental degradation.

Also of concern is the granting of concessions (some several thousand hectares in size) in coastal areas for the establishment of camping grounds, "ecotourism" ventures etc. This is competing with local communities for the limited space and resources along the Mozambican coast. These developments are taking place on a haphazard and tenuous basis and are changing the coastal zone land use mix without any proper land use plan in place. Uncontrolled tourism is discussed in detail below.

These and other coastal zone issues and problems have been highlighted in the National Environmental Management Programme - Draft (MICOA, 1994) currently under review (Table 6).

Figure 8.
Changes in soil contents of organic nutrients (organic carbon and nitrogen) after slash and burn and subsequent abandoning.

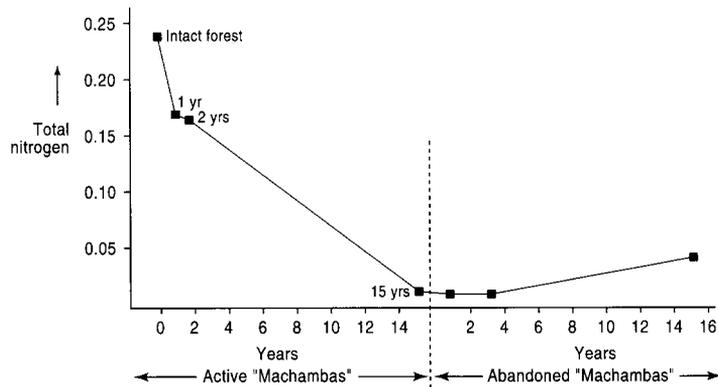
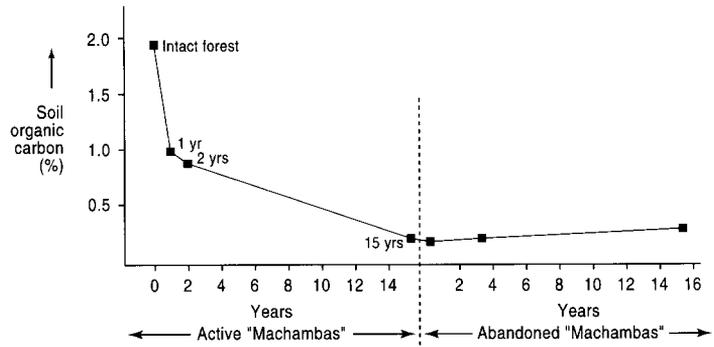


Figure 9.
Changes in soil contents of inorganic nutrients (calcium and phosphorous) after slash and burn and subsequent abandoning.

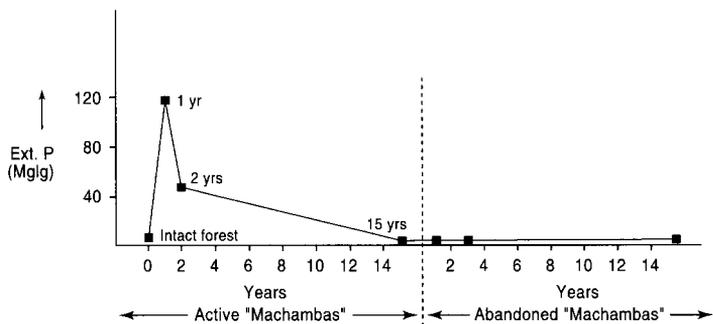
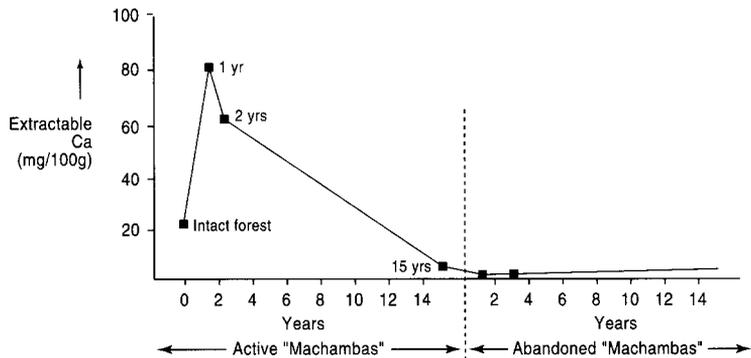


Table 6. Coastal zone issues and problems identified in the NEMP – Draft report

ISSUE	PROBLEMS
Fishing	No reliable register of fish catches. Possible over-exploitation of stocks in littoral waters.
Marine Parks	Lack of information to guide planners. Lack of adequate or sufficiently detailed legislation. Lack of trained staff.
Coastal/Marine Ecosystems	Degradation of mangroves, seagrass beds and corals.
Tourism	Uncontrolled development. Lack of inter-sectoral coordination. Lack of master plans for strategic areas.
Marine Pollution	Land based sources of pollution including agriculture, industry, municipal effluents and ports. Emissions from marine transport

Marine Pollution

Land-Based Sources

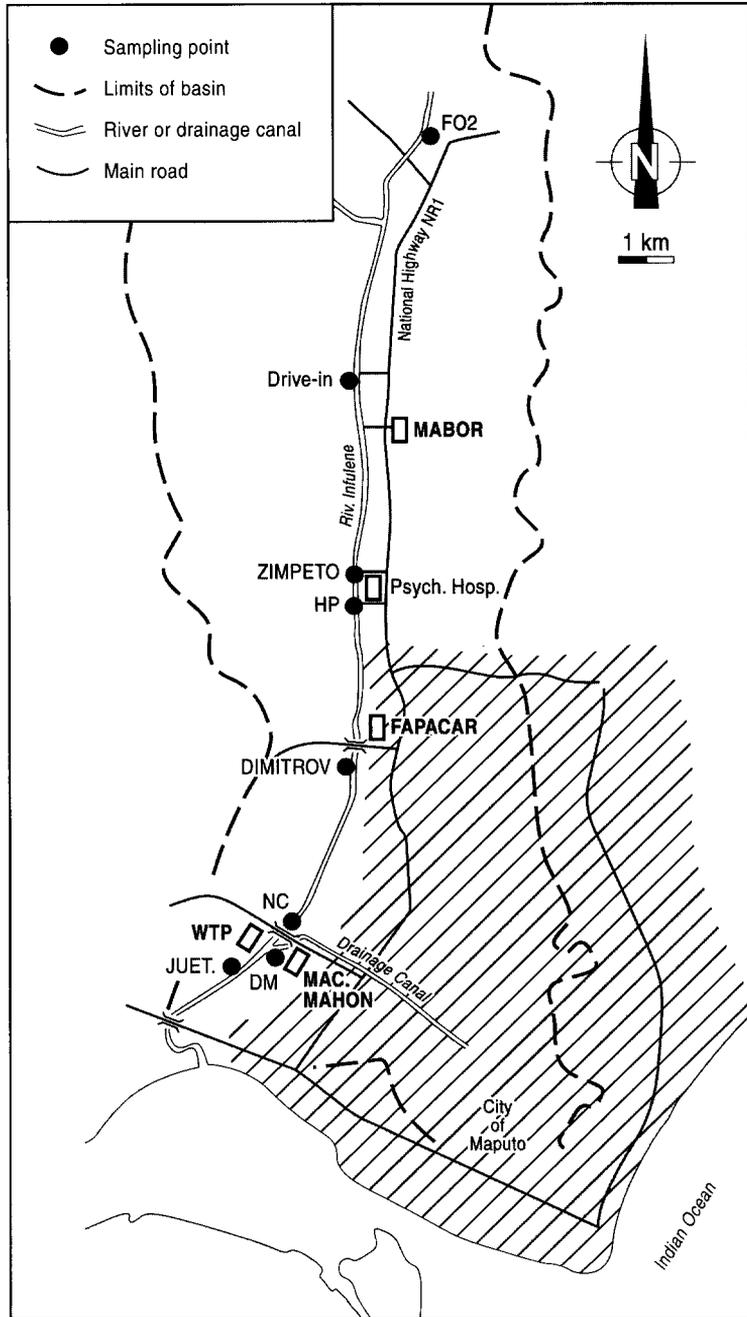
Land-based sources of pollution do not represent a major threat to the marine environment as a whole at present. However, close to major urban settlements, several forms of land-based pollution pose a threat to human health and detract from the quality of the marine environment. The main sources of potentially serious pollution are discussed in the following paragraphs.

Industry

Industrial development is limited and the majority of Mozambique's installed manufacturing plants are located within the urban centres. Manufacturing employs several thousand people. However, capital formation is relatively low and most plants are operating at chronically low rates of their installed capacity. Production is often limited, due to shortages of raw materials and spare parts. In spite of this, the direct discharge of industrial and municipal wastes into the sea forms a significant threat to the coastal and marine environment adjacent to the main urban centres, including Maputo, Inhambane, Beira, Quelimane, Nacala and Pemba (Ministério da Saúde, 1980; Nguenha, 1985). Although industrial output is currently low in Mozambique as a whole, industrial activities are concentrated in two main centres: Maputo/Matola and Beira. There are 126 factories operational in the Maputo/Matola area. Large factories discharging waste into the rivers and canals that enter Maputo Bay include TEXLOM, FAPACAR, MACMAHON and MABOR (Fig. 10).

The textile factory TEXLOM is located on the Matola River, ca. 8 km upstream from its mouth. It manufactures on average 9.5 million cubic metres of finished

Figure 10.
 Location of
 factories and
 water treatment
 plant along
 Infulene River,
 Maputo.



fabric per annum. Approximately 12 000 tonnes of caustic soda are used annually. Other chemicals used include acids, detergents, amides and dyes. The only treatment of residues prior to discharging waste into the Matola River involves sedimentation. For several hundred metres downstream of the TEXLOM factory very high pH values (>11) have been recorded. A tannery is also located on the Matola River and waste is discharged directly into the river without any prior treatment. No quantitative data is available on the amount and type of pollutants that may be discharged into the Matola River from this source. Three large factories are located adjacent to the Infulene River (in fact a stream) which flows north-south and discharges into the Espirito Santo Estuary: a paper factory (FAPACAR), a brewery (MACMAHON) and a tire factory (MABOR). Residues from all three factories are untreated prior to being discharged into the Infulene River. Daily waste water and emissions discharged from the FAPACAR factory are shown in Table 7. Daily waste loads from the MACMAHON brewery are shown in Table 8. Water quality parameters for the Infulene River at two sites downstream of the MACMAHON brewery (at the site where the discharge canal enters the river and 200 m downstream this site) are given in Table 9. Significant amounts of organic and inorganic pollutants from these factories are entering Maputo Bay via the Infulene River alone. Although it is evident that industrial effluents are entering Maputo Bay, there is little information available on pollution levels in the Bay as a whole. A joint study is presently being carried out by the Ministry of Environmental Affairs (MICOA) and the United Nations Industrial Development Organisation (UNIDO), to determine levels of agrochemical and industrial pollutants entering Maputo Bay.

Table 7. Waste water and emissions discharged daily into the Infulene River from FAPACAR (BOD = Biological Oxygen Demand, COD = Chemical Oxygen Demand)

PARAMETER	AMOUNT
Waste water production	1 220 m ³ /day
Suspended solids	570 kg/day (467 mg/l)
BOD	260 kg/day (213 mg/l)
COD	940 kg/day (771 mg/l)

Table 8. Daily waste loads discharged from the MACMAHON Brewery

PARAMETER	AMOUNT (KG/DAY)
Total suspended solids	311
BOD	690
COD	1 135

Table 9. Water quality downstream of the MACMAHON Brewery

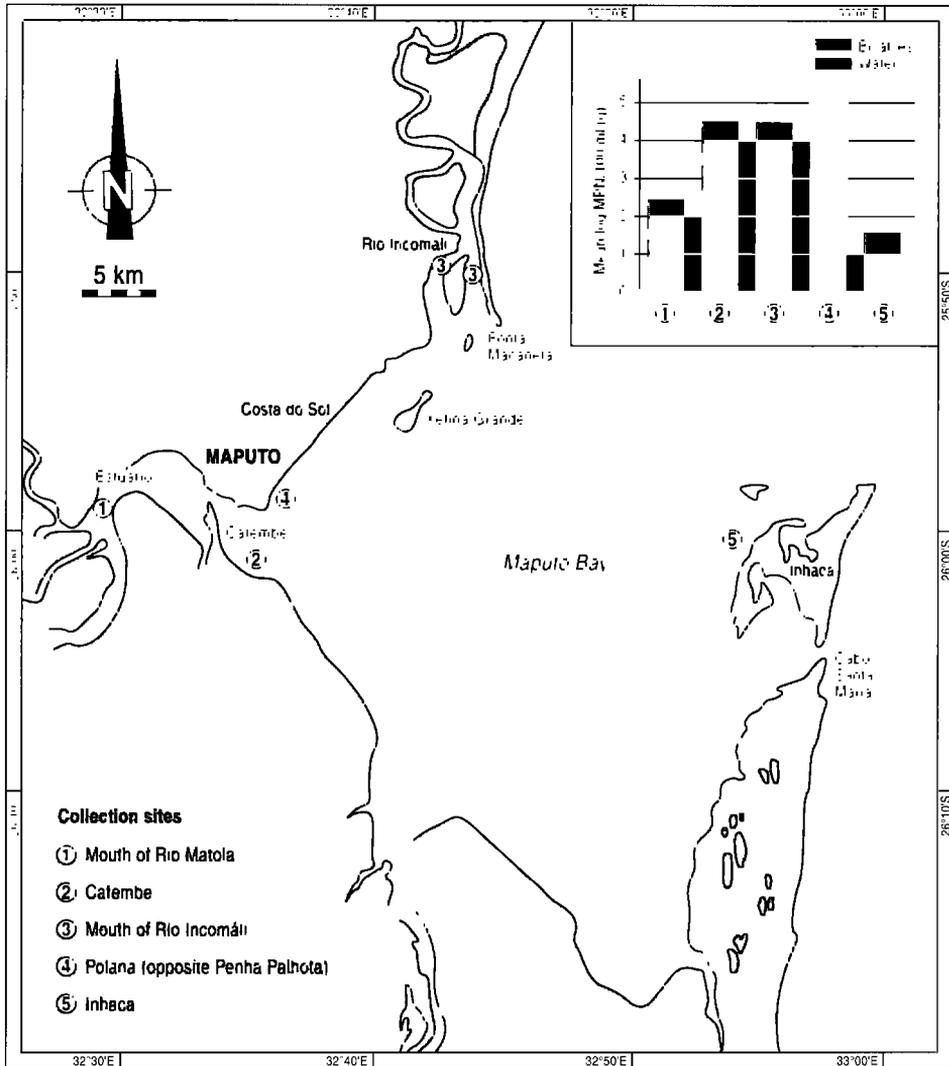
PARAMETER	SITE A - DISCHARGE CANAL	SITE B - 200M DOWNSTREAM OF DISCHARGE CANAL
pH	7.7	7.5
Electrical conductivity (mmho/cm)	3.045	1.704
Suspended solids (mg/l)	129	65
BOD (mg/l)	119	32
COD (mg/l)	376	94

Sewage

Domestic sewage is an important source of pollution in coastal waters adjacent to major population centres. Sewage discharged through pipes beyond the surf zone today may be effectively dispersed and decomposed in the open sea. However, the risk of overloading the sea with untreated discharges from main cities in the near future cannot be neglected. Discharges into the surf zone are not dispersed but tend to spread in the shallow water along the coast and may pose serious contamination problems at bathing beaches. In most of the coastal cities at least part of the drainage system, including sewage, leads directly to the sea without adequate treatment. There is no indication of the amount involved, but sewage is one of the major sources of organic and bacteriologic pollution in the port areas.

The Maputo sewage system (from the Cidade de Cimento – "Cement City") channels sewage to a water treatment plant (WTP) located on the Infulene River. The WTP comprises a series of anaerobic and facultative tanks designed to treat organic matter. However, it is estimated that less than 50% of Maputo's sewage is treated. The remainder enters septic tanks or is discharged via a series of canals into Maputo Bay. Faecal coliform levels in the canal leading into the Infulene River are extremely high (4.6×10^5 bacterial counts/100 ml) and high in river itself (>2 400 bacterial counts/100 ml). Studies on clams and water around Maputo Bay showed contamination by faecal coliform throughout the Bay. Fernandez *et al.* (1992) monitored several areas in Maputo Bay: Polana, Matola, Catembe and Inhaca Island (in front of the hotel). In all sites, faecal coliform, faecal streptococci and *E. coli* were detected in both marine waters and shellfish tissue, with levels consistently higher in shellfish. The proportion of faecal coliform to faecal streptococci suggests that faecal contamination is of human origin. Although all waters are contaminated, only one area, Polana, showed contamination greater than internationally acceptable levels for bivalve growth, i.e. > 1.4 MPN/100 ml. (National Seafood Sanitation Programme – NSSP; see Fig. 11). *Salmonella* was also isolated from 16.6% of clams from the Polana sampling site. Fernandez *et al.* isolated for the first time in Mozambique the bacterias *Vibrio parahaemolyticus* and *Vibrio mimicus* from clams at Rio Incomati (the former) and Polana and Matola (the latter). *Vibrio* sp.

Figure 11. Faecal coilform counts at five sites around Maputo Bay (after Fernandez et al., 1993).



cause severe gastro-intestinal illnesses. Except for Maputo, in the absence of arrangements to monitor sewage and drainage effluent at their source or in the sea, it is impossible to construct reliable estimates of pathogenic organisms or toxic leaching entering coastal waters near urban centres. Urban solid waste dumps also form a potential source of local coastal pollution. The leaching of materials from dumps adjacent to the sea poses a serious potential hazard during periods of heavy rain.

Agriculture

Agriculture may also represent a significant source of marine pollution in the coastal waters. Most of the arable land and larger farms lie along or close to the main river basins. Therefore, any agricultural chemicals used within the drainage systems of those rivers may enter the coastal and marine environment adjacent to the mouth of the rivers. Four rivers discharge into Maputo Bay via a common estuary (Estuario Espirito Santo): the Infulene, Matola, Umbeluzi and Tembe Rivers, while the Nkomati River discharges into the Bay further north and the Maputo River enters the Bay in the south. The Nkomati and Maputo Rivers arise in South Africa and the Umbeluzi River in Swaziland. Intensive agriculture is practised upstream in Nkomati, Umbeluzi and Maputo River valleys, e.g. several thousand hectares are under sugar cane in the Umbeluzi River valley, Swaziland. No accurate data regarding agro-chemicals entering Maputo Bay are available. Despite the widespread use of pesticides, including DDT and other persistent agricultural chemicals, there is no policy to prevent or control the use of hazardous agricultural materials (Tamele, pers. comm, 1990). and there is no programme to monitor and assess their effect upon coastal waters or the riverine systems feeding them.

Shipping

Ports

The main international ports in Mozambique are Maputo, Beira and Nacala. The small ports such as Chinde, Angoche, Pebane, Macuse and Mocimboa da Praia, are the main outlets for agricultural production areas, while regional ports (Pemba, Nacala, Quelimane, Beira and Maputo) also function as trans-shipment points for traffic to and from small ports (VISAL, 1992). The potential pollutants in ports are oils from ship's bilge, oil spills from bunkering and tank washing and garbage dumped by ships. All pollutants do not have the same relative effect. Oil seems to be the most relevant pollutant to study in ports. Large accidental spillage can affect nearby beaches and mangroves. Small but steady leakages affect mostly the port basin. To avoid local pollution from small spills and environmental catastrophes from major accidents, proper management of ports, and surveillance and contingency plans are necessary.

Handling of Oil and Harmful Substances

Beira is the most important transit port for petroleum products. The tank farm in Beira has a storage capacity of nearly 110 000 m³ when the capacity of all companies is included (VISAL, 1992). The Beira Corridor pipeline capacity is between 1 and 1.5 million tonnes per year. There are plans to increase the capacity to over 2 million tonnes annually. The main oil deposits in Mozambique are shown in Table 10. From the oil terminals in Mozambican ports, oil is pumped in pipelines under the quays to the tank farms. In some cases the pipes are very old, representing great risks for

pollution during the loading and unloading operations. An example of this risk is illustrated by the Nacala port system, where the pipeline is about four kilometres long from the oil terminal to the storage tank farm. The oil terminal is located in the northern extreme and the tank farm is at the opposite side, separated by a sea trench; therefore the pipeline has to go round the bay. All the way the pipeline is underground or under the quay at the pier side, which makes it very difficult to locate any leaks. Mozambique's only oil refinery is located on Maputo Bay. The importation and storage of hydrocarbon products has increased by more than 50% over the last years. Maputo and Matola harbours have the capacity to pump and store petroleum products, with most being received by Matola harbour (Table 11). The pumping, storage and piping systems of the Maputo/Matola complex are in a poor state and leakages are reported to be frequent although no quantitative data are available. The complex is currently being rehabilitated.

Table 10. Main oil deposits in Mozambique (VISAL, 1990)

SOUTHERN REGION	CENTRAL REGION	NORTHERN REGION
Maputo	Beira	Nacala
Matola	Chimojo	Nampula
Xai-Xai	Tete	Angoche
Lionde	Moatize	Pemba
Inhambane	Quelimane	Mocimboa de Prala
Mocuba	Lichinga	Cuamba

Table 11. Importation of hydrocarbons 1987–1993 (in tonnes/year international trade)

PORT	1987	1988	1989	1990	1991	1992	1993
Maputo	18 091	2 123	3 095	1 4430	12 269	7 444	
Matola	184 519	243 265	243 265	276 042	252 844	222 945	255 120

Dredging

Maintenance dredging is necessary in most ports in Mozambique, both along the quays and in the canals. The dredging problems are serious in Beira, due to the composition of the sediments (sand, salt and clay). Re-siltation and transport economy are the only factors considered when choosing areas for deposition. Pollution problems are not included in this analysis.

Pollution from Ships

Pollution from ships along the Mozambican coast can be listed as follows (VISAL, 1992):

- Exhaust fumes discharged to the atmosphere.
- Oily bilge water and oil sludge from the engine room discharged to the sea.
- Toilet sewage discharged to the sea.
- Garbage and galley waste discharged to the sea.
- Accidental oil spills from damaged tankers.

De-ballasting and tank cleaning operations by tankers and ships seem to be the most frequent forms of pollution. The solution to these problems lies in the enforcement of international regulations related to the prevention of pollution by ships, in particular tanker de-ballasting and cleaning operations. At present, there is no offshore oil exploration and production. However, future oil-related development will have to be carefully monitored.

The frequency of tanker movements within the region poses a threat in the form of a major offshore oil spill in the event of a tanker accident. The risk of a major oil spill resulting from a tanker accident in routes well offshore is considered low but not impossible. There is a relatively greater risk of a spill resulting from a collision or grounding of tankers delivering oil to Mozambican ports, as shown by the recent Katina P oil spill in 1992 near the mouth of Maputo Bay. The consequences of a major spill could be very serious. Several of the coastal and marine ecosystems which support economically significant activities, such as fisheries, are very vulnerable to oil. Oil-related damage to mangrove, coral reefs or seagrass beds could have a serious and long lasting impact on fish stocks. The oil cargoes presently carried along the Mozambican coast are all distillates of various grades. If these are discharged to the sea, all fractions above the grade of diesel oil will rapidly disperse on the sea surface and evaporate within a short time. Diesel oil will similarly disappear but at a somewhat slower rate; fuel oil will remain for a considerable time. Organisms in the interface of air and water will be affected, generally with fatal results, depending on the amount of exposure. If washed ashore, the lighter fractions will have a serious effect on organisms, due to very high toxicity. It is estimated that ca. 450 million tonnes of hydrocarbon products pass annually through the Mozambique Channel, transported by 5 200 tankers, of which 1 200 are very large crude carriers (VLCC carrying 200 000 tonnes each). The possibility of an oil tanker disaster due to collision, hurricanes or human error is, therefore, high. The predominant wind direction along the Ponta de Ouro – Xai-Xai stretch of coastline is east-south east (April to September) and south-south east (October to March). Consequently, oil slicks will be directed to the coast, as demonstrated during the Katina P oil spill.

The main sea routes are:

- Beira – Inhambane (Inhambane)
- Nacala – Zambezia (Quelimane)
- Nacala – Cabo Delgado (Pemba)

The most important coastal trade routes are between Nacala and Quelimane and between Nacala and Pemba. Table 12 presents an estimation of environmental risks in tonmiles (tonnes x miles). According to these data, the greatest risk for accidental oil spills seems to be on the Nacala-Quelimane trade route.

Table 12. Estimation of environmental risks in Mozambique (Data from 1990)

ROUTES	DISTANCE (MILES)	TONNES	TONMILES
Maputo - Beira	481	2 494	1 200
Maputo - Nacala	898	770	365
Beira - Inhambane	250	7 599	1 900
Nacala - Quelimane	386	16 485	6 363
Nacala - Pemba	110	8 936	1 032

Environmental Concerns in Tourism

The coastal area of Mozambique has long been recognised as an area of high tourism potential. Prior to Independence in 1975, the southern stretch of the coastline was frequented by tourists, mainly from South Africa. However, because of the political tensions existing in the southern African sub-region following Mozambican Independence, the tourism industry declined dramatically. Since the early 1990s, the situation in southern Africa has changed significantly, due to improved political relations between South Africa and Mozambique, as well as the return of peace and stability to Mozambique. These inter-related events have led to an increase in tourism activities along the coast. Coastal areas currently experiencing tourism pressure are:

- the Ponta do Ouro – Machangulo Peninsula – Inhaca Island coastline
- the Macaneta Peninsula
- the Bilene – Xai-Xai – Chonguene coastline
- the Inhambane coastline
- the Bazaruto Archipelago

Three broad types of tourist activities can be identified: casual tourists (mainly campers and sports fishermen), visiting yachts, and requests for concessions to set up "ecotourism" ventures.

Camping Tourists/Sports Fishermen

The majority of casual tourists are campers bringing in their own equipment and supplies by road, usually in 4x4 vehicles. Favoured destinations are Ponta do Ouro, the Ponta do Ouro – Machangulo Peninsula coastal strip, Macaneta Peninsula,

Bilene, Xai-Xai and Inhambane. Prior to 1994, South African tourists entering Mozambique by road were obliged to do so by one of two border crossings: Namahaca on the Swaziland border or Ressano Garcia on the South African border. The Maputo – Ponta do Ouro road is currently in poor condition (July 1995) and the journey can only be made by 4x4 vehicle, hence access to the Ponta do Ouro – Machangulo Peninsula coastline via this route is limited. However, since the opening of a border crossing point at Ponta do Ouro in 1994, the number of casual tourists visiting the southern coastline has increased markedly. (*Note: The Maputo-Ponta de Ouro road is currently under rehabilitation and once complete will result in a further increase in tourism activities along this stretch of coast.*)

The illegal and uncontrolled activities of these tourists is a cause for increasing concern along much of the southern Mozambican coast. The illegal harvesting of fish is widespread between Ponta do Ouro and Inhambane. It is estimated that many hundreds of kilograms of fish, including reef fish, are exported illegally to South Africa in portable deep freezers or refrigerated trucks. Other activities causing concern include the driving of 4x4 vehicles on the beach above the high-water mark, which poses a direct threat to the loggerhead and leatherback turtles currently nesting on this stretch of coastline, and the harvesting of corals by souvenir hunters. This type of tourism brings few economic benefits to Mozambique or Mozambicans, whilst causing maximum environmental degradation.

Visiting Privately-Owned Yachts

The number of privately-owned yachts, based mainly in South African marinas, that visit Mozambican waters has increased markedly in the last three years. For boats sailing northwards from South Africa, the nearest anchorage is Inhaca Island. Yachts are apparently anchoring over coral reefs, causing extensive damage. Scuba divers report extensive damage to the Baixa Danae coral reef, ca. 8 km north-east of Inhaca Island due to anchoring and harvesting of coral by souvenir hunters. In 1992, the crew of a South African registered yacht *The Coralita* was apprehended for illegally salvaging bronze from a sunken wreck near Baixa Danae, as well as harvesting coral. The crew managed to flee Mozambique with the yacht before the case was brought to court.

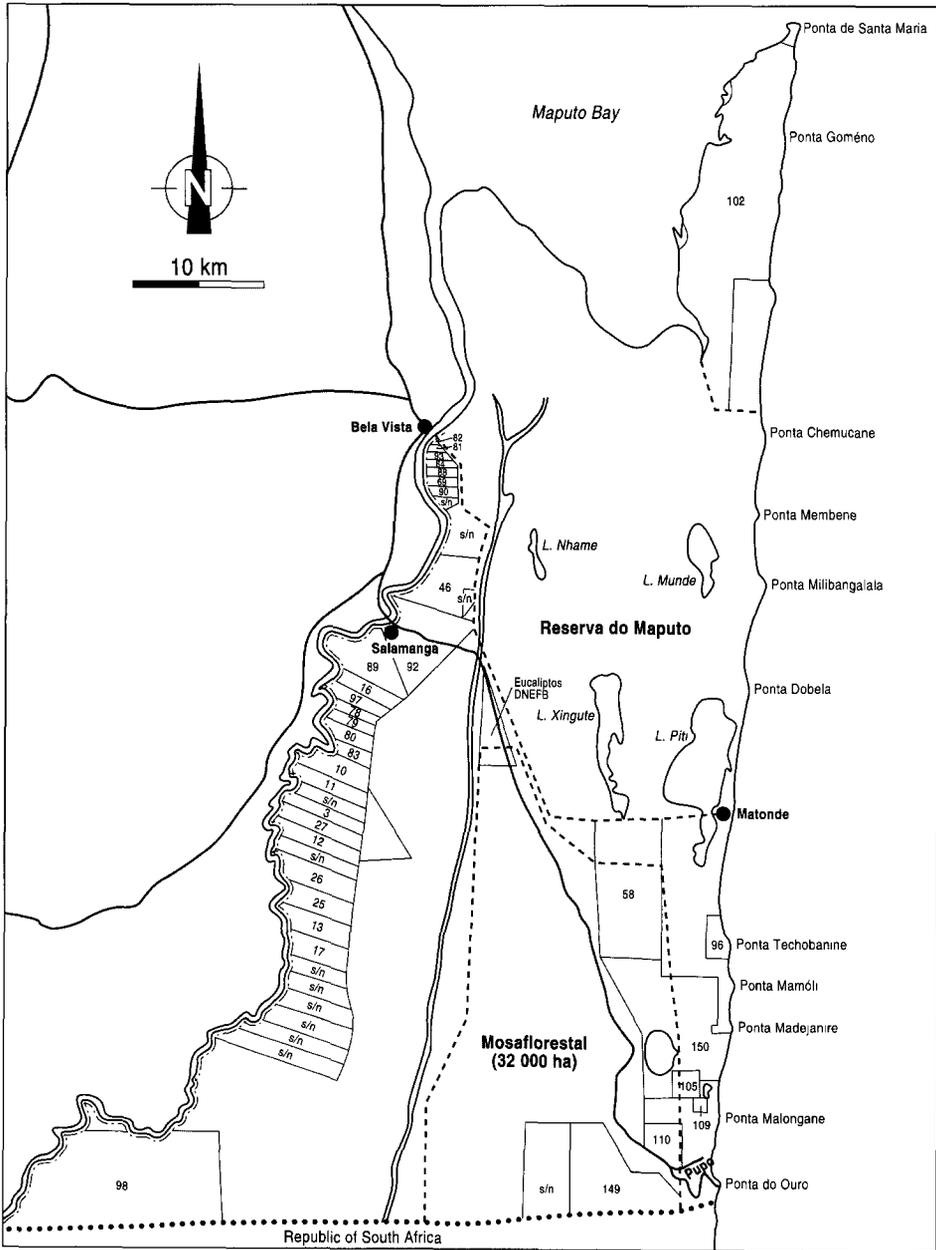
Tourism Concessions

Since the signing of the Peace Accord in October 1993, many requests have been submitted to the various provincial and district authorities for land concessions to establish holiday homesteads, camping grounds, "ecotourism" ventures, etc. A substantial number of these requests have been made by South Africans following a growing perception that land is "up for grabs".

The Ponta do Ouro – Machangulo Peninsula Coastline

This stretch of coastline is probably under the greatest pressure, due to its proximity to South Africa. The entire coast between the northern tip of the Machangulo Peninsula and Ponta do Ouro has been demarcated by the Provincial DINAGECA Offices as concessionary areas for the establishment of "ecotourism" projects (Fig. 12). For example, in 1994, the whole of the Machangulo Peninsula (except for three small enclaves already under lease) north of the Maputo Reserve, covering an area of some 9 950 ha, was requested for the creation of a "nature reserve" (Reserva da Natureza em Machangulo) as a joint South African – Mozambican venture. Since then the proposed developers have reduced the size of the concessionary area to ca. 3 000 ha. Apparently, by mid-1995, authorisation had been given to these same developers to develop camping and tourism facilities at two sites on the peninsula by the Investment Promotion Office (Centro de Promoção dos Investimentos) although authorisation has not been given by the Ministry of Industry, Commerce and Tourism. Nevertheless, the developers have already started to clear dune vegetation and construct tourism facilities. It should be noted that access to Machangulo is only via the beach or via the Maputo Elephant Reserve. Unknown "developers" have cleared dune vegetation and built a track at Ponto Techobanine (August 1995), even though this area is under request by another concession seeker who proposes to develop a small nature reserve with rustic style "ecotourism" facilities. A tourist complex comprising chalets and a restaurant, constructed prior to Independence and rehabilitated in 1993, is currently operational at Ponta Malongane. The rehabilitated complex maintains the original design so that there is minimal impact on dune vegetation. The Sociedade Ponta Malongane apparently has fulfilled all the necessary requirements to legally operate. The Ponta Malongane operators are currently requesting adjacent land to create a small game reserve. The camping ground at Ponta do Ouro, located at a key site on the beach, re-opened in 1993 as a South African – Mozambican joint venture scheme. Authorisation to operate was given by the district authorities although the legality is being contested. The manner in which the South African partner was managing the camp and lack of control of visiting tourists resulted in his expulsion in 1995. Negotiations are currently underway to properly administer the camping ground. Several other requests for concessions to establish ecotourism projects along this coastline (varying in size between 450 and 4 500 ha) have been submitted to DPA and are under currently under consideration. An American developer (Blanchard Mozambican Enterprises BME) has submitted a large-scale tourist development plan to the Mozambican Government for the Inhaca Island – Machangulo Peninsula – Maputo Elephant Reserve (MER) – Ponta do Ouro area. The proposal seeks to develop world class tourism facilities on Inhaca Island/Machangulo Peninsula with the concomitant rapid revitalisation of the Maputo Elephant Reserve. The proposal – "The Machangulo Peninsula and Expanded Elephant Reserve Development" comprises several components including:

Figure 12. Concession areas under request. Ponta do Ouro – Santa Maria, January 1995.



Inhaca Island master plan scope

- water sports/marina/causeway
- chain ferry - Inhaca to Santa Maria
- passenger ferry - Maputo to Inhaca
- Inhaca marina to Ponta Torres Road
- holiday village resort
- luxury hotel
- golf course
- local population facilities

Santa Maria - Machangulo Peninsula scope

- wildlife breeding centre
- animal farming
- Santa Maria village
- Santa Maria landing strip
- village/local community service industry
- agricultural/horticultural nursery
- tented safari camps
- Gaza theme African village
- Santa Maria nature reserve with housing
- game lodge and underwater observatory
- luxury resort hotel
- golf course
- village centre
- restaurant/disco complex
- sports fishing/diving lodge
- jetties
- light rail train (traversing Machangulo Peninsula and the Maputo Elephant Reserve)

The BME proposal also aims to rapidly revitalise and expand the existing Maputo Elephant Reserve, as apparently this would enhance the success of a large-scale tourism development within the region. In addition, the developer has requested a large concessionary area south of the MER, although the nature of the developments within this area are not well specified. The developer claims that if approved the project would attract US\$800 million in investment. If this level of investment is forthcoming (and this is the key), it would create jobs and stimulate economic growth in the sub-region, dramatically altering the lifestyle of local communities. The BME proposal indicates an intention to manage the project to benefit local people and environments. The mechanisms to achieve these objectives, however, are weak. Although the proposed project has received considerable attention from media, both nationally and internationally, it is a remarkable fact that local communities, the most affected group, have not been informed of its nature and scope. The government agreed to a 50 year lease in December 1996 (ed. remark).

Although all the above proposals purport to be ecotourism projects which will provide economic benefits for the local communities, it is not clear what are the legal rights regarding the land or natural resources of communities residing in these areas, should the concessions be approved. Furthermore, and importantly, it appears that the local communities have not been properly advised or consulted on the implications of the changed status of what they consider to be their land and their resources.

Inhaca Island

Inhaca Island (26°S, 33°E), covering some 42 km² and located 35 km from the capital city Maputo, has special significance for Mozambique, for tourism and science. Prior to Independence in 1975, the island was the focus of tourism activities in southern Mozambique. Since 1992, as with other coastal areas, the Mozambican authorities have received numerous requests from international and national investors, seeking to develop a variety of tourism activities. However, due to the existence of an integrated development plan for Inhaca Island drawn up in 1990 (Project MOZ/86/026 funded by HABITAT/UNDP), many of the proposals have not been approved. Nevertheless, several small-scale tourism operations have been established, albeit illegally. Tourism facilities presently available on the island are limited and include a hotel (Hotel Inhaca) a sports-fishing operation with four 5-metre boats, two camp sites (within the Terrestrial Reserves and administered by the Department of Biological Sciences, UEM) located at the southern tip of the Island (Ponta Torres) and Ilha dos Portugueses respectively, and several small "bars" that have been/are being constructed in a somewhat haphazard fashion in the vicinity of the main hotel. Several pirate tourist ventures offering rustic style accommodation are currently operational. The major tourist facility on Inhaca Island is the Hotel Inhaca, classified as a three star hotel, currently being managed by a Portuguese firm, Grupo Pestana. The Hotel has a 110 bed capacity and employs 93 workers. Sixty-nine percent (69%) of the workers are islanders. The occupancy rate is low, attaining a maximum of 50% in summer and 10–15% in winter. Two small tourist venture schemes, Ilha Choque and Paraiso da Ilha offer "rustic" tourist accommodation, each with a capacity of 28 guests. Although these two operations have been given an order to cease operations by the Ministry of Commerce and Tourism, they are still receiving guests. A tourist camp with rustic accommodation (Coconut Village) has been set up on the north-west of the island but has been recently closed (apparently) by DINATUR pending a decision on its legality. A sports fishing company (Gone Fishin) set up operation in 1993 after obtaining the necessary permission and operates four 5 m boats. Several other small unofficial camps have been set up on the island and on the mainland at Santa Maria. Besides Hotel Inhaca, Restaurante Take Away Lucas and Gone Fishin, which have the proper authorisation, the legal status of the small operations is not clear.

In view of the ecological sensitivity of the island and the potential impact from tourism, the integrated development plan for Inhaca Island developed in 1990,

made specific recommendations to ensure sustainable development. Importantly, this plan included recommendations for community participation in selected development projects.

Some of the main recommendations proposed in the integrated plan include:

- Grant conservation status to the island and littoral waters as a Protected Nature Zone.
- Upgrade the Hotel Inhaca to a 3-star status, thus making it a "focus" for tourism on the island.
- Construct a second hotel catering for 75–100 tourists in the northern part of the island.
- Construct three rustic-style tourist complexes each catering for 15–20 tourists and managed by associations of islanders.
- Upgrade the existing camping facilities and create an additional camping ground near the lighthouse.
- Provide/improve facilities for the local inhabitants e.g. wells, clinics and schools.
- Implement development initiatives for the local population, such as skills training, apiculture and agriculture.
- Investigate issues related to land rights of the local population and, if necessary, secure land rights for the local communities.

Furthermore, all investment projects must be subject to an appropriate environmental impact assessment. This should determine the type and extent (if any) of negative impacts on the natural resource base of the island and littoral waters, positive/negative socio-economic impacts for the local communities, appropriate mitigating measures (where required) and the establishment of longer-term monitoring and evaluation mechanisms. The selection and approval of tourism projects on Inhaca, as per the terms of reference, aims to ensure that any project mounted on the island will provide maximum economic benefit for local communities and, at the same time, minimise environmental impacts on the fragile island ecosystem. Although the integrated development plan was completed in 1990 it has not, as yet, been officially approved by the Mozambican Government and has not, therefore, been implemented. Nevertheless, the existence of the plan has probably deterred excessive illegal tourist activities which have characterised other coastal resorts.

The Bilene –Xai-Xai – Chonguene Coastline

A critical situation exists in the Bilene – Xai-Xai – Chonguene area in the Gaza Province, as highlighted during a recent coastal zone workshop held in Xai-Xai (July, 10–12, 1995).

Praia do Bilene

The main tourism operations in Bilene are located adjacent to Lago Bilene (Uembje). Note that the shoreline of the lake is commonly referred to as Praia de Bilene.

Three contiguous camping grounds are located immediately adjacent to the lake, from north to south: Parque Mira Flores, Parque Palmeiras and SOTUR. Of these, only one – Parque Palmeiras – is fully operational. Parque Mira Flores is partially operational and the camp site at SOTUR is currently under preparation (the preparation of the campsite has resulted in removal of a substantial area of dune forest). Together, these three contiguous campsites run for 2.1 km along the shore of Lake Uembje and all are located within 10 to 20 m of the high water mark. Until recently, no provision was made to allow access to the lakeside, resulting in conflicts between tourism operators and local communities. Following negotiations, tourism operators allowed access to the lake, although in practice this is not always given.

Praia de Zonguene

Praia de Zonguene is located on the south bank of the Limpopo River. While a few small plots of land have apparently been awarded in the area, the major tourism development is the Agencia de Turismo de Mozambique, Lda., a joint South African – Mozambican venture. The developers have been awarded 7 ha of land, and rustic style bungalows and associated tourism facilities are in an advanced state of construction. The project will cater to sports-fishing tourists. It appears that the operators have the approval of the appropriate authorities to legally operate (Centro de Promoção dos investimentos, Ministerio de Industria, Comercio e Turismo, DINAGECA, etc.) although no environmental impact assessment was undertaken. The investor has requested an additional 500 ha surrounding the core 7 ha, for the creation of a "game farm" with the introduction of several large mammal species. This request is currently lodged with the Serviços Provinciais de Floresta e Fauna Bravia (Xai-Xai). It appears that no feasibility study regarding the introduction of wildlife into this habitat has been carried out. An assessment of the environment and social impacts of the proposed expansion has not been made, nor indeed demanded, by the provincial authorities. From interviews with local communities it appears that conflicts, related to the restriction of access to the estuary and associated natural resources have already arisen. If the tourist development project is expanded, at least two families will lose access to land, and several others will lose access to both natural resources and sacred sites.

Praia de Xai-Xai/Praia de Chongoene

The Xai-Xai – Chonguene stretch of coast with its parabolic dune forests, coastal barrier lakes and pristine beaches has long been a favoured resort area for South African and Mozambican tourists. The 10 km stretch of beach running northwards from Praia de Xai-Xai to Praia de Chongoene falls under two administrative bodies: the first four kilometres is under the jurisdiction of the Conselho Municipal de Xai-Xai, while the remainder is under the Xai-Xai District Administration. Two tourist facilities are currently operationally, *viz.* Hotel Halley and the Praia de Xai-Xai camping grounds. A prime site has apparently been awarded to an investor from Swaziland for the development of "time-share" accommodation.

The Xai-Xai City Council has drawn up a tourist development plan comprising a series of contiguous 50 x 500 m plots designed to incorporate the maximum number of plots along this coastal stretch. If the tourist development plan proceeds, it will result in a large number of tourist operators competing side by side in a very limited area. In effect, the plan maximises the number of tourism operations and, if implemented, will result in the irreversible transformation of the social and natural environment along this prime stretch of ecologically sensitive coastline. The plan clearly falls outside the National Tourism Policy which advocates "high quality/low impact" tourism for the Xai-Xai-Chongoene coastal area.

In addition, tourism development of this nature will severely jeopardise any future tourism development along the adjacent Praia de Chongoene, which is linked to Praia de Xai-Xai by a common access road. This entire stretch of the Praia de Chongoene coast is under request by a number individuals and/or companies. Requests for concessions have been made through a variety of channels and there is consequently much confusion over claims to the land. In several cases claims overlap. In most cases, the provincial offices of the Ministry of Industry, Commerce and Tourism have not received details regarding the nature of the proposed tourist developments.

Key factors resulting in confusion over requests for plots of land are:

- Lack of coordination between agencies.
- Lack of any uniform procedure for applying for concessions.
- Failure to register and map requests with the Provincial DINAGECA Offices in Xai-Xai.

Nevertheless, many concession seekers have cleared plots of land (in some cases removing intact dune forest) and have started construction of homes/camping grounds. In view of the failure to obtain the necessary permission, these activities are probably illegal.

Potential Socio-economic Conflicts

Under current law all land belongs to the State and can only be acquired on the basis of a long-term lease (50 years). The amounts paid to gain concessions are far below the actual market value. Following a growing perception that land is "up for grabs" the prime coastal sites are being acquired without any long-term socio-economic and land use plan in place. Sadly, the options for Mozambique to gain maximally from its most valuable asset, the coast, are rapidly being foreclosed. This coastal zone area has a high potential for developing a sustainable and diversified sub-regional economy in such a way that Mozambique and its citizens gain maximum benefit from these unique resources. It is in the national interest that steps are taken now to ensure that this occurs.

The exploitation of a wide number of resources by coastal communities may result in direct conflict with the tourism developers, who suggest that alternative economic benefits would accrue to these communities. However, it is by no means assured that local residents will gain more than they lose from these operations and therein lies the crux of the problem. The potential for conflict between concession seekers and local residents competing over limited land and coastal resources is high. The situation is urgent and requires immediate steps to prevent and/or reverse incompatible land uses and potential conflict.

Loss of Coastal and Marine Biodiversity

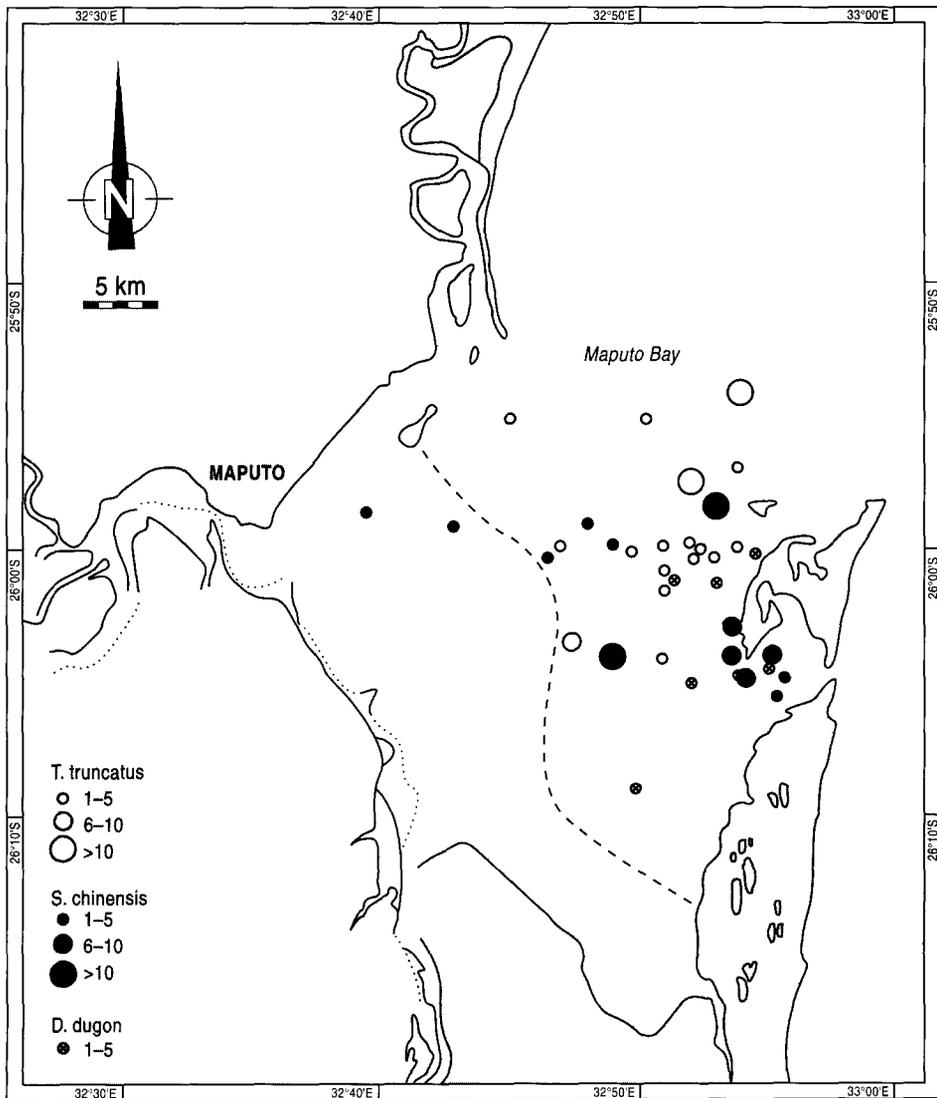
Marine Mammals

The endangered dugong (*Dugong dugon*) occurs in shallow waters with seagrass beds. The largest population of dugong along the East African coast occurs in Bazaruto Bay and a smaller population inhabits Inhambane Bay. A remnant population is believed to inhabit Maputo Bay, although the herd is estimated to comprise less than 15 individuals and is apparently isolated. Due to the distance (some 500 km) and lack of suitable habitats between Maputo Bay and Inhambane Bay, it seems unlikely that there is a regular exchange of genetic material between the two populations. Interestingly, however, a single dugong was sighted in open sea near Zavora, 100 km south of Inhambane during a survey undertaken by the Oceanographic Research Institute in 1993 (Van der Elst, pers. comm.). A study of possible dugong migration routes between bays would undoubtedly provide valuable information to develop a proper dugong conservation action plan for the Mozambican coast. Dugong meat is highly valued and animals are undoubtedly killed when caught accidentally or intentionally. In interviews with local communities on Inhaca Island and Inhambane, it was reported that certain parts of the dugong are used for magico-medicinal purposes although the precise purpose and use could not be ascertained. Guissamulo (1993) has shown that there is an interaction between fishing and marine mammal distribution and abundance. For example, three species of marine mammals occur in Maputo Bay: the bottlenose dolphin (*Tursiops truncatus*), the Indo-Pacific humpback dolphin (*Sousa chinensis*) and the dugong. All three are found mainly in the eastern part of the Bay (Fig. 13). The humpback dolphin occurs in shallower, turbid waters close to the coast. School size appears to decrease from east to west. Bottlenose dolphins are found in clearer waters mainly in the north-eastern entrance of the Bay where they occur in large schools. Dugongs occur around Inhaca Island and in the sheltered littoral waters west of Machangulo Peninsula. Their occurrence is correlated with the seagrass bed distribution. Three fisheries are likely to interact with marine mammals:

- Artisanal drift gill netting from small boats.
- Artisanal set gill net (for kelle shad, mullets and sharks).
- The semi-industrial shrimp trawling fishery.

The distribution of the artisanal drift gill net fishery for keele shad (*Hilsa keele*, Clupeidae) is shown in Figure 14. This fishery interacts with the humpback dolphin and the dugong. However, such interaction does probably not result in incidental catching of dolphin, but negatively affects the population as a consequence of the competition over fish stocks. Humpback dolphins have been observed to feed in the fishing ground in the Machangulo Channel during fishing operations comprising 24 boats. Indeed, fishermen use dolphins as indicators of fish abundance, laying

Figure 13. Distribution of dolphins and dugong in Maputo Bay (Guissamulo, 1993).



nets where they occur. Dugongs are easily disturbed and may be occasionally caught by these drift nets in the Saco da Inhaca, Machangulo and Santa Maria fishing grounds by fishermen resident on Inhaca and the Machangulo Peninsula. Here, fishing activity increases at night. At that time dugongs approach the coast to feed on seagrass, thus interacting with this fishery. Set gillnets of large mesh size are used in deep water channels around Inhaca Island and off Machangulo Peninsula and may occasionally catch dugongs and dolphins. Semi-commercial trawling for

Figure 14. Distribution of set gillnet and drift gillnet boats, Maputo Bay (Guissamulo, 1993).

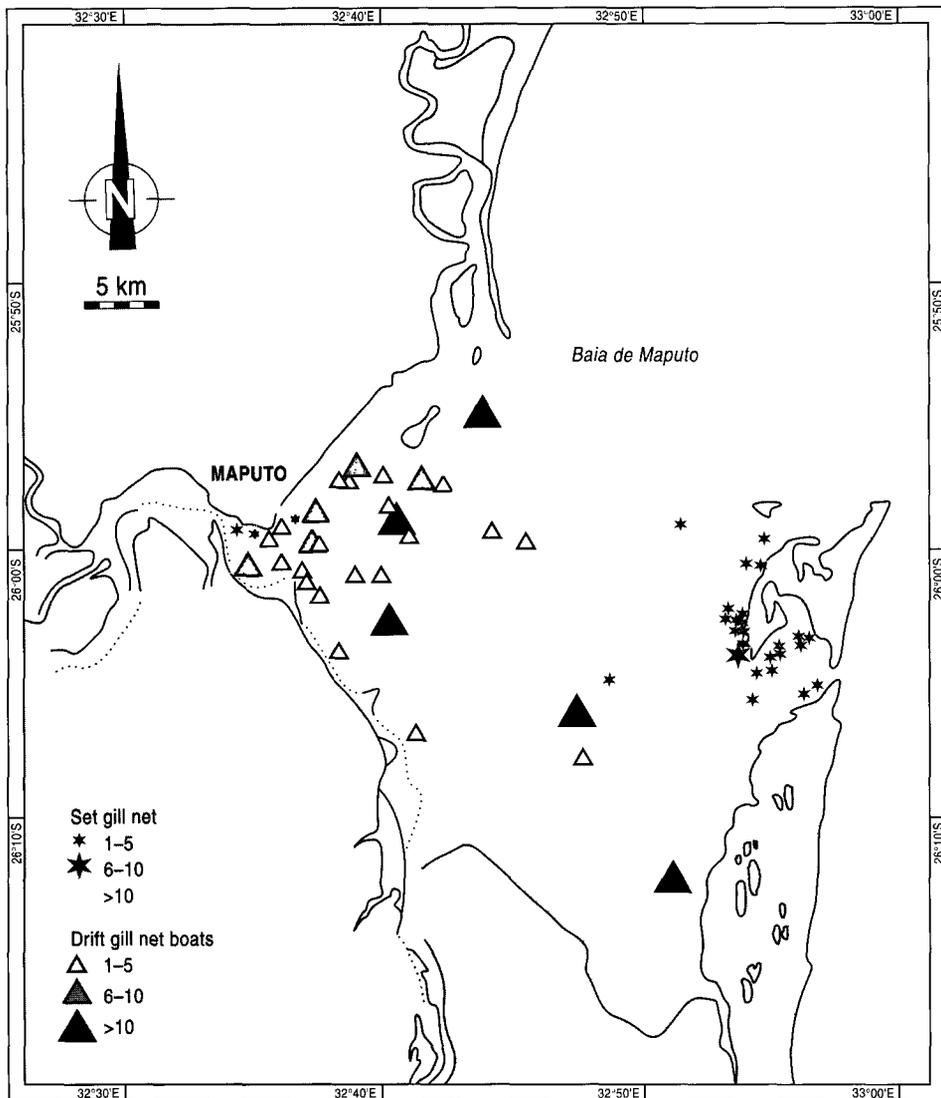
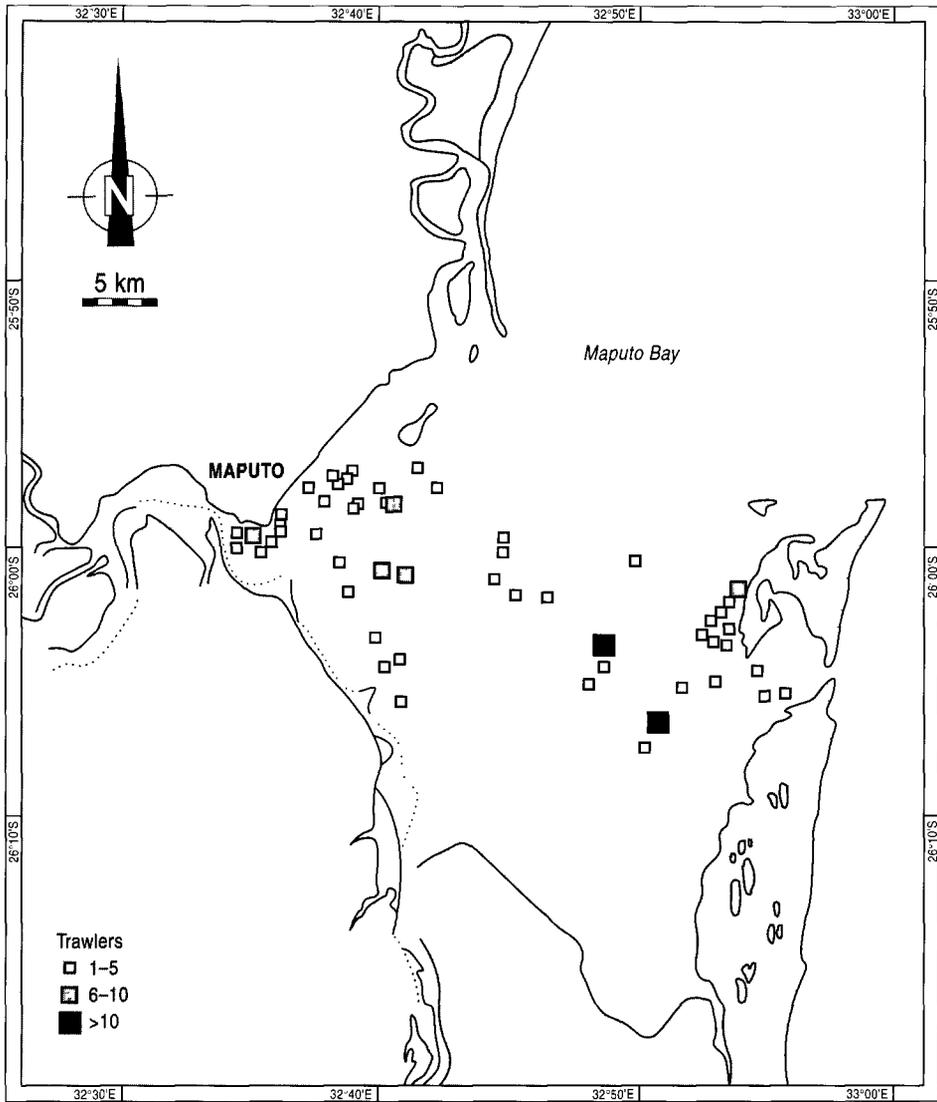


Figure 15. Distribution of prawn trawlers in Maputo Bay (Guissamulo, 1993).



prawn is practised in Maputo Bay from March to November. This fishery exploits the western and south eastern zones of the Bay, where water is turbid (Fig. 15). Turbid waters are avoided by bottlenose dolphins although Humpback dolphins are known to occur. Humpback dolphin school size and sightings decreased from east to west in the Bay (Guissamulo, 1993). This might be due to the negative effect of trawlers that deplete fish stocks in these waters. At the entrance to Maputo Bay, north of Inhaca Island, shark fishing is practised using nets. Bottlenose and spinner dolphins may be caught in these nets although no data is available. At Inhambane

Bay, bottlenose dolphins are reported to occur at its entrance, while humpback dolphins and dugongs inhabit the entire Bay. Shark nets are laid out at the entrance of the bay. These nets incidentally catch dolphins and dugongs. An average of three dugongs are caught by this fishery per year. The number of dolphins caught by shark netting is unknown. Humpback dolphins are common in Inhambane Bay and incidental catches are reported. Dugongs are also incidentally caught during artisanal beach seine operations at Linga-Linga (Morrumbene estuary). The southern right whale appears to face threats from fisheries as indicated by the lack of sightings of this species in recent years.

The protection and conservation measures for these marine mammals must promote fishing gear that is safe for these species. However, proper conservation can only be effectively implemented once sufficient data on the distribution and abundance of marine mammals and the interactions with fishing activities are available.

Sea Turtles

Threatened marine species in Mozambique include sea turtles (IUCN/UNEP, 1985). Efforts are currently underway for the protection of nesting turtles and their eggs at Inhaca Island (since 1987), Bazaruto Archipelago (since 1990) and more recently in Ponta Malongane and Maputo Elephant Reserve. The current population of turtles has not yet been estimated, but populations are believed to be in decline. Local communities report that turtle populations have decreased markedly over the years. This is due to the lack of protection measures exacerbated by the displacement of people from the interior to the coast during the protracted civil war, which placed additional pressure on marine resources. Other factors include an increase in fishing activities since Independence, and the uncontrolled growth of tourism activities along the coast (since 1992). The latter has resulted in tourism complexes constructed directly on sand dunes, and the movement of 4x4 vehicles on nesting beaches. Natural threats to nesting beaches include erosion processes and predation by ghost crabs. The turtles and their eggs are widely used as food. Nesting females are killed whenever encountered and their eggs dug up. This is not the case in Bazaruto, where the local population is actively participating in a turtle protection scheme. Fisheries interact negatively with turtle populations. Entanglement of turtles in fishing nets has been reported in Maputo Bay and Bazaruto (Guissamulo, 1993). Trawl fishing in Inhassoro using tractors (the only place in Mozambique where this fishing technique is used) results on average in the death of 30–35 turtles per month, mainly green turtles (Gove & Magane, 1996). Industrial fishing in Mozambican waters carried out by countries such as Spain, South Africa, Russia and Japan undoubtedly has a significant impact on turtles. There is a prosperous tourist market for turtle carapaces and their products in Pemba, Beira, Nampula, Inhaca and Maputo (in the latter case including the Municipal Market and the international airport). Customs officials enforce the confiscation of shells where attempts are made to export these without proper permits, although this

system is open to abuse. Carapaces, mainly of hawksbill and green turtles are sold to, or used by, craftsmen and traditional healers. Traditionally, turtles and their products are used by the local people for a variety of magico-medicinal purposes. In Inhassoro, the eggs are used to treat sexual disorders (Gove & Magane, 1996). Hughes (1971) reports that in southern Mozambique, north of Delagoa Bay the heart of turtle is eaten by the chief to acquire longevity.

The legal basis for turtle conservation is the Hunting Law 7/1978 and Decree 117/1978. A limited degree of protection is afforded to some nesting/breeding sites and feeding grounds that occur within gazetted conservation areas (e.g. Maputo Elephant Reserve, Inhaca Island, Bazaruto Archipelago). These areas are the most important only for the leatherback and loggerhead turtles. The conservation programme initiated in 1987 on Inhaca Island has proved successful. Prior to the programme almost all the nests were raided by the local people. Since the beginning of this programme, only 1.6 nests (or 5%) on average are raided per year. On Bazaruto Island, a conservation programme involving the participation of local communities is currently underway (DNNFB in collaboration with the WWF) and is proving highly successful. However, for most of the Mozambican coast, agencies lack effective means and human resources for enforcement of the law. In addition, international conventions signed by Mozambique are still not incorporated into the national laws.

Exploitation of Marine Resources

Fisheries

The highest tonnage of fish landings was in 1986, when a 38 700 tonne catch was registered (Siquela, 1994). Of this, 65% was caught by the industrial sub-sector, 34% by the artisanal sub-sector and less than one per cent by the semi-industrial sub-sector. Since that time the structure of the catch has changed dramatically. The total landings have fallen by nearly 50% (to 18 446 tonnes), while the share of catch caught by the artisanal fleet has fallen to 20% and the share caught by the semi-industrial fishermen (SIF) has risen to 12%. Table 13 shows changes in the catch by species. It can be seen that the major reason for the change of structure is the collapse of the fish catch for both the industrial and artisanal sub-sectors.

Although shrimp are not the main product by volume, their high value makes them the most important product of the Mozambican fisheries sector. It is frequently stated that Mozambique is the only shrimp fishery in the world which is not over-fished. Although there seems to be some doubt as to the accuracy of some of the stock assessment data, the estimates commonly cited (Table 14) show Mozambique to have ample unexploited stocks: the important crustacean species are apparently exploited at only 25 per cent of the potential (although it should be pointed out that the level of exploitation of shrimp concentrated in the Sofala Bank is at its maximum capacity) (Siquela, 1994).

In June 1994, there were 212 boats licensed to fish in national waters. Table 15 shows that 31% of the fleet (66 boats) were registered as semi-industrial. Some 39% of the total fleet fish for shrimps with another 12% fishing for gamba.

Table 13. Fish landings in Mozambique (tonnes). (Source: DNP, cited in Siquela, 1994)

SPECIES	1986	1988	1990	1991	1992	1993
<i>Global total</i>	38 671	32 033	27 552	25 417	20 496	18 446
Shrimp	7 766	7 436	6 863	7 698	6 759	7 343
Gamba	2 412	3 726	2 841	2 350	1 652	1 833
Fish	25 942	18 949	15 823	13 105	9 354	6 107
Shrimp bycatch	1 799	1 023	835	1 033	1 237	1 547
<i>Industrial</i>	24 952	26 584	18 545	18 932	15 362	12 462
Shrimp	7 575	7 328	5 957	7 050	6 338	6 692
Gamba	2 412	3 726	2 841	2 350	1 652	1 833
Fish	12 524	13 701	8 276	7 757	5 391	1 755
Shrimp bycatch	1 689	930	780	720	672	738
<i>Semi-industrial</i>	381	342	240	941	1 271	2 230
Shrimp	48	94	74	179	184	276
Fish	223	155	111	448	516	1 137
Shrimp bycatch	110	93	55	313	565	809
<i>Artisanal</i>	13 338	5 107	8 767	5 544	3 836	3 754
Shrimp	143	14	832	469	237	375
Fish	13 195	5 093	7 436	4 900	3 447	3 215

Table 14. Yields and landings (tonnes) (Siquela, 1994)

RESOURCES	POTENTIAL YIELD	REGISTERED LANDINGS	% OF USE
Crustaceans	43 600	10 906	25
Pelagic fish	219 800	50 580	23
Demersal fish	167 500	20 275	12
Shellfish & other resources	3 200	525	16
Others	197 000	99 460	50
TOTAL	631 100	181 746	29

Table 15. Fishing effort (DNP, cited in Siquela, 1994)

RESOURCE	TOTAL	INDUSTRIAL FISHING BOATS	%	SEMI-INDUSTRIAL FISHING BOATS	%
Shrimp	83	55	66	28	34
Gamba	26	26	100	0	0
Fish	89	53	60	36	40
Other	14	12	86	2	14
TOTAL	212	164	69	66	31

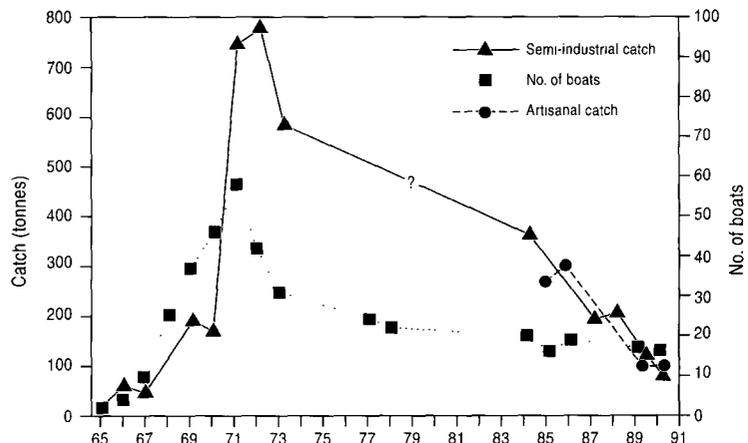
Fishing Activities in Maputo Bay

In terms of fish catch the keele shad (*Hilsa keele*) fishery is the most important in Maputo Bay. Annual catches are estimated to be in the region of 3 000 tonnes, harvested mainly by the artisanal sector. Prawn fishing in Maputo Bay is practised by semi-industrial and artisanal fishers using trawl nets. The semi-industrial sector exploits the entire Bay whereas the artisanal fishers trawl closer to the shore (e.g. the Nkomati, Maputo and Espirito Santo Estuaries and Catembe). The prawn catch comprises (ca. 90%) two species: *Penaeus indicus* and *Metapenaeus monocerus*. Prawn catches have progressively declined since 1973 when a total annual catch of 800 tonnes was recorded (semi-industrial sector only) – see Figure 16. Precise data regarding prawn catches for 1994/1995 are lacking, although preliminary estimates suggest that ca. 200 tonnes are being harvested annually (semi-industrial plus artisanal sectors). Whether this decline is due to over-exploitation or reduced fishing intensity is not clear, as the number of semi-industrial boats fishing in the Bay has also fallen. The Maritime Authorities specify each year the location and period when prawn fishing may take place in Maputo Bay (e.g., a general prohibition exists for the period December to March) in order to allow the prawn stocks to recover. However, these regulations are regularly flouted due to lack of effective control.

Fisheries and Environmental Concerns

Mozambique's economy is essentially reliant on its natural resource base. Its prospects for economic growth, as well as the productivity and quality of life of its population, are therefore closely tied to the natural environment. The low population density and minimal industrialisation, however, has made the environmental problems few in Mozambique so far, compared with other developing countries.

Figure 16.
Total annual prawn catch and number of semi-industrial trawlers in Maputo Bay.



Nevertheless, the environmental challenges facing the country are becoming evident, including high urban population growth rates, increasing levels of pollution, inadequate access to clean water and sanitation, unchecked land clearing for urban fuel wood supply, decreasing soil productivity, and degradation of coastal environments, including damaged mangroves, erosion, and declining productivity of some marine fisheries. The exact status of many of these trends remains to be determined. Marine fisheries in Mozambique fall into two categories: coastal and offshore fisheries. Coastal fisheries consist primarily of shallow-water demersal and pelagic species, usually caught on the continental shelf. Offshore fishing is mainly for tuna, most of the exploitation being from licensed vessels. The relatively extensive continental shelf of Mozambique supports a lucrative shrimp fishery. However, it has been observed that inshore resources, particularly shallow water shrimp, are being heavily exploited by the artisanal and industrial fleets.

The artisanal fisheries are operated without any management or control. Landing data from this sector is incomplete, if any, and knowledge of the fishery stocks is limited. However, it is highly probable that many of the resources are heavily exploited, mainly in the bays close to urban centres. Various management measures have been put in place, particularly directed towards industrial fisheries, including closed season, fishing effort limitation (number of vessels), catch quotas and mesh size regulations. However, although quotas and licensing are consistent with natural productivity and rates of recovery, monitoring and enforcement are still a major problem. Furthermore, enforcement of the management measures, particularly for the artisanal fleet, is lacking, which causes conflict with the industrial sector. Poor systems of licensing and data collection for artisanal fisheries further aggravate effective management of fisheries resources. The targeting of keystone species (or certain grazers), for example, may remove important ecological links from the reef system. In other instances, non-selective fishing through use of overly efficient gear can be extremely damaging to a wide range of organisms, including many non-targeted species. Examples include the use of small mesh sizes, which capture all size classes of virtually every variety of fish, and the kilometre-long floating drift nets, forming an invisible wall in the oceans and entangling non-targeted marine life, including endangered marine mammals and turtles.

Sports Fishing

Sports line-fishing, mainly by South African fishermen from beaches or ski boats, has increased markedly since 1992. The Ponta do Ouro – Machangulo Peninsula, Bilene – Xai-Xai and Inhambane Bay coastlines are the most affected. There is little or no control over this type of fishing activity and there are many reported cases of South African "sports" fishermen exporting large quantities of line and reef fish to South Africa (Hatton, 1995). The Oceanographic Research Institute (ORI), Durban, in collaboration with the Fisheries Research Institute (IIP), Maputo, are currently carrying out a survey of sports angling along southern coastal Mozambique, based on the voluntary return of catch cards by anglers.

Skiboat Angling

There is a distinct summer peak in the number of skiboat angling outings recorded along the Ponta do Ouro to Ponta Malongane coastline. In 1995, the total time spent fishing was 3 486 hours and, as each boat had an average crew of 3.3 anglers, the cards represented the catches made during 11 503 man hours of angling (David *et al.*, 1996). These values must, however, be regarded as an underestimate, as there is no assurance that all skiboat skippers filled in their catch cards. A wide variety of pelagic and demersal species was caught by tourist anglers. The major components of the catch were tuna (mainly yellowfin tuna, *Thunnus albacares*, and eastern little tuna, *Euthynnus affinis*), king mackerel (*Scomberornorus commerson*), kingfishes (*Carangidae* spp.), greenfish and jobfish (*Abion virescens* and *Pristipomoides filamentosus*) and bottom-dwelling fish such as rock cod (*Serranidae* spp.), slinger (*Chrysoblephus puniceus*) and emperors (*Lethrinidae* spp.).

Shore Angling

Tourists in southern Mozambique also take part in shore-based rock and surf angling and usually obtain access to various localities along the coast by means of 4x4 vehicles. Catch card returns indicated that the main species in the catch were wave harrick (*Trachinotus botla*), kingfishes (*Caranx* and *Carangoides* spp.) and slumpnoses (*Rhabdosargus sarba* and *R. thorpei*) (David *et al.*, 1996). Saltwater fly fishing is also practised by some tourist anglers, with kingfish the primary target species.

Spear Fishing

Spear fishing is a popular tourism activity in southern Mozambique, with divers active from both boats and the shore. Catch cards collected at two resorts in 1994 and 1995 (Ponta do Ouro to Ponta Malongane) indicated that kingfishes (*Carangidae*) were the major component of the catch. The remainder of the catch was made up of pelagic species, such as king mackerel (*Scomberomorus commerson*) and barracuda (*Sphyrena* spp.), and bottom dwelling species, particularly rubberlips (*Plectorhincus* spp.).

Commercial Exploitation of Holothuria

Holothuria (sea cucumbers) are widely exploited along the Mozambican coast where suitable habitats occur. Dried holothuria are highly valued in the Far East where they may fetch prices of up to US\$50 per kg. Along the northern sector of the coast (Cabo Delgado and Nampula), local communities harvest and dry this resource at camps located on islands or on the mainland. Tanzanian middlemen purchase the dried product which is exported (often illegally) to Tanzania for subsequent re-export to Hong Kong. The commercial harvesting along the Ponta do Ouro – Xai-Xai coastline takes place mainly on Inhaca island. Ten species of holothuria occur in the shallow waters of Inhaca Island of which only one species, *Holothuria scabra*, is exploited for commercial purposes. The distribution coinci-

des with that of the seagrass beds. The harvesting around Inhaca was banned in 1990, following depletion of stock. However, in 1993 the Maritime Authorities again granted permission for the commercial exploitation of holothuria (based on the assumption that the stock had sufficiently recovered) and by 1994 seventeen camps were operational on Inhaca and seven on the nearby Machangulo Peninsula. Holothuria are harvested mainly in the shallow waters and canals in the north and south bays. Gujral (1995) estimates that at least 32 tonnes and possibly more were harvested over an eight month period in 1994, clearly indicating an over-exploitation of stock. According to Gujral the lifting of the ban in 1993 was too early, suggesting that recovery of stock requires at least two years. All holothuria licenses were issued to non-islanders with local inhabitants working as salaried employees. Dried holothurias are sold to middlemen in Maputo for ca. US\$20 per kg. Local islanders, however, were earning approximately US\$25 per month. Residents of Inhaca Island are, therefore, not gaining maximum economic benefit from this highly priced resource. The processing of holothurias involves boiling in large tanks prior to sun drying. It is estimated that for each kilogram of dried holothuria 23 kg of fire wood is required (Costa & Montecino, 1990). If this ratio is correct then some 726 tonnes of fire wood were used in the processing during the eight-month harvesting referred to above. Since most of the camps are located near mangroves, a secondary effect is certainly the cutting down of large numbers of mangrove tree.

Environmental Concerns in Mariculture

Mariculture is a new concept and activity in the fisheries sector in Mozambique. Its development is constrained by lack of local tradition. Apart from knowledge of culture techniques, this activity requires certain conditions, human and financial resources which at the moment are not available in the country. Three main regions were selected for the first phase in mariculture development: Maputo, Beira and Quelimane, with 7 500, 19 500 and 6 000 ha respectively. In total, around 33 000 ha have been inventoried and selected for mariculture development, located within a range of 25 km around the capital cities. The coastal and estuarine potential for mariculture in Mozambique is estimated to be around 170 000 ha. Currently, there are few proposals or projects for mariculture of shrimp along the Mozambican coast. There are no major environmental problems with the practice, since the level of activity is almost nil. Experience in other parts of the world does, however, give reason to plan and prepare specific legislation to address large scale introduction of mariculture. General concerns include clearing of mangroves and other coastal ecosystems, nutrient loading of coastal waters and introduction of foreign genetic material to the wild in the form of organisms propagated or pests affecting the farms.

Mangrove Destruction and Coastal Deforestation

Mangroves occur along the entire Mozambican coast, although the most extensive formations are in Sofala and Zambezi provinces, where the coastline is classified as a delta coast. Sustainable use of these areas is important from the standpoint of

fisheries, forestry, biodiversity conservation, and protection against coastal erosion. Mangrove trees are used by coastal communities for a wide variety of purposes (Table 16). Based on satellite imagery, estimates indicate that the mangroves cover ca. 396 080 ha, representing a reduction of 3.9% since 1972 (Saket & Matusse, 1994). Changes in mangrove cover per province and distribution of mangrove vegetation along the Mozambican coast are shown in Table 17. At present, although the total degraded mangrove area appears to be small, there is uncontrolled cutting of mangrove in areas close to urban centres. Among the most destructive activities affecting mangrove ecosystems are clear-felling of mangrove for construction of solar salt pans (mainly in the northern region), charcoal production or simply large scale removal of fire wood. In contrast, the selective cutting of poles for local house construction is not a major threat if adequately controlled. With the development of shrimp aquaculture, a new threat to mangrove ecosystems may arise when large areas are cleared for aquaculture ponds.

Table 16. Species of mangrove and their uses by the coastal communities, Cabo Delgado province

SPECIES	USES
<i>Avicennia marina</i>	Construction of beds, fire wood, building dugout canoes, leaves for animal fodder
<i>Bruguiera gymnorrhiza</i>	Poles used for house building, fire wood
<i>Cerops tagal</i>	Poles used for house building fire wood, timber for boat building
<i>Rhizophora mucronata</i>	Poles very resistant – used for house building, bark used for drying nets, fire wood, fish traps
<i>Sonneratia alba</i>	Floral nectar sucked by children; fire wood, boat building
<i>Xylocarpus granatum</i>	A concoction is made from the fruit and is taken to induce abortion (high dosages are said to be lethal), fire wood, cure for stomach problems and hernia

Table 17. Mangrove cover (ha per province) in Mozambique (Saket & Manisse, 1994)

PROVINCE	MANGROVE AREA (HA) 1972	MANGROVE AREA (HA) 1990	AREA DEGRADED (HA)	NEW MANGROVE AREA (HA)	CHANGE (%)
Maputo	14 605	12 599	2 217	211	15.2
Gaza	387	387	0	0	0
Inhambane	20 094	19 848	246	0	1.2
Sofala	129 997	125 317	6 334	1 654	4.9
Zambezia	159 417	155 757	3 766	106	2.4
Nampula	55 849	54 336	2 006	493	3.6
Cabo Delgado	27 730	27 836	0	106	0
TOTAL	408 079	396 080	14 569	2 570	3.9

Capacity Constraints and Institutional Development

While most of the major issues in the coastal zone are recognised, if not entirely understood in terms of the full extent and impact of the problem, addressing these issues can be extremely problematic. Apart from the obvious resource constraints, there are significant institutional constraints which hamper the systematic and coordinated efforts required to launch viable Integrated Coastal Zone Management programs in the country. The institutional constraints concern issues related to the political setting, the legal and policy environment, the administrative and organisational aspects of resource management, and the limited human resources available to deal with the issues which currently undermine sustainable development in the coastal zone.

Political Setting

The need for an integrated approach to management of the coastal zone places a special emphasis on appropriate institutional arrangements and accommodations among stakeholders. Among other things, this requires cooperation between Government sectors in clarifying their roles and jurisdictional responsibilities over coastal resources, and harmonising their policies and management interventions in line with agreed on objectives for the coastal zone. Institutional mechanisms are also required to resolve the many user conflicts that are arising over increasingly limited resources in the coastal zone, and a commitment to their sustainable use is vital. Compliance with sustainability objectives will depend in part on the degree of ownership and participatory involvement realised by stakeholders in different stages of coastal zone planning and management. Among the incentives necessary for such compliance is a partnership between the private sector and government, transparency in decision-making and management accountability, all of which are severely constrained by the current political setting.

Policy and Legal Aspects

The Constitution of Mozambique makes basic provision for environmental control legislation. However, specific legislation dealing with the protection of the marine and coastal environment is at a very early stage of development. There are few effective controls or performance standards, and enforcement is hampered by the absence of environmental monitoring and adequate skills. As in other fields of Mozambique's economic and social activities, most environmental legislation in force is dated prior to Independence (1975). In fact, under Article 79 of the first Constitution approved in 1975, any law or its provision adopted prior to independence will remain valid as long as it does not harm the interest and policy of the Republic of Mozambique. Most of the legislation published during the Portuguese administration is, therefore, still valid and in force. Thus, it is common that whenever reference is made to environmental legislation in Mozambique, the principles underlying it are internationally outdated.

An important factor which has contributed to the rapid degradation of natural resources and habitats in the coastal zone has been a weak policy environment to regulate and otherwise influence the development in this area. Environmental codes and regulatory legislation to offset environmental consequences of economic development, for example, tourism and agribusiness, are only now emerging. Similar laws regulating access to and use of coastal resources have yet to be developed.

An additional factor which undermines the progress being made in development of appropriate regulatory policies and standards, is the lack of enforcement. This is both a resource issue, in term of inadequate surveillance staff and budget, and an accountability issue. While the first can be corrected with sufficient resources, the latter remains more problematic.

Weak enforcement of existing laws and traditional use rights has important implications for the management of coastal resources. Many coastal and marine resources (such as fisheries, mangrove forests and wetlands) are considered common property resources within the legal jurisdiction of local or state authorities. Assurance of continuous benefits to users of these resources was made possible through systems of traditional user rights and license schemes, which served – at one time – to limit access to these resources. With the high rates of population growth, urbanisation and unemployment, however, the pressure for broader access to these resources has grown along with the state's inability to restrict it. Community barriers to over-harvesting have been breached by people displaced by economics or war, who have little incentive to ration their harvesting. A loss of common interest once shared by users in the fate of these resources has led to a breakdown of management practices, exploitation competition and the "Tragedy of the Commons."

Administrative Weakness and Jurisdictional Issues

Since the coast is not a traditional sector in the economy of the country, management of the coastal zone has generally proceeded along *ad hoc* lines. Overlapping jurisdictions of government agencies with authority on the coast (Table 18) have led to confusion, on the one hand, as to which resources fall under whose domain, and inertia on the other, as vested interests in conflicting development scenarios compete with one another, eroding enforcement and preventing coordinated action.

Government ministries charged with natural resources oversight have neither the political clout nor the resources to promulgate the necessary policy and regulatory framework that would balance development with other stakeholder interest in the coast. Because coastal zone management is still a novel concept in Mozambique, there is a paucity of information on potentially viable approaches to ICZM. Similarly, at the national level, there is a relatively inadequate data base on the full scope of coastal zone issues, which is needed to undertake the kinds of strategic analysis and planning required to design the initial stages of an ICZM program.

Table 18. Institutes involved in coastal zone research, planning and management.
(a) = only for Inhaca Island

INSTITUTION	RESEARCH	PLANNING	MANAGEMENT
<i>Ministry of Coordination of Environment Affairs</i>	X	X	X
<i>University Of Eduardo Mondlane</i>			
Dept. of Biological Sciences	X		X (a)
Dept. of Geography	X		
Dept. of Forestry	X		
Dept. of Chemistry	X		
<i>Ministry of Agriculture & Fisheries</i>			
National Directorate of Forestry & Wildlife	X	X	X
National Agronomic Research Institute	X		
National Directorate of Geography & Cadastre	X		
Fisheries Research Institute	X		X
Small-scale Fisheries Development Institute	X	X	
<i>Ministry of Transport & Communications</i>			
National Institute of Hydrography & Navigation	X	X	
National Marine Directorate			X
Maritime Administration			
National Meteorological Institute	X		
<i>Ministry of Commerce & Tourism</i>			
National Directorate of Tourism		X	X
Department of Commerce	X	X	
<i>Ministry of Health</i>			
Laboratory of Environmental Health & Water	X		
<i>Ministry of State Administration</i>			X
<i>Ministry of Industry & Energy</i>			X

Limited Human Resources

Clearly, sustainable management of the coastal zone to meet the development needs of the country depends upon having a large cadre of well trained and well equipped resource managers. There is currently a paucity of personnel with experience and access to the latest technologies and methods to deal with the complex issues of CZM (for example, remote sensing, GIS, EIA, participatory rural appraisal – PRA, and mechanisms to facilitate voluntary compliance with regulations and policies among resource users). CZM curricula need to be developed and tailored to the needs of the country. Development of, and access to, well-planned data bases for environmental assessment and monitoring will also be required. Career development incentives, including prospects for promotion and competitive salaries, will also have to be provided, to create a competent and highly motivated corps of coastal zone managers. Without these investments in human resource development, the groundwork cannot be laid for successful integrated coastal zone management programs in the region.

Issues and Recommendations for Action

Coastal degradation in Mozambique occurs in relation to a variety of incompatible human activities, such as agriculture, forestry, fishing, tourism and urbanisation. This results in coastal erosion, habitat destruction of mangroves, beaches, seagrass beds and reefs, biodiversity loss, land degradation and depletion of fish stocks.

Coastal erosion (e.g. in the city centre of Beira) is mainly caused by building structures too close to the shoreline and lack of maintenance of protection structures. In the southern part of the country, uncontrolled tourist activities are placing pressure on the natural resource base. Examples are tourism without proper planning and causes destruction of coastal habitats (mangroves, beaches, dunes, reefs and other sensitive environments) and adversely affects the social and cultural life of local communities. There is, therefore, an urgent need for action to combat developments that undermine the livelihood of coastal communities, in terms of their dependence on fish protein, agriculture and other natural resources upon which these communities depend. The issues, causes and possible actions to address these coastal zone problems are presented in Box 1.

BOX 1. PROBLEMS, CAUSES AND RECOMMENDATIONS FOR ACTION

Marine and coastal pollution

Marine pollution in Mozambique is currently a localised problem primarily affecting the coastal urban areas and the international shipping lanes.

Marine based source of pollution

Problems

- Tanker discharge and ship bilge discharge are dispersed widely and eventually ends up in Mozambican coastal waters and beaches. There is no contingency planning in ports to deal with accidental spills.
- Exploratory drilling often leads to localised pollution (drilling fluids).

Causes

- Increasing age of world tanker fleet and the stricter regulations in many parts of the world will make the old fleet more likely to traffic Mozambican waters (Katina P). The likelihood of a spill has increased with the intensification of traffic (due to the recent rehabilitation of railways system and port facilities) and the increase in sea unworthy ships.
- Increasing efforts to exploit oil and gas in coastal area of Mozambique will increase the likelihood of accidental spills.

Actions

- Develop oil spill contingency plans based on oil spill trajectory predictions and sensitivity mapping of vulnerable areas.

- Create response network and train clean-up operations.
- Ratify existing conventions and other providing protection and assistance when marine pollution occurs.

Land based sources of pollution

Causes

- Lack of data and information on pollution problems and consequences, as well as monitoring systems.
- Existing institutional framework is inadequate to deal with multi-sectoral aspects of coastal zone development.

Sewage

Problems

- Sewage, primarily from domestic urban areas and tourism facilities.
- Absence and/or inadequate collection and treatment of sewage. Only Maputo is connected to a sewage system. Inadequate collection and disposal of solid waste is also a problem in most coastal towns and villages and diseases are easily spread.

Causes

- Increased urbanisation of rural people to coastal areas; informal settlements have worsen environmental pollution associated with discharge of waste water and disposal of garbage.
- Inappropriate construction of outfalls and poor treatment of existing discharge makes potential source of fertilisers into a destructive pollutant.

Actions

- Invest in low-cost sewage collection and treatment facilities for local communities. Pit latrines and septic tanks should not be used in water table coastal areas.
- Enforce regulations and standards of tourism development in term of waste water discharge and setbacks from the shoreline.

Agriculture

Problems

- Runoff with silt and chemicals from agriculture and other poor land-use practices.
- Increasing runoff from agricultural lands with nutrient loading in shallow areas and siltation is becoming a serious problem along large stretches of the Mozambican coast.

Causes

- Increased intensity of coastal agriculture with higher levels of runoff caused by soil erosion and use of inappropriate use of land.

Actions

- Increased technical assistance to coastal agriculture to develop sustainable production systems.
- Promote soil conservation through adoption of better farming practices.

Industry

Problems

Industrial discharge is primarily limited to urban centres in the southern coastal zone and some localised sources along the rest of the coast. Sources of pollution range from textile industries (dyes and strong alkalis), power generation (oil and sulphur), petroleum industries (discharge oils and tars) to soap and cleaning manufactures (detergents). Environmental pollution associated with the discharge of waste water from pollution factories can be a serious problem in areas with sensitive marine environment (e.g. reefs and coastal lagoons).

Causes

- Industrial pollution results from policy failures, weak enforcement of existing regulations and standards, use of inappropriate technology, and inefficient industries.
- Increased industrialisation and port activities in coastal cities, primarily Maputo and Beira, with insufficient zoning and effluent treatment.

Actions

- Industrial discharge can most often be easily addressed through proper treatment and simple process changes in the production.
- Impose and enforce regulations and standards for effluents and receiving bodies.
- Provide incentives for modernising plants, adopting less polluting practices including pollution control equipment.

Environmental degradation of fisheries and living marine resources

Coastal fisheries, aquaculture and mariculture

Problems – fisheries

- Over-fishing is taking place in the near coastal zone along most of Mozambique's bays. The catch data are, however, so unreliable that is hard

to determine what the maximum sustainable catches could be or at what level current effort is practised.

- Destructive fishing methods like trawling and small-meshed nets are of particular concern. There is serious damage taking place on most fishing grounds in the near coastal areas along Mozambican coast.
- Local contamination from sewage of seafood and fisheries is also a problem close to coastal towns.

Causes

- Over-fishing can be explained by the open access situation which encourages short-term benefits. The underlying factors are over establishment of fishermen using inappropriate fishing methods, as well as factors lying outside of the sector like environment destruction and pollution.
- Rural poverty, pushing marginal population into fisheries as last resort.
- Weak licensing and permit system permitting access to fishing over the whole Mozambican coast.
- Lack of enforcement of existing legislation
- Lack of reliable catch data.
- Inappropriate fishing methods concentrating fishing in near coastal zone.
- Insufficient extension services to assist fishermen to use more sustainable fishing methods.
- Lack of capital for investment in relatively untapped resources like large pelagic fisheries.

Problems – aquaculture and mariculture

Since this is still a new activity, no signs of environmental degradation caused by this activity have been seen yet.

Actions

- Development of fisheries management plans, in coordination with ICZM.
- Survey standing stocks, catch data, socio-economic issues with fishermen.
- Development and implementation of regulations on fishing activities (catch/size limits etc.).
- Improve coordination/operation of fisheries agencies.
- Involvement/education of users and public.
- Protection, zoning and regulation of critical ecosystems like mangroves, reefs.
- EIA for projects with impact fisheries and aquaculture (dams, tourism, industrial and ports development).
- Promote sustainable mariculture (fry hatcheries, technical assistance, regulations).
- Increase returns from fisheries, minimise post harvest losses, improve storage and processing.

- Make reasonable evaluations of fisheries resources so proper trade-off decisions can be made.
- Study economic alternatives for fishermen to leave fisheries and take occupations like mangrove harvest, mariculture and salt production (opportunity costs).

Coastal degradation

Coastal degradation takes place in relation to many human activities like agriculture, forestry, fishing, tourism and urbanisation. This results in coastal erosion, habitat destruction of mangroves, beaches, seagrass beds and reefs, biodiversity loss, land degradation and depletion of fish stocks.

Problems

- Land degradation from agriculture and tourism is currently expanding in the coastal areas particularly along the southern coast from Ponta do Ouro to Inhambane. This creates increasing pressure on the resources and will have serious implications for long term expansion of agriculture and tourism. Tourism without proper planning and provisions causes destruction of coastal habitats (mangroves, beaches, dunes) during construction, damages reefs and other sensitive environments, and adversely affects social and cultural aspects of local people.
- Coastal erosion along Maputo province and in the central city of Beira is increasingly costly and requires more attention in the planning process. Coastal erosion problems are mainly caused by building structures too close to the shoreline, and poorly designed and maintained protection structures.
- Habitat destruction resulting in a decrease of productive ecosystems and biodiversity is becoming a serious problem particularly in the southern part of the country. A few key species like sea turtle and dugongs are particularly threatened but the main problem is related to a general decline in ecosystem function.
- Loss of mangrove is a localised problem for areas like Nacala, with large implications for local users and coastal products and services. Alternative land uses like salt production and over extraction are the two main problems. Excessive loss of mangrove leads to loss of: habitat for fisheries, shoreline stabilisation, sediment trapping, nutrients for coral and seagrass.

Causes

- Inadequate institutional capacity and legal framework for ICZM. Sectoral policies fail to integrate urban environmental issues at national and local levels.
- Weak land use planning and lack of comprehensive policy account for destruction of many sensitive areas. This high increase of land use conflicts among various stakeholders is difficult to resolve within the existing policy, legal and institutional system.
- Rural poverty is pushing marginal population into unsustainable farming on fragile lands along the coast.
- Soil erosion and sedimentation due to inappropriate inland farming and tilling practices, especially on steep slopes.
- Agriculture policies and technical assistance focus on the more productive inland agriculture and neglect needs of poorer agricultural land on the coast.

Actions

Agriculture and forestry

- Increased technical assistance to coastal agriculture.
- Promote soil conservation through adoption of better farming practices.
- Design and implement mangrove management plans and regulate clearing of mangroves for other uses.
- Develop alternative energy sources.

Tourism

- Develop and enforce regulations of tourism development.
- Planning for tourism as part of ICZM. EIA for tourism infrastructure.
- Limit impacts of tourism on sensitive habitats (paths, guides, moorings, public awareness).
- Promote better local economic return from tourism (ecotourism, joint ventures).

Erosion

- Promote public education and scientific appraisal of impacts. Emphasis of installation of low cost, low technology erosion control measures.
- Enforce the 100 m buffer zone.

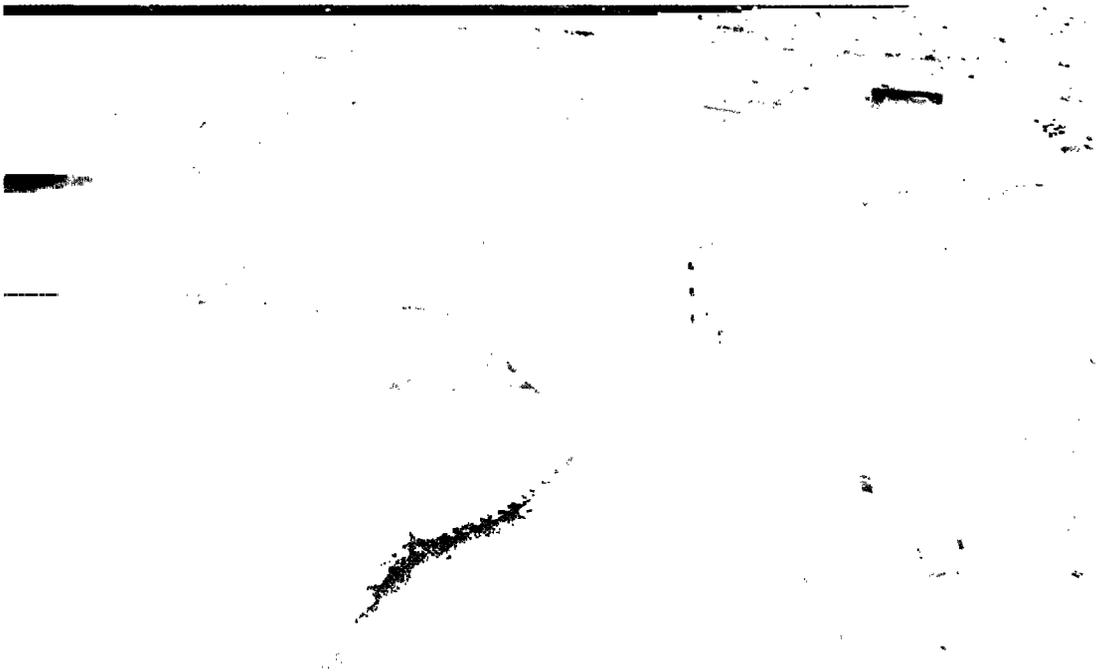
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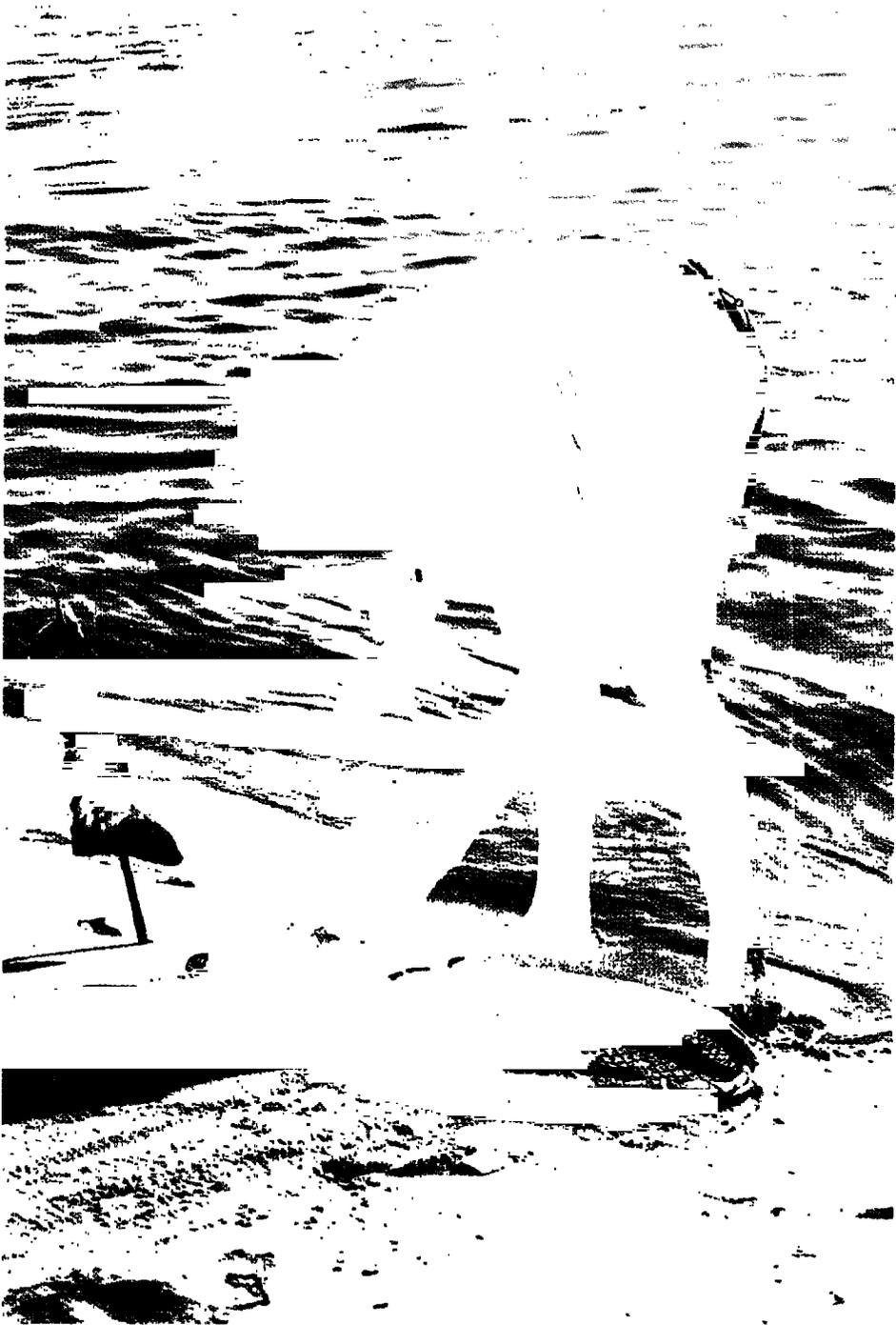
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Coastal erosion is a serious problem along the coast of Mozambique, threatening important infrastructure such as the road behind this beach north of Maputo. (Photograph: C. G. Lundin)

Coastal ponds are used for salt production, and increasingly for cultivating shrimp. A serious environmental impact assessment should be carried out before shrimp farming is allowed. (Photograph: C. G. Lundin)



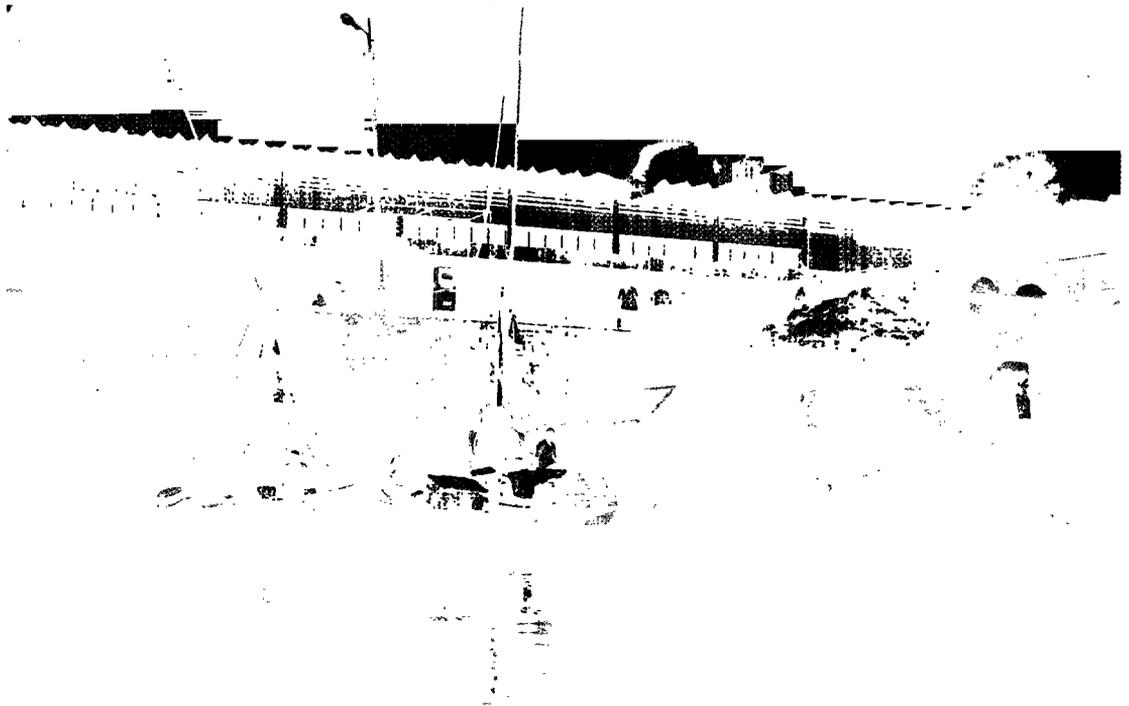


Fish provides protein for most of the coastal population. Shifting pressure from near shore fish stocks to some of the offshore stocks, particularly the by-catch from the shrimp fishery, could be one way of promoting sustainable use. (Photograph: C. G. Lundin)



The Marine Biological Institute is an important collection and education centre for enhancing our understanding of the marine environment. Research is the foundation for understanding and improving the management of coastal resources. (Photograph: C. G. Lundin)

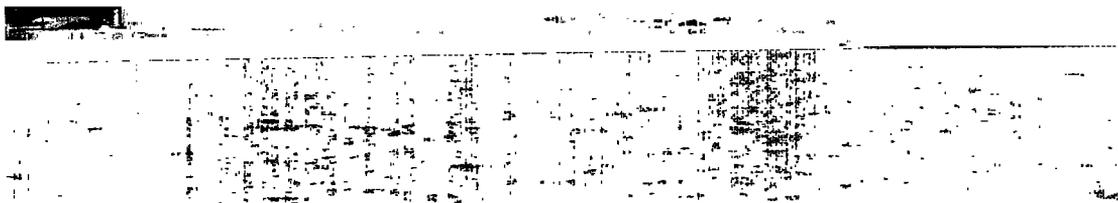
Maputo harbour is vital for the communication and hence the development of Mozambique. The development of the fisheries sector will also require well functioning infrastructure, much of which is now being privatised. (Photograph: C. G. Lundin)





Sandy soils make the Bazaruto Archipelago unsuitable for agriculture. View of Bazaruto Island, with parabolic dunes and coral reef. (Photography: S. Magane)

Sewage is one of the most serious threats to the coastal marine environment. In Maputo, only sewage from the "Cement City" is treated, while an estimated 50 percent of the total sewage remains untreated. Studies on clams and water around Maputo Bay show high contamination by faecal coliform bacteria. (Photograph: C. G. Lundin)



TERRITORIAL PLANNING OF THE COASTAL ZONE OF MOZAMBIQUE – METHODOLOGY

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Introduction

The coastal zone of Mozambique, which extends over 2 700 km, is characterised by a significant variety of eco-systems (both marine and terrestrial), and a relatively high population density. It is estimated that around 40% of the inhabitants of Mozambique live in the 42 coastal districts.

Therefore, the zone can be said to have two important attributes:

- Extremely fragile eco-systems (beaches, humid zones, estuaries, lagoons, coral reefs, rocky coasts, mangroves and other areas with high bio-diversity).
- Generally numerous and sometimes conflicting interests (principal coastal towns, traditional and semi-industrial fishing, industry, tourist developments, historic sites, marine parks etc.).

Even without detailed knowledge of these issues, it can be said that the coastal eco-systems currently suffer from a few severe but isolated environmental problems, while there in other areas is a potential for serious deterioration.

A large and impoverished portion of the population of Mozambique lives in the coastal area. By over-using its resources, this concentration of people stress some of the most fragile eco-systems of the coast. These same eco-systems play a decisive role in both local and national economy. For example, the coastal zone provides the resource base for traditional, semi-industrial and industrial fishing, which constitute the major source of protein for the inhabitants of the area. It also represents about 40% of the GNP. Furthermore, with the end of hostilities in Mozambique, both domestic and foreign tourism in the coastal zone are increasing, leading to uncontrolled construction of tourism infrastructure. Finally, given the current state of development, institutions at both local and national level have little ability to intervene. This low capacity translates into weak facilities for planning and control or monitoring on the local level. Similar constraints exist with regard to financial resources and implementation of legislation. Thus, conflicts arise, particularly concerning the use of land and other coastal resources.

The consequences of implementing a development program without adequate planning will be unsustainable resource use and an array of negative effects on the

¹ Prepared by the work group of the Coastal Management National Workshop on the Integrated Coastal Zone of Mozambique, May 1996.

environment and the economic activities in the area. However, careful planning with regard to natural parameters and processes may succeed in stabilising the eco-systems of the coastline and provide possibilities for harmonious development. To address these issues, the participants of the *National Workshop on Integrated Coastal Zone Management* met on Inhaca Island and in Maputo, May 5–10, 1996, to discuss a methodology for territorial planning of the coastal zone of Mozambique. Such a planning process is an important step toward a more comprehensive program for Integrated Coastal Zone Management.

Integrated Coastal Zone Management in Mozambique

Integrated Coastal Zone Management (ICZM) is an ongoing process, since it involves not only planning, but attention to implementation of the plans and monitoring of their outcome. This process should therefore be considered as permanent, continuously enabling feedback on the actions to be undertaken. For these reasons, ICZM should be a priority on the agenda of the Government of Mozambique.

Implementation of this kind of program requires considerable effort, including the establishment of a number of presuppositions regarding theory, methodology and institutions, most of which have yet to be accomplished in the country. Therefore, a preparatory phase is recommended. This phase will have as objective to establish these presuppositions, which will then form the basis for further development of the program. A state-of-the-art assessment of studies on the coastal zone of Mozambique seems to be one of the basic tasks at this initial stage. A survey of available technical-scientific information will permit identification of existing gaps, and provide material for preparation of preliminary diagnostics. Another basic task is the training of staff to operate the program, one of the most important efforts in this phase of the program implementation. This phase should also include the establishment of institutional mechanisms to sustain the program, which this paper seeks to address. International experience in similar programs indicates that weak institutional capacity is the principal cause of poor results or discontinuation in this type of program. Finally, collective selection of tools and methodology should take place in this preparatory stage. Possible choices are also outlined later in this paper. The general principles guiding the concept of environmental planning are presented below.

It should be emphasised that the purpose of the program is to establish sustainable standards for the use of land and resources in the coastal zone. This should follow the principle of sustainable development, which seeks harmony between economic and ecological processes, as mentioned above. Conservation of coastal eco-systems and resources, preservation of landscape and species, and principally, an improved quality of life for the population, constitute the objectives of the proposed program.

International experience demonstrates that these objectives stand a better chance of being attained when the program encompasses the following characteristics:

- decentralised functioning
- collaborative drafting
- multi-disciplinary perspective
- cross-sectoral orientation
- inter-institutional operationality

Methodology for Territorial Planning of the Coastal Zone

The proposed methodology in this paper is the result of group discussions on the document "Proposal of Methodology for the Territorial Planning of the Coastal Zone of Mozambique". The following were the revisions suggested to this methodology.

A precursory phase should be initiated to provide a macro-diagnostic of the coastal zone, consisting of various components, including:

- Inventory of available data.
- Identification of gaps in data.
- Examination of institutional capacity to carry out analyses, research and/or tasks necessary.
- Coordination of existing information.

The anticipated results from this phase would be: (a) definition of the coastal domain, and (b) definition of the planning units.

Definition of the Coastal Domain

There should be a separate definition of the boundaries for the "marine area" and the "land area". For the marine area, the boundary of the territorial waters (12 nautical miles) serves as a delimiter for the coastal zone. For the land area, the definition should be the most flexible and broadest possible, according to the following criteria:

- *Large physiographic unit.* Here an explicit proposal was made, which may serve as a starting point for the macro-diagnostics. The coast of Mozambique would be split in three parts, according to the morphological differences already defined in other studies. These are: the south zone, parabolic dunes and coastal lagoons with a *faixa directriz* (directrix land strip) of medium width; the central zone, a mangrove estuary zone with a *faixa directriz* of greater width, and the north zone, a coral zone with a *faixa directriz* of lesser width.
- Ecological criteria.
- Administrative criteria.

Other criteria could also be taken into account, such as geo-morphology, saline wedge, hydrology, tide, economic activity, population mobility etc.

Note: The definition of the coastal domain should encompass the requisites for management, covering diverging situations.

Definition of Planning Units

The planning units should be of multi-level character, based on the principle of collaboration between the respective command levels – national, province, district and local. They should respond to the growing need for administrative decentralisation in the country, and be open and flexible to the possibility of taking care of specific projects. At this point, only the priority and emergency areas and units on national level and of importance for the country as a whole shall be defined, leaving the remainder to the later phases. It was recommended that the definitions of the planning units should be attentive to the desired integration with management of the region's hydrographic basins.

In the discussion of methodology for territorial planning of the coastal zone of Mozambique, the participants suggested taking into consideration the following:

- *Definition of priority areas.* These are emergency areas in terms of critical conflicts, and/or of relevance, importance, fragility and vulnerability of their ecosystems. At a secondary level, potential conflicts should also be considered.
- *Definition of specific surveys in the priority areas.* These shall be made up of basic surveys, relating directly to problems and their causes. Definition of action strategy, identification of projects and respective person responsible should be included. Strategies on making required surveys and research feasible should be prepared.
- *Definition of tools for basic surveys in the long term.* After the phases mentioned above have been accomplished, the coordination of data, prioritising of problems, and identification of conflicts, problems and their causes will follow.

Methodology of the Planning Process

Further recommendations for the methodology of the planning process include:

- Inclusion in the strategies of mechanisms for implementation of coastal management (such as zoning, setting standards, control, economic instruments, direct intervention, monitoring, action programs).
- Understanding of the program as a process in constant operation.
- Seeking participation of the population through traditional leaders.

- Widely distributing the actions to be carried out.
- Creating space for inter-sectoral coordination at national level.
- Involving various local figure-heads (from the commercial sector, the scientific community, non-governmental organisations (NGOs) etc.) in the program.
- Working with inter-disciplinary teams, always including members from the actual region in the teams on the national level.
- Drawing up a time line for actions, relating immediate actions to medium-and long-term strategies.
- Incorporating tools for decision-making, either on the level of concerns or area of work, or on the level of tools, such as social cost analysis, environmental impact assessment, etc.

Intermediary aspects, which are not defined here and which must be developed in the near future, fall on the Inter-institutional Technical Committee for Coastal Management. To summarise the discussion on methodology, taking into account the different steps for analysis and planning for the coastal zone, the following actions should be implemented:

- *Consider information as a cornerstone.* Gather all available data, identify gaps, draw up strategies to obtain necessary information.
- *The element of participation is essential.* Adopt collaborative methodologies, already in carrying out the initial diagnostics.
- *Portion out the actions to be undertaken.* Create fora for inter-institutional dialogue. Create possibilities for inter-sectoral expression at the government level. Involve the various public figure-heads in this context; from the commercial sector, the scientific environment, the NGOs and the community.
- *Institutionalise the program,* giving it administrative support and political sustenance.
- *Define clearly the institutional profile* needed for sustainability of the program.
- *Establish inter-disciplinary teams, strengthening the existing research institutes* to attain already established potential capacity of generating know-how.
- *Draw up a timeline for planning actions,* relating immediate actions to medium-and long-term strategies.
- *Medium term action must introduce the notion of a program* for coastal and maritime zone management in constant operation.
- *Emergency actions must be structured like demonstration projects* to be implemented in specific areas. These must in turn relate to initiatives for staff training and drafting of collaborative surveys on the local level.

Institutional Rearrangement

Institutional Framework

As a result of the discussions in the seminar, the participants propose that the following aspects should be considered for the institutional model:

- The Ministry for Coordination of Environmental Action (MICOA) is responsible for coordinating the drafting and implementation of the National Program for Coastal Zone Management (PNGC).
- MICOA draws up and defines the terms of reference for the Inter-institutional Technical Committee, responsible for the operational aspects of the PNGC.
- The terms of reference for the Inter-institutional Technical Committee are based on the need for the following components:
 - a) Gathering available basic data.
 - b) Identification of existing gaps in the data and the implementation of programs for resolving such information discrepancies on the national level.
 - c) Draft an initial macro-diagnostic of the coastal zone.
 - d) Draw up a time line for action planning and establishment of administrative support necessary for implementation of the former.
 - e) Promote the program on different institutional levels and in the community at large.
 - f) Definition of priority studies corresponding to critical levels.
 - g) Training and education.
 - h) Establish conventions and mechanisms for program operability.
 - i) Establish multi-disciplinary teams for the completion of detailed studies of diverse character.
 - j) Implementation of pilot projects to reduce critical situations that require immediate solution to a minimum. For example, at conflict between spontaneous tourism and local communities, or when several institutions overlap in issuing concessions or licenses. For this institutional corner-stone to function adequately, the possibility of obtaining international assistance must be considered, in terms of financial backing, coordination support, specialised consulting and training. National staff should be integrated in carrying out the work.

Control

The possibility of a sole control system for coastal activities (tourism, fishing, protected zones, constructions etc.) was discussed. The benefits of a sole control system would be that:

- Human and material resources would be optimised.
- Through training, the least number possible of control officers would be assigned to the field.

However, it was established that such a process would be very difficult to realise, as its application would be complex (the development of a super-controller). Thus, the control function should be maintained in its present state, but in a more coordinated form. This implies that different segments of the control apparatus must seek to work together without conflict. It also implies sharing of common resources.

Final Recommendations

At this stage, the participants propose that:

- A political commitment at the highest level of decision-making is indispensable.
- Assessments of the natural resource potential, to inform the drafting of plans for land use, are of vital importance.
- Efficient coordination between both the vertical and horizontal planes is of crucial significance for the success of the program.
- The implementation of the program must respect the principle of precedence, according to a scale defining priorities.
- Staff training must be considered in the implementation process of the National Program for Coastal Zone Management, in order to ensure the capability of the local institutions (training, equipment, structural foundation etc.).
- The Ministry for Coordination of Environmental Action should give special consideration to the UEM and other research institutions to optimise utilisation of local potential and create opportunities for scientific progress in Mozambique.

MECUFI COASTAL ZONE MANAGEMENT PROJECT

ALFREDO MASSINGA

Introduction

Goal of the Case Study

The goal of this case study is to shed light, from the vantage point of participation and self-related criteria, on the approach taken by the Mecufi Coastal Zone Management Project. The prerequisites for the success of the project's fundamentally participation-oriented approach are examined in detail, to determine their transferability to other situations. The project's characteristics with regard to its participatory and self-help promoting impacts are analysed. Above all, every effort is made to ensure that this analysis reconstructs and grants the participant insight into the processes embodied in the project.

Definitions

Resource management refers to the conservation and sustained utilisation of the natural bases of production – soil, water, vegetation and fauna. In this report, *resource conservation* is used synonymously.

Self-help, as used here, means efforts undertaken by local population groups themselves, to solve problems that they perceive as pressing. The focus is on communally organised efforts by local groups to overcome problems associated with the destruction of natural resources.

Participation refers to the involvement of target groups, on a voluntary basis, in all activities aimed at achieving improved resource management.

Brief Description of the Project

The objective of the Mecufi Coastal Zone Management Project is to reduce pressure on the natural resource base of the coastal zone, by encouraging improved management and conservation practices. In doing so, a contribution is being made to conserve natural resources in the overall district, and general improvement of the living conditions of the rural population. This goal is to be achieved through environmental education, direct community participation and inter-sectoral cooperation. The planned project term was three years, from December 1992 to December 1996, but this was extended for another nine months, to September 1996. During the first year, the project was in its preparation phase. The project executing agency is the Ministry for the Coordination of Environmental Affairs (MICOA),

with headquarters at the Mecufi district in the Cabo Delgado province.

The following results are being worked towards:

- Secured coordination among the institutions and organisations working in the field of resource conservation in the Mecufi district.
- Strengthened ability of the rural population to practice self-help in connection with measures to conserve natural resources.
- Improvement of the socio-economic situation for women.
- Introduction or establishment of village management nuclei.
- Establishing a training mechanism to raise awareness among the villagers, school teachers, official administration and extension workers.
- Establishing a strategy for coastal zone management in Cabo Delgado.

Geographical and Socio-economic Situation

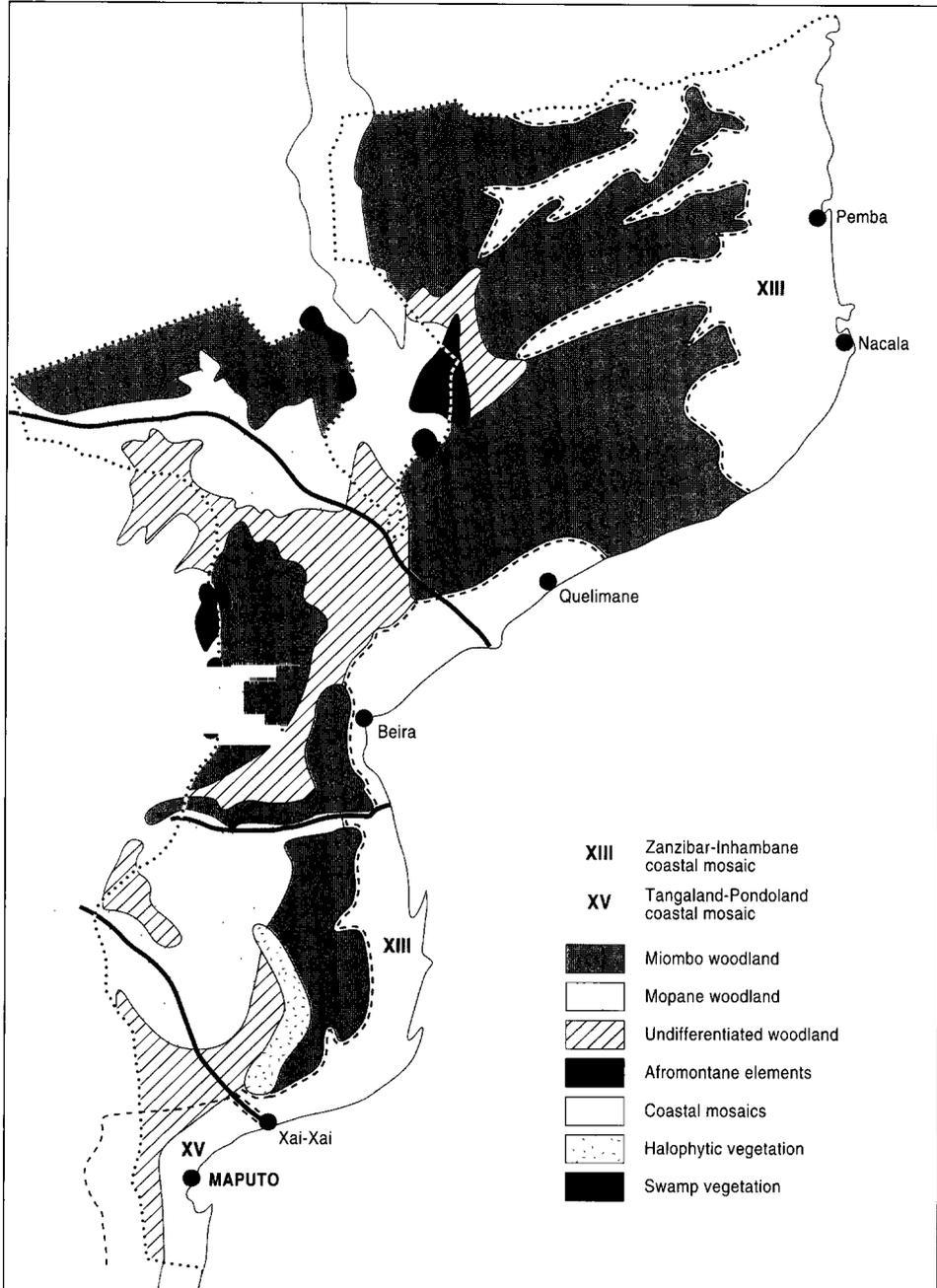
The Landscape of Mecufi

The coastal zone area of the Mecufi district lies between 13°26'S in the south (the mouth of the Megaruma River) and 13°06'S in the north. In phytogeographic terms, the Mecufi district is located within a coastal belt of varying width (the Zanzibar-Inhambane regional mosaic) that extends along much of the Mozambican coast to Tanzania, Kenya and southern Somalia (Hatton & Massinga, 1994). In northern Mozambique, the width of the coastal belt varies considerably, as it penetrates further inland along broad river valleys (Fig. 1). Most of the land within this belt lies below 200 m above sea level. The outer part of the coastal belt (the coastal plain proper) is underlaid by marine sediments of various ages, from Cretaceous to recent. Inland from the coastal plain the more undulating topography is underlaid principally by Precambrian rocks.

According to White (1981), the Mecufi area is classified as Zanzibar-Inhambane secondary grassland and wooded grassland. The dominant landscape is a mosaic of agricultural crops, grassy fallow, secondary thickets and orchards of exotics fruit trees such as cashew (*Anacardium*), mango (*Mangifera*) and coconut (*Cocos*). Within this landscape mangroves, dune vegetation, riverine forest and seasonally flooded edaphic grassland also occur. Common indigenous trees occurring locally include *Adansonia digitata* (imbondeiro) and *Ziziphus mucronata* (maçanica). The fruit of the latter is highly valued.

Over the northern coastal sector which runs almost N-S between the Tanzanian

Figure 1. Main vegetation types of Mozambique.



border and the town of Mossuril, the highlands approach locally to within five kilometres off the coast. The coast is highly indented, and protected by numerous offshore islands and well developed coral reefs. There are several small bays, including Pemba Bay, along this stretch of coast. In addition, other small bays and river mouths are sheltered by sandy spits on their southern sides. No fewer than ten major streams and innumerable minor ones reach the coast in this sector, but because the coastal plain is narrow the rivers are not tidal for any greater distance. Tidal forests are in consequence confined to the vicinities of their mouths, to the shores of bays and along salt-water creeks which may penetrate several kilometres inland.

While mangrove forests are floristically well developed in the region, they are seldom very extensive between their landward and seaward faces and are semi-continuous along the coast. Generally, *Sonneratia alba* is the seaward pioneer adapted to the open coastal and coral platforms, occupying sites that are deeply flooded every day. *Pemphis acidula* is a beach tree that thrives on old coral within reach of the waves and often intrudes into the *Sonneratia* fringe if it is interrupted by a coral outcrop. A *Rhizophora mucronata* zone usually occurs behind the *Sonneratia*. Towards the back of the swamp, where tidal flooding is less deep and frequent, *Rhizophora* is replaced by *Bruguiera gymnorhiza*. *Xylocarpus granatum* is a common associate of both *Rhizophora* and *Bruguiera*, occurring close to creek banks, and in muddy depressions in the *Bruguiera* zones. In drier sites, thickets of *Ceriops tagal* form broad belts. These may give way to an *Avicenia marina* zone. Often, the typical sequence *Rhizophora/Bruguiera* and *Ceriops* is telescoping along creeks where narrower bands of the different species follow one another in quick succession – as in the case of the creek mangrove adjacent to Mecufi town (Hatton & Massinga, 1994).

Destruction of Natural Resources

Mecufi has a relatively high population density on a comparatively narrow strip of the coastal area. This can be shown by the demographic trends over the last 15 years in Table 1 (Tovela, 1996). The principal sources of livelihood of the population are farming and fishing. In recent years, the trend of degradation and destruction of Mecufi's natural resources has reached worrying proportions. The main causes are a high population density in a small area of the district (as a result of both natural population growth and migration from other areas, due to recently ended security situations in other inland districts), and the traditional land-use practices of the rural population, which are no longer appropriate to existing ecological conditions.

Growing population pressure is forcing farmers to increase agricultural production. Within the context of traditional land-use systems, this is achieved not by raising productivity per unit area of land, but rather by constantly extending the amount of land under cultivation. Consequently, traditional fallow times are being

shortened and many plots are farmed continuously or nearly so, in both cases without fallow periods of sufficient duration for the soil to recover its fertility. At a steadily quickening pace, agricultural land is thus being degraded and lost. Tree cover is being increasingly reduced to meet the growing demand for fuel wood and building materials, and through slash-and-burn practices for conversion of forest into cropland.

As a result of overuse by human beings and animals, together with inappropriate land-use methods, soil degradation is continually worsening as the vegetative cover is depleted. The consequences are destruction of the soil structure, loss of humus, mineralisation of organic matter, leaching of nutrients from sub-soil, and crust formation. Increased surface runoff from rainfall entrails soil particles, carrying them off and causing erosive phenomena such as rills and gullying. This disturbs the soil-water regime and leads to loss of arable land, declining soil fertility with lower yields, and depletion of the woody vegetation with associated energy problems.

Table 1. Demographic trends 1980, 1991 and 1995

Year	POPULATION			DENSITY (PERSONS/KM ²)		
	1980	1991	1995	1980	1991	1995
	26 127	32 000	37 020	21.9	26.8	31.5

Socio-Economic situation

The Mecufi district is divided into thirteen villages and each village has its own chief ("president da aldeia"), who represents the government in implementation of the official development program (Fig. 2). There are also seven traditional chiefs ("régulos") in the district. They are the upholders of the village's traditions and social life, and traditionally the highest arbiters to whom the villagers can turn with their problems and conflicts (Fig. 3). Prior to 1975 these traditional chiefs held all of the decision-making powers in a village in their hands. In 1975, with independence, the traditional chiefs were deprived of their authority and an attempt was made to grant greater influence to the "presidentes das aldeias". The so-called "grupos dinamizadores" (people's structures) were established for village administration. This gave rise to enormous tensions within the villages. Very recently, with the change of policy approach, including democratisation, traditional structures have regained some of their former importance. However, every village still has its "popular structure". These are intended to work together with the traditional chiefs, and in many case they actually do collaborate to a certain extent.

Figure 2.
Administrative
division of the
Mecufi district.

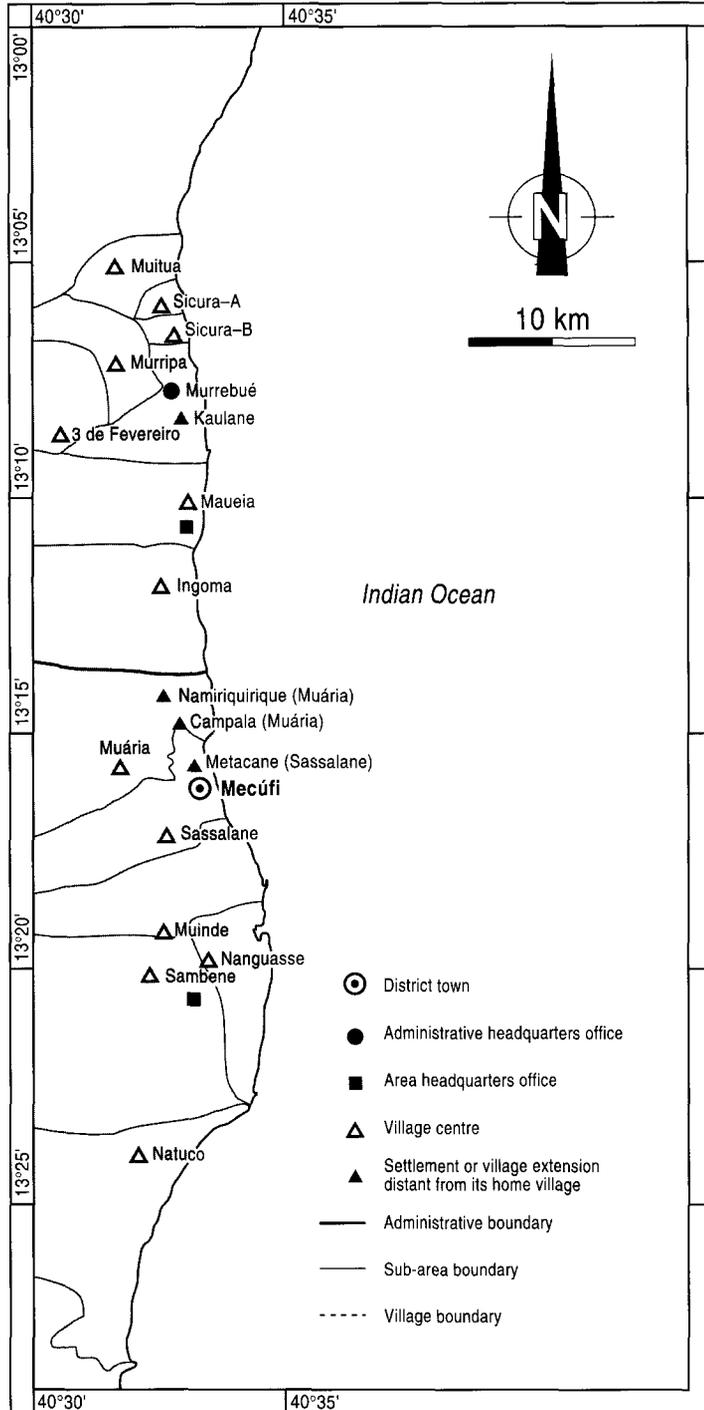
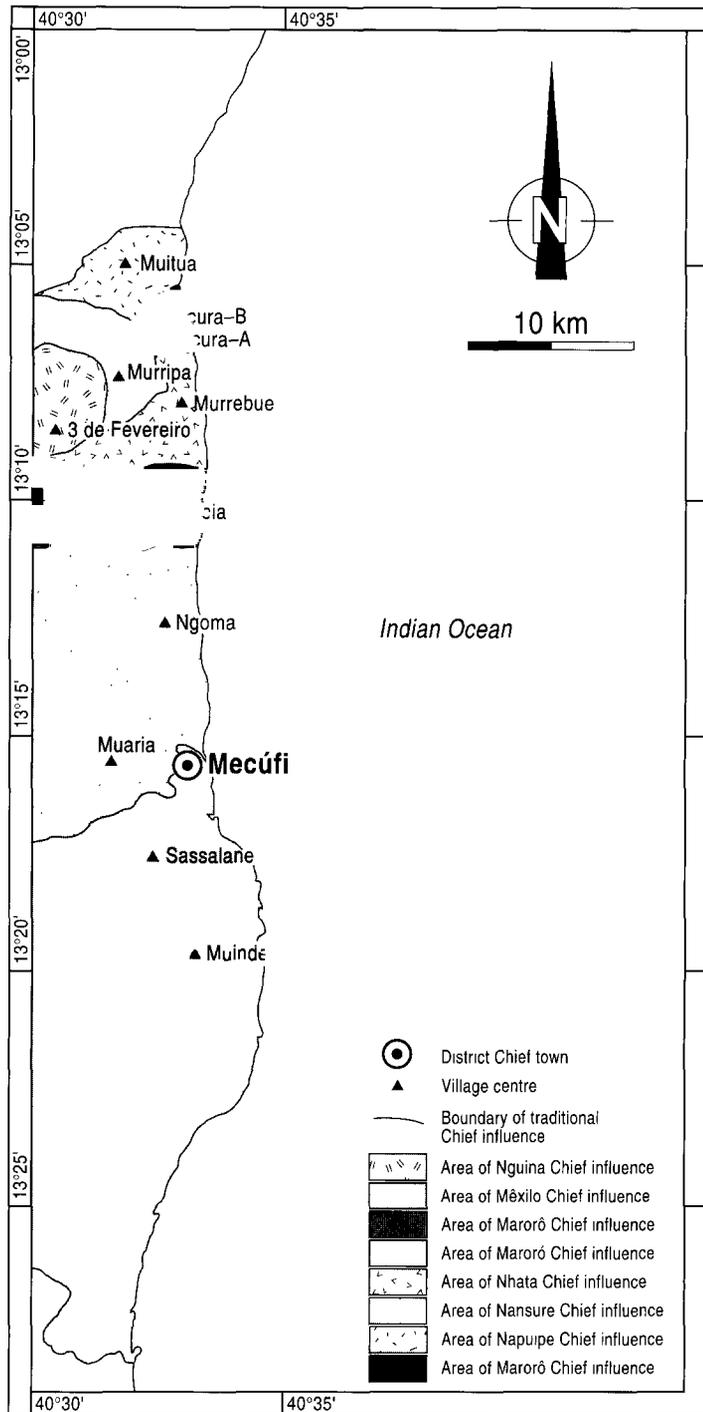


Figure 3. Areas of influence of traditional leaders in Mecúfi.



As in other parts of the country, there is a gender-specific division of labour, assigning certain activities and areas of work to women and men. The men perform heavy labour in the fields, grow cash crops, and spend the dry season building and repairing the huts and granaries, doing other manual work, trading etc. Housework, which includes collecting fuel wood and fetching water, and child care are the tasks of the women. In addition, they are highly integrated into the rural production structures. They are responsible for certain jobs in connection with growing crops on the family plot, such as hoeing, sowing, weeding and transporting the harvest.

The main economic activity is subsistence agriculture, which normally takes place between November and April. Millet, sorghum, maize and rice are grown as subsistence crops. The level of mechanisation is almost nil. As a rule, fields are worked using traditional tools like the hoe (Massinga *et al.*, 1993). During the dry season the villagers engage in various income-generating activities, such as weaving cloths, baskets and mats, growing vegetables etc. Fishing and raising livestock are secondary activities. There is only one owner of cattle. Some households have sheep, goats etc. Most also possess chickens and other poultry. They are kept to supply the family's own needs and can also be sold at the local market, or presented as gifts to visitors.

The material and social infrastructure is precarious. There is only one health centre for the whole district, but it is not functioning well, due to lack of qualified personnel and medications. Practically every village has one school, totalling twelve schools for the whole district, from grade one to seven. The schools are faced with a lack of teaching material and equipment, qualified teachers etc. The only mean of transport available is the bicycle, which is accessible to very few people. There are small informal local markets with very limited capacities in the villages. There are no financial institutions in the district. The nearest bank is in Pemba, 50 km away (Tovele, 1996).

Current Situation, Achievements and Impacts

Participation of the Population in Resource Management

During colonial times, the colonial administration carried out many projects of importance for the public by forced labour and/or coercive recruitment of workers. These practices seriously and lastingly diminished the willingness of the rural population to take part in communally implemented tasks. The current potential for mobilising traditional forms of self-help and enhancing the willingness of village populations to better manage and use their natural resources would be considerably greater were it not for this historical background.

During the period immediately following Independence, the government began to create structures for intensification of agriculture. Following East European mo-

dels, an attempt was made to boost agricultural production by forming village groups and setting up an extension service. The aim was to in this way generate the surplus needed to promote development of the overall economy. However, the village groups formed at the instigation of the government were not sufficiently dynamic, and participation of the village populations left much to be desired. Politically, the real breakthrough in connection with the issue of greater participation by the village population in resource management was only achieved very recently.

Results to Date

The project objective is to reduce pressure on the natural resource base of the coastal zone, by encouraging improved management and conservation practices through environmental education, direct community participation and inter-sectoral cooperation. In important areas, the project has already attained its targets. Its principal achievements have been:

- Creation and promotion of a Village Management Nucleus for coordinating and leading development and resource-conservation measures at the village level.
- Establishment of a system for training village extension workers, primary-school teachers and the farming population, on resource conservation.
- Development of a participatory land-use planning approach at the village level.
- Promotion of biological and other inexpensive resource-conservation techniques.
- In certain areas, research and monitoring of the natural resource base.

Community Participation in Natural Resource Management

The participatory approach to natural resource management that has been developed by the project is still being tested. For methodological and practical reasons, therefore, it is only possible at this point to include a limited number of villages in the comprehensive natural resource management programme.

The participation of the community in natural resource management is a process which involves several stages.

1. Raising of the villagers' awareness in preparation for resource management

This is done by discussions with the community, and by carrying out discrete measures to create an atmosphere of mutual trust and confidence. The village must show willingness to work with the project. "We enter the village through the door that the villagers open for us (the discrete measures) but we already have our eyes on the whole (village land use program)", as project staff members describe this process. Most of the discrete measures implemented are now generating rapid

income. The principal immediate needs of the village's population are discussed at a village meeting which is usually attended by the entire community and the responsible extension workers. During this meeting, the extension worker and the project staff endeavour to call the villagers' attention to the problems of natural resource degradation and the available possibilities for sustainable resource management. In general, the villagers have already developed an acute awareness of the problems.

2. Survey and analysis of natural resources

This step initially involves a survey of the infrastructure and natural resources of the area. The analysis of natural resources is done in three stages:

- Description of the condition of natural resources and socio-economic situation of the past, by the village elders: vegetation, fauna, croplands, condition of soils, agricultural production and yields, population, living conditions etc.
- Description of the situation and the above-mentioned aspects as they appear at present, by younger villagers, in conjunction with an analysis of the causes.
- A comparative analysis of the past and present situations to reveal the problems. This is then taken as the starting point for a discussion of prospects for the future. As a rule, short-, medium-, and long-term approaches to solving the problems are considered:
 - a) Improvement, rehabilitation and recovery of the resources.
 - b) Changing land-use methods.
 - c) Planning and organisation of village resource management.

3. Establishment of the Village Management Nucleus

The last step is to set up a Village Management Nucleus. The village elects its members according to certain criteria presented in the statutes (for example, the members should be representative of the village population in terms of gender, they should be able to provide a certain guarantee that they will remain in the village, and they should be socially accepted). The Village Management Committee is responsible for coordinating and implementing the land-use plan, and for administering the planning instruments. It also represents the village in the contacts with the project, official government and other cooperating organisations.

Conclusions

The success of the Mecufi Coastal Zone Management Project, in its present form, is essentially due to the following factors (the order in which they are listed does not indicate any priorities):

Existing will of the village population to practice self-help

The willingness of the village population to practice self-help in connection with resource-conservation measures grew with the progress of the implementation of the project.

The increasing pressure of problems

Continued inappropriate use is leading to accelerated degradation and destruction of natural resources. Shrinking croplands, falling yields and other problems are rapidly causing deterioration of living conditions in the village communities. The people in Mecufi are consequently forced to devote thought to ways of solving the problems afflicting their own habitat.

National campaigns

The willingness of the village population to practice self-help in connection with resource-conservation measures has been influenced by national programs and campaigns, aimed at raising their awareness of the problems and disseminating information about suitable ways of addressing them. For example, traditionally people were not keen on planting trees. However, as a result of systematic education and information campaigns by state services, NGOs and the Mecufi project, the population in Mecufi has become increasingly aware of the role played by the vegetation in their environment. Trees provide fuel wood and timber, fruit, leaves, medications and shade; they help improve the soil and its water regime etc. The willingness to replant trees is growing, expressed in the implementation of agro-forestry measures and the establishment of the project nursery and plantations.

Technical topics and training measures

Drawing from similar projects in other parts of the world, the Mecufi Coastal Zone Management Project was able to offer tried and proven resource-conservation techniques. The farmers were immediately able to familiarise themselves with these methods and their persuasive results by direct observation, and to derive direct economic benefits from them. The success of these techniques has also been due to their simplicity and the fact that the villagers can easily apply them. They can perform them using locally available tools and materials. Many of the methods borrow from or are based on traditional practices, and can thus be readily understood by the village population. This enhances the self-confidence of those involved and increases their willingness to carry out the activities on their own, also contributing greatly to the sustainability and long-term effectiveness of the measures. Because the project recognised the importance of training measures right at the beginning, high priority has been attached to their implementation, parallel to all other project activities. They are well received by both the cooperating organisations and the villagers. This is because training topics and methods, as well as the teaching aids employed, start from the needs and possibilities of the target groups. The contacts among project staff, extension workers and villagers permit continual feedback and speedy adjustment of the training topics whenever required.

The method of village land-use planning

The village (participatory) land-use planning approach applied by the project is successful, because it is performed within the context of a dialogue between the villagers and the project and/or the cooperating organisations (Fig. 4). The villagers contribute knowledge of and experience with the environment, and this body of information then constitutes the basis for joint analysis of the principal problems and identification of ways to get them under control. This approach has stimulated positive changes in attitudes and behaviour in the villages. In particular, it is slowly affecting sustained management of village territories by the villagers in a spirit of independence and responsibility for their own actions. The village population is gaining a new perspective, encouraging it to stay put and endeavour more strongly to conserve its natural resources.

The existence of village level organisations

The existence of organisations at the village level in the project area (both traditional and established by the government) has been highly advantageous for the project – in spite of the weaknesses of these structures – because they have facilitated communications.

The institutional framework for implementation of the project

The Mecufi Coastal Zone Management project was conceived as a "support project" for the government and NGOs active in the project area. Consequently, the project does not "compete" with others at the village level. Instead, the cooperating organisations benefit from technical advice, training measures and material and logistical assistance that the project makes available to them. The project has played an active role in establishing the cooperative relations now linking the government administration and various government services. An effective collaboration has emerged, based on the willingness of the institutions to work together and with the project. This cooperation has been institutionalised in the form of a consultative body at the district level, with the participation of some provincial institutions. The coordinated overall approach that this has permitted at the village level (with harmonisation of technical standards, technologies, methods, planning and organisation) is overcoming the insecurities of the village population, caused by the badly coordinated and often conflicting advice given to them by different services and organisations. The project's approach is substantially increasing the villagers' participation in the measures.

Favourable national framework conditions

The framework conditions in Mozambique are relatively good for the success of participation-oriented approaches in resource management. This has manifested itself in the development of national plans and programs that emphasise participation by the population and decentralisation of the responsibility for land-use decisions as the critical prerequisites for sustainable resource management. This has provided the requisite latitude of action for participation-oriented resource-conservation projects, such as the Mecufi Coastal Zone Management Project.

INTEGRATED ADMINISTRATION OF THE COASTAL ZONE OF THE ISLAND OF INHACA

DOMINGOS Z. GOVE

Introduction

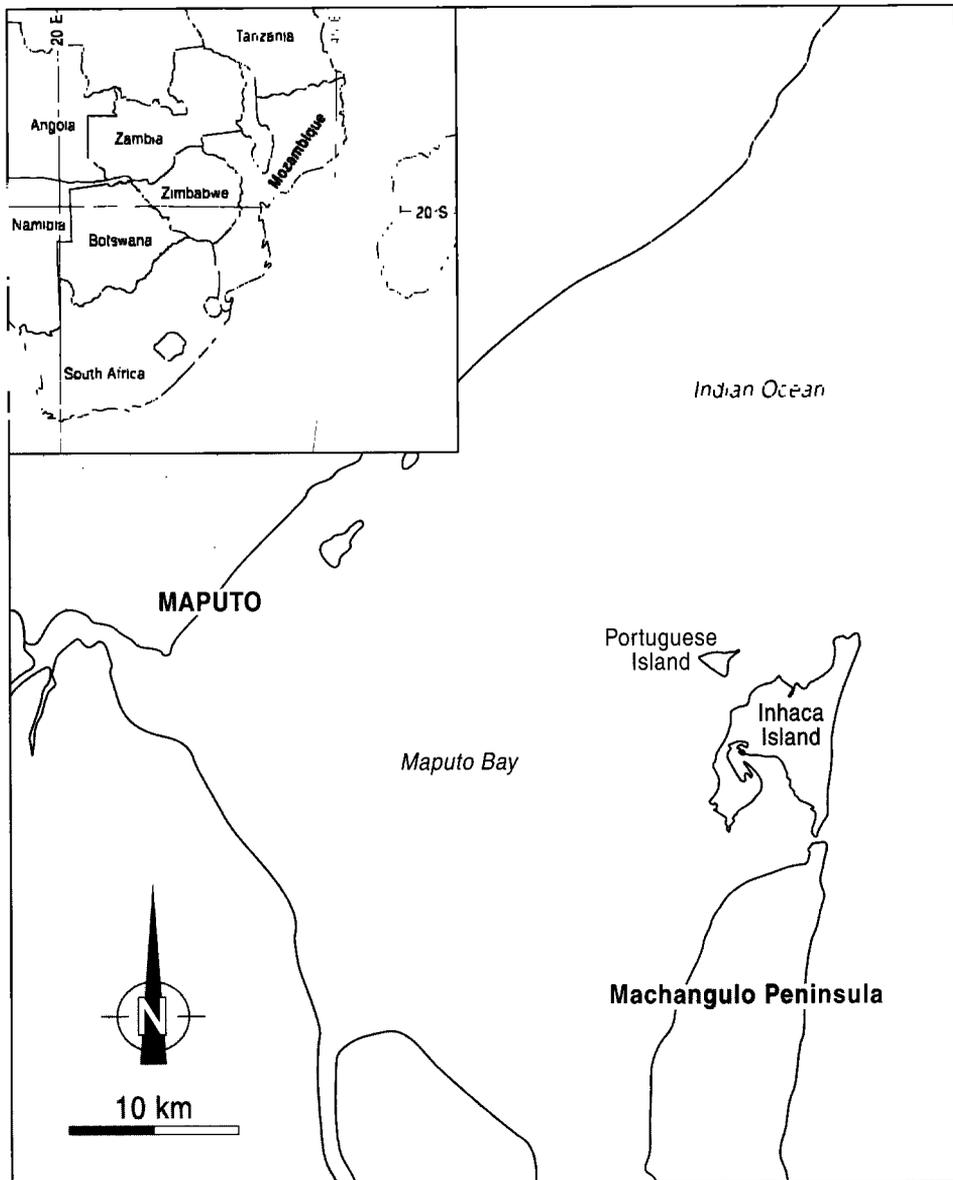
The island of Inhaca is located 35 km from the city of Maputo and around 100 m from the Machangulo Peninsula (Fig. 1). It has an area of around 42 km² and, together with the Machangulo Peninsula, is part of the eastern barrier which separates Maputo Bay from the Indian Ocean. The island, which is the southernmost of the east coast of Africa, is situated on a latitude corresponding to the climatic transition from the tropical climate to the warm temperate (Macnae & Kalk, 1969). There are several Reserves on Inhaca and adjacent Portuguese Island (Fig. 2).

The island of Inhaca has two important dune lines. The eastern dune line is longer and higher. The ocean side of this dune line is steep and without vegetation. Apart from the Barreira Vermelha, which is the highest point on the west coast of the island, the western dune line is lower than the eastern and is covered by vegetation to the beach. Between these two main lines, there are various other dune lines covered by vegetation. Shoals appear between the dunes, some of which have small fresh-water lagoons. (Macnae & Kalk, 1969). As a consequence of the irregular topography and the sandy soils, the land is quite infertile, since it is unable to retain enough water or humidity for agricultural development (Campbell *et al.*, 1988). Because of winds, sea currents and the geologic structure, the island also suffers from erosion (Anonymous, 1990). On the east coast, sand is brought by sea currents and deposited on the beach. It is thereafter transported by eolic motion (winds from the south-east) into the island, passing over the dune crests, and burying the vegetation. It then begins to cover the land bordering to agricultural areas, which become infertile. On the western dune system, particularly in the Barreira Vermelha area, sea currents and rain damage the dunes.

In 1989 the population of Inhaca was estimated at 5300 (excluding war refugees), living in three main districts – Inhaquene, Ribdjene and Inguane. Of the total population, 53% were women and around 49% were less than 15 years old, whereas 7% were over 60 (Anonymous, 1990). Before independence, the natural growth rate of the population in Inhaca was 1.9% (Anonymous, 1990). Since 1980, because of the insecure situation on the mainland, the island has become a centre for migration. By 1985, the growth rate of the population had reached 3.1% (Lopes, 1991), and in 1989 it was estimated at 5.8% (Anonymous, 1990). However, at the end of the war in 1992, when all of the displaced people returned to the mainland,

the 1989 estimate was drastically reduced. Even so, given the type of production methods practised by the permanent island population, in particular in agriculture and forestry, the number of people living on the island in 1989 exceeded the carrying capacity of the island's resources. (Anonymous, 1990). In 1989 the illiteracy rate was 13.9% for people between seven and 19 years old, and as many as 46.6% could not read among people over the age of 20. Although this is low compared to

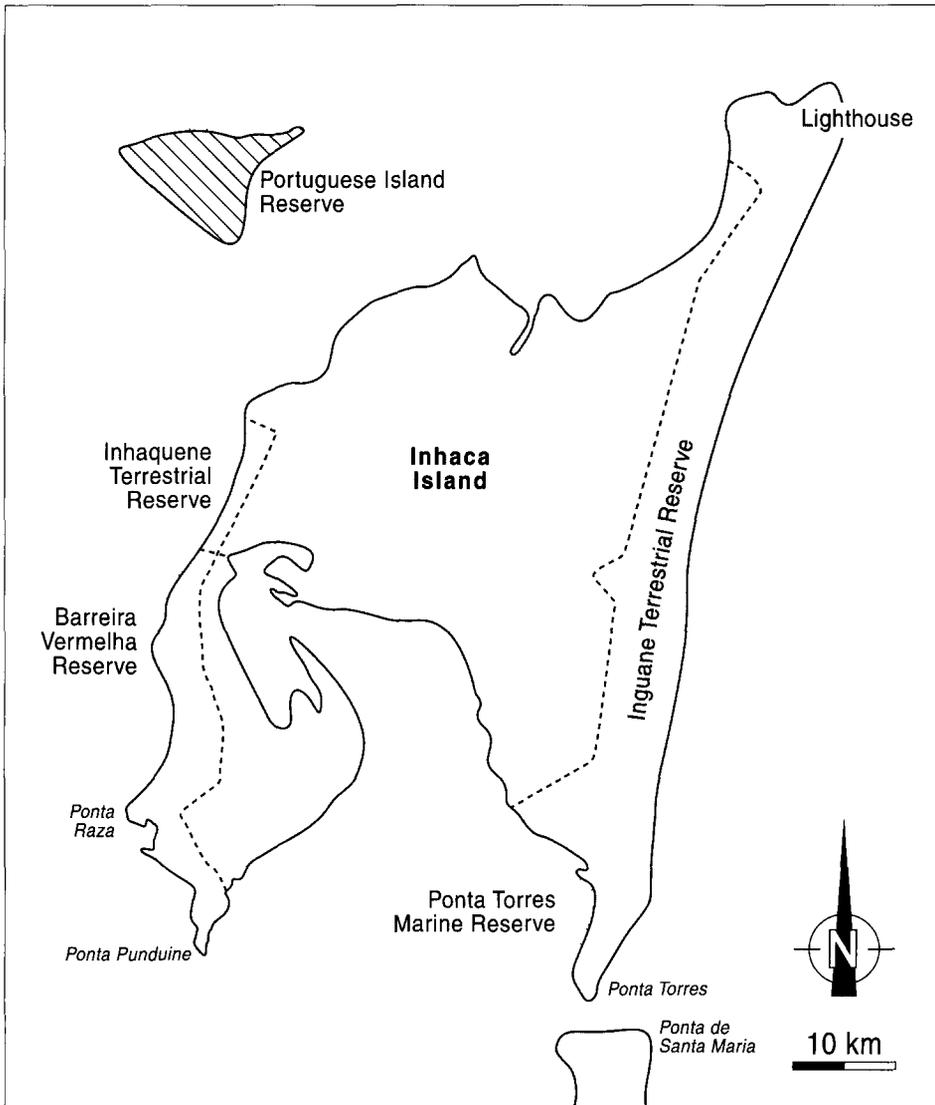
Figure 1. Location of the island of Inhaca.



the average of the country, the illiteracy rate is still high. Poverty is also widespread. Only 27% of the island population get two daily meals (Anonymous, 1990).

Taking into account the high population growth of the island, the poverty, the land ill-suited for agriculture and the island's overall fragility, worsening environmental damage could be expected. Once the island's ecological sustenance limits are

Figure 2. Reserves of Inhaca and Portuguese Islands.



reached, unpredictable transformations of the environment could occur. Moreover, unless action is taken to ensure sustainable development, with a balance between human activities and the environment, developing the considerable tourism potential of the island will only intensify the damage already occurring.

It was in this context that a Plan for Integrated Development of Inhaca Island was drawn up in 1989. The plan was meant to serve as a reference document for the implementation of a development program of the island of Inhaca. It focuses on two fundamental considerations: a survey of the island's existing problems, and alternatives for development.

Summary of Principal Problems

The island is experiencing maritime and eolic erosion. This is a process caused by natural phenomena, such as sea currents, winds, rain and the geology of the island, all of which are prone to be accelerated by human activities, such as:

- **Increasing consumption of fire wood**, which puts pressure on the forest resources of the island, playing a vital part in the protection of the coast.
- **Search for more agricultural land**, which leads to deforestation and a reduced layer of vegetation.
- **Lowering of freshwater quality**. The increased use of freshwater, following the growth in population, has caused saline intrusion in the freshwater supply.
- **Indiscriminate exploitation of natural resources** caused by poverty and high cost of living. Natural resources are exploited at a higher rate than their natural renewal.
- **Absence of an open-sea fishing sector**. Due to a lack of means to enable fishing in the open sea, the maritime resources of the bay-side are being over-exploited.
- **Stagnation of the local economy**, mainly due to a lack of alternative development, besides fishing.
- **Lack of managed development of the excellent tourism potential** of the island. Inhaca has beautiful beaches, corals and clean waters, all of which are potential tourist attractions.
- **Inadequate transport system**. Both with respect to the connection between the island and the mainland and locally, the poor state of the transport system has put restraints on development.
- **Urgent need to improve and enlarge infrastructures**.

Following the survey of existing problems on Inhaca, the Plan for Integrated Development of Inhaca Island presented development alternatives. The alternatives have as a basis the declaration of the island as a protected nature zone and the aim to diversify the economy. In order to reduce dependency on natural resources, employment alternatives and more appropriate techniques must be developed. In addition, a regulatory policy aimed at minimising the number of outsiders settling on the island is needed. These directives should be flexible enough to permit continual adjustment to the changes and contingencies reality always poses.

Development Alternatives

- *Creation of a Centre for Integrated Development of Inhaca* on the island, tied to the island's administration. The objectives should be to promote the involvement of the local population and of various institutions on and off the island in the decisions on, and implementation of, development undertakings on the island.
- *Creation of an Advisory and Multi-disciplinary Technical Team* in the Executive Council in Maputo that will assume responsibility for the establishment of contacts between the Executive Council and the administration on the island.
- *Education and environmental management.* This was recommended to assist the population of the island in recognising the need for a balanced ecosystem, and to participate in the formulation and implementation of an action plan for environmental protection and conservation.
- *Combat of erosion*, through methods such as the use of trees in stabilising the dunes and sands worn down by human activity.
- *Creation of a protected nature zone*, which would include the whole island of Inhaca and the neighbouring waters. This action was proposed with a view to reducing the lack of harmony between basic human activities and conservation of the environment, in order to allow the two to coexist in a positive and self-sustaining manner.
- *Reduction of use of the natural forest* of the island as a source of fire wood and building material. This could be achieved by planting trees for fire wood and building material, and by enforcing payment of fees by all private entities to encourage economising, changes to other types of fuel, etc.
- *Protection of endangered species* (dugongs, turtles etc.).
- *Creation of the necessary prerequisites for open-sea fishing.* A training program for open-sea fishing techniques should be carried out, which would enable the fishermen of Inhaca to catch more fish per day. Coupled with the training program should be a system for financing the purchase of boats and engines available on the island. Another kind of assistance would be technical and financial support for the master artisan builders of wooden boats on the island, so that this traditional craft is recuperated. This would decrease the cost of purchasing and maintaining boats.

- *Development of integrated tourism.* This tourism would not harm the environment and could be developed in a way that minimises interventions in the socio-cultural order and the landscape where it occurs.

The situation of the island requires development alternatives which reduce the dependency of the population on agricultural activities and the collection of fire wood. Instead, such alternatives would make it possible for families to obtain the necessary financial resources to purchase food and fuel. It is in this sense that tourism could emerge as a principal engine for the island's development (besides fishing), through its potential to help diversify revenue-generating activities on Inhaca. No other sector has the same capacity to accommodate the diverse interests in Inhaca – at the local, national and regional levels. Locally, the prime interest lies in increasing the population's standard of living, while at the same time preserving the environment. At the national level, increased tourism on Inhaca could constitute an important source of foreign currency for the country. Regionally, a developing tourism sector could, besides benefiting the local economy, stimulate interest in the preservation of the island's unique ecosystems – principally its coral banks, which are among the world's most southern.

Appropriate planning should make it impossible to put tourism-related interests before the concerns of the local community. Rather, the aim should be to integrate the developing tourism sector with the real needs of the population. This could be done by the following actions:

- *Development of a program for agricultural expansion,* to raise productivity on existing cultivated lots and to introduce and encourage production of foods that are less land-intensive. An agriculture program inspired by new methods of cultivation should be developed. Bee-keeping, raising of small breeds and cultivation of fruit trees are all such examples. Even if agriculture does not have the same development potential as fishing and tourism, and hence may not be considered an economic priority sector, it is nevertheless a vital part of the local culture, and crucial in the relationship between women, their families and the community.
- *Diversification of the economy.* Commercial fishing and tourism seem to be the economic activities most likely to lead the development of the island. However, it is important that these be integrated with all other sectors. The development of fishing and tourism could create the economic resources necessary to stimulate a diversification of enterprise, thus making viable other commercial alternatives and the production of services. This would reduce the dependency on agriculture as the one means of support. Only in this way will the island have a secure and strong economy capable of multi-sectoral development.
- *Development of small-scale business.* The development of an economy based on

fishing and tourism has the capacity to generate a large number of indirect economic opportunities. Studies undertaken in East Africa indicate that for each job/employment generated directly by tourism, another three jobs were indirectly created. In the long term it may thus be that the indirect opportunities created by fishing and tourism will employ more people than those directly generated by any other sector.

- *Establishment and improvement of social infrastructures*, such as the building of a new medical station, improvement and expansion of schools, construction of a soccer field and a civic centre.
- *A hydrological survey* should be made to obtain data of the ground water, which would make it possible to open new wells in certain places and to improve some of the already existing wells.
- *Establishment of a regular transport system* would benefit the population and the development of the tourism industry.
- *Creation of garbage collection and disposal service systems*.
- *Construction of a telephone system* operating 24 hours a day, with at least one public telephone in every third village.

Final Thoughts

Although the Plan for Integrated Development of Inhaca Island was completed in 1990, it has not yet been officially approved by the Government of Mozambique (Hatton, 1995). All the same, some undertakings foreseen in the plan, particularly those with a social component, have been or are being realised. For example, the building of a new medical station, the construction of a soccer field, the creation of garbage collection and disposal services, the hydrological survey and construction of a few wells, the improvement and expansion of the schools, the setting-up of a telephone system which shall work 24 hours a day, and the start of the environmental impact study regarding the installation of an anchorage, have all been initiated. Therefore, it can be said that the advent of this plan was well timed and beneficial, since it acted as a catalyst for the installation of various infrastructures on the island, which contribute to improving social conditions of the local population. Moreover, according to Hatton (1995), most illegal tourism activities on the island, which presently characterise other coastal areas in the south of the country, can probably be avoided thanks to the existence of this plan, although some small tourism structures have been illegally established on the island. Nevertheless, it is important to emphasise that until now, no materialisation of the principal development alternatives recommended by the plan, which aim for a balance between human

activities and the environment that take into account the fragility of the island, has yet occurred. This is due to two fundamental factors, namely, the non-operationality of the entities directly linked to the implementation of the plan, and the galloping increase in the country's cost of living.

Inoperationality of the Institutions Involved

Although the Centre for Integrated Development of Inhaca Island was created over four years ago, and the campaign for environmental education was launched (Hatton, 1995), no significant results have been attained, as these endeavours took place over a very short time period and have not been continued. The centre never functioned expediently, which is a direct reflection of the failure of the Multi-disciplinary Technical Team to establish close ties between the Executive Council and the local administration, in which the Development Centre is integrated. Moreover, when the Multi-disciplinary Technical Team occasionally functions, it completely empties the capabilities of the Development Centre, which is reduced to the role of mere spectator. The result is that there is no local participation (population and institutions) in decision-making, which in itself is a fundamental element for the success of the development plan. Thus, implementation of development alternatives for Inhaca Island that aim at a harmonious solution of the socio-economic problems of the local population, the maintenance of the island's ecological balance, and revenue generation for the State, are unduly marred.

The above circumstances are responsible for the illegal tourist activities on the island which have had negative effects on the protected areas of Inhaca. For instance, trees have been felled in the land reserves to be used as fire wood and building materials, significant quantities of litter (empty cans, plastics etc.) are present on the beaches, corals are damaged or stolen, and there is excessive collection of shells that are sold to tourists etc.

High Cost of Living

The high demand on marine resources is caused by several factors, including the relatively affordable prices of fish and related products compared to meat, the city of Maputo, which has more than a million inhabitants, the reduction of fish stocks around Maputo, and the galloping increase in the cost of living due to poor economic situation. All this results in an over-exploitation of the marine resources of Inhaca island. Among the problems are over-harvesting of fish and sea cucumbers, and trespassing in the marine reserves. For example, as a result of stock depletion in Maputo, fishermen from there are sometimes found fishing in Inhaca's waters, which only exacerbates the situation. The circumstances on Inhaca show that even a great effort to manage a given vicinity may be rescinded or distorted by the socio-economic situation and the diligence of the Government to implement development policies. Sustainable development of Inhaca requires a number of preconditions. First, the Multi-disciplinary Technical Team needs to be reactivated

(a task which falls on the Government, through the present Municipal Council of the city of Maputo) by consolidating the Centre for Integrated Development of Inhaca as the designated entity for the effective promotion and development of the island. Second, the capacity of the control organisations (in this case the Maritime Biological Station of Inhaca, the Maritime Delegation and the Administration of the island) must be reinforced, and there must at least be a minimum of economic stability in the country.

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ENVIRONMENTAL PROFILE OF THE BAZARUTO ARCHIPELAGO

SAMIRO MAGANE

Introduction

The Bazaruto Archipelago, covering approximately 600 km², consists of the islands of Bangué, Magaruque, Benguérua, Bazaruto and Santa Carolina. It is situated in the province of Inhambane, divided over the Vilanculos and the Inhassoro districts (between 21°30' and 22°10'S, and 35°22' and 35°30'E). The Bazaruto National Park, located in this archipelago, is the first and only marine national park in Mozambique. It was created through the legislative diploma No. 46/71. The park is composed of the islands of Bangué, Magaruque and Benguérua, and a five kilometre zone around them. The islands of Bazaruto and Santa Carolina have been designated as special vigilance zones. At the time, the reason for the creation of the park was linked to the need to protect particular species of fauna in danger of extinction – species still abundant in the waters of the archipelago, such as the dugong and turtles.

The Bazaruto National Park has the following objectives:

- Conserve the ecological integrity and bio-diversity of the area.
- Propose environmental education and training for people connected to environmental sciences.
- Promote the investigative work necessary to attain proper preservation and socio-ecological sustenance of the park.
- Permit greater participation of the local communities in the preservation and sustainable use of the natural resources of the park, as well as of its income.
- Allow for the creation of recreational facilities for domestic and foreign tourism, in accordance with the social and ecological conditions of the park.
- Attain financial self-sufficiency through the revenues generated by a sustainable use of the resources of the park.

Profile of the Bazaruto Archipelago

Physical Environment and Natural Resources

Generally speaking, the ecological situation of the archipelago is good, even though a considerable number of habitats (particularly the sand dunes) show signs of

alteration as a result of human activity. There is thus need for preservation measures.

Geology and Soils

The archipelago developed from the present Cabo São Sebastião peninsula. It is the result of incisions that occurred during variations of the sea level caused by the melting of glaciers. The islands are essentially composed of sand with grains of quartz that contain small quantities of carbonates originating from skeletons of marine organisms. The soils are sandy and have a low content of organic matter, which make them inadequate for agriculture, as well as easily moved by various natural processes.

Climate

The climate is sub-humid, with summer temperatures of around 30°C and winter temperatures of around 18°C. The yearly average temperature is 24°C. Precipitation varies between 466 mm and 1 928 mm, with a yearly average of 978 mm. From December to March precipitation reaches its peak.

Hydrology

There are several fresh- and brackish-water lakes in the archipelago. They can be found on the islands of Bazaruto (Lake Mbiti, Nhassasse, Lengué Maubué, Manuvubué, Quinqué and Nhamuaré) and Benguérua (Lake Zivane and Bomopomo). Most of them host crocodiles and are located at the base of the dunes on the west side. It is also worth mentioning that the principal storage of subterranean water in the islands is in the dunes.

Habitats

Some distinct types of habitats can be found in the archipelago (Table 1).

Table 1. Habitats in the Bazaruto Archipelago

LAND AND AQUATIC HABITATS	MARINE HABITATS
Coastal sand dunes	Coral reefs
Marsh forests	Sandy beaches
Brambles and thicket	Marine vegetation banks
Pastures	Rocky beaches
<i>Dialium</i> and <i>Julbernardia</i> vegetation	Scrub communities
Pioneering vegetation of primary dunes	Zones between tidal waters
Remains of dune forests	
Bush savannah	
Scrubs connected to ground water	
Beef wood	
Remains of Climax forest	
Freshwater lagoons	

Fauna

Land mammals. The mammals found in the Bazaruto Archipelago are remnants from the time when the islands were linked to the continent, specifically: Simango monkey (*Cercopithecus mitis*), cabrito vermelho (*Cephalophus natalensis*), esquilo vermelho (*Paraxerus palliatus*), galago (*Galago maholi*), imbabala (*Tragelaphus scriptus*) and musaranho (*Petrodromus tetradactylus*).

Marine mammals. Given its combination of oceanic and shallow waters, the archipelago is suitable for marine mammals. The following species can be found: dugong (*Dugon dugon*), humpback whale (*Megaptera novamangliae*), humpback dolphin (*Sousa chinensis*), common dolphin (*Delphinus delphis*), spinner dolphin (*Stenella longirostris*) and bottlenose dolphin (*Tursiops truncatus*).

Birds. More than 180 species of birds have already been identified in the archipelago, including a large number of marine and water fowl. The archipelago is an important passage site for some migratory birds.

Reptiles. A total of 45 species of reptiles and amphibians have been recorded, including the crocodile (*Crocodilos niloticus*) and the five turtle species existing in Mozambique, namely the green turtle (*Chelonia midas*), hawksbill turtle (*Eretmochelys imbricata*), leatherback turtle (*Dermochelys coriacea*), loggerhead turtle (*Caretta caretta*) and the olive Ridley turtle (*Lepidochelys olivacea*).

Fish. The fish present in the archipelago are representative of the whole East African coast. Around 80% of fish families existing in the Indo-Pacific region can be found and more than 2 000 species have already been identified.

Socio-economic Context

Population

The population is part of the Tsonga generic group which lives from the Save River to the south of Mozambique. The population of the archipelago belongs to the subgroup Matsonga. Xitsonga is their language. At present, 2 689 people live in the archipelago (Raimundo, 1995). They are divided in 580 families distributed as shown in Table 2. The economy of the Bazaruto Archipelago is based on traditional fishing, construction of boats, transport services and raising of household animals.

Table 2. Distribution of the population of the Bazaruto Archipelago

ISLAND	NO OF PEOPLE	NO OF FAMILIES
Bazaruto Island	1 735	348
Benguêrua Island	774	170
Magaruque Islands	180	62
Santa Carolina Island	No data	No data
Bangué Island	Uninhabited	

Fishing

Traditional fishing is the principal economic activity of the islands, occupying over 70% of the population. Even without sophisticated equipment and methods, the fishermen do not only manage to satisfy personal needs, the requirements of hotels and crocodile farms, but can also dry some of the fish to sell on the mainland. The type of fishing practised is hand trawling to the beach. Other frequently used methods include fishing with hook and line and using beach traps made of stone or wooden slats. There are some 59 fishing stations in the archipelago. Normally, these are operated by hired hands within the family, who earn their wages in fish. Of these fishing stations, 45 are located on the island of Bazaruto, 12 on Benguérua and two on Magaruque. It should be noted that these stations produce around 1 322 tonnes, 187 tonnes and 33 tonnes of dried fish, per island (Dutton & Zolho, 1990).

Agriculture and Cattle Farming

Agriculture is essentially a spare-time occupation carried out by women during periods of waiting for the spring-flood and its harvest of sand oyster (*Pinctada imbricata*). This type of agriculture does not have any larger economic significance; its purpose is rather to obtain additional food products to supplement the basic diet of fish. Areas with natural vegetation are cleared and burnt and the cinders are collected to be used as fertiliser, which is badly needed given the soil's inaptitude for agriculture and the irregular rainfall. Every year new areas are developed for this purpose. The principal crops are cassava, sweet potatoes, beans, pumpkins, plums and watermelons. Cattle farming provides an alternative in the worst hunger periods, and it also constitutes a financial reserve (i.e. bank) in case of emergency. For the islanders, cattle is considered a heritage to be conserved from generation to generation.

Tourism

There are six tourist establishments in the archipelago. Two of them are on Bazaruto: the Bazaruto Lodge with a present capacity of 32 beds and a planned expansion to 80, and the Sabal Developments with 40 beds. Another two can be found on Benguérua: the Beguela Lodge and the Marlin Lodge, each with 40 beds. On Magaruque there is the Hotel Magaruque with 60 beds, and on Santa Carolina the Hotel Santa Carolina with 160 beds.

The islanders benefit little from tourism. Over 90% of the hired staff come from the mainland, and concession duties are paid to the central authorities that give permission the undertakings. However, the central authorities' responsibility does not extend to ensuring that part of the income from the duties go back to the local communities, nor are they involved in conservation of the area.

Transports

The islanders have to travel regularly to the mainland, which is in fact a contradiction, as there are neither regular transports to and from the mainland, nor between

the islands. With the exception of the hotels which have their own motor boats, the population is forced to make the crossing in sail boats, which for the most part are not equipped or fit at all for open-sea navigation. This has over time caused some shipwrecks. Air transport is used primarily by tourists visiting the islands. There are landing strips at the four inhabited islands, the ones on Magaruque and Santa Carolina being made of concrete, and the others of grass.

Education and Health Services

In the entire archipelago, there used to be three official schools: one on Benguérua and two on Bazaruto. At present, only one is still in operation, the Rural School of Estone on Bazaruto in the Estone locality. In this school approximately 60 pupils attend the first and second classes of elementary school.

There is only one health service station – the Health Station of Bazaruto, located in the Zenguelemo district. This is not enough to meet the needs of the local population, as medicines are both short in supply and of inferior quality. There is no permanent nurse on the island.

Institutional Framework

Bazaruto National Park is the only national park in Mozambique with a population legally living within its boundaries. As a consequence, it has some characteristics distinguishing it from other parks in the country. The National Forest and Wildlife Authority is the state institution responsible for handling and managing the Bazaruto National Park. A staff list for the Park should be composed of a Park Director, an Assistant Park Director, a team of park inspectors and a group of community guards. At present, the staff consists of a director, one person responsible for inspection and nine wildlife guards chosen by the communities, who work as instructors. The wildlife guards function as a bridge between the park and the local communities. They try to reach out with a message of the necessity to conserve and make rational use of the resources, and at the same time convey the problems and concerns of the local population.

Administratively, the islands of Bangué, Magaruque and Benguérua are part of the district of Vilanculos, and the islands of Bazaruto and Santa Carolina of the Inhassoro district. The districts address the civic issues of the archipelago. Even though the archipelago is dependent on two districts, there is only one administrative office, the Bazaruto Administrative Office. Although located on Bazaruto, it is responsible for the administration of both the islands of Bazaruto and Santa Carolina.

There is a total of three police stations in the archipelago, on Bazaruto, Santa Carolina and Magaruque. They are responsible for ensuring law and order. The Maritime Delegations of Vilanculos and Inhassoro are responsible for the control

of the territorial waters of the region and for the licensing and collection of taxes for boats, traditional fishing (trawling, angling, submarine fishing, oyster and sea cucumber harvesting, traps etc.), as well as other artisanal activities that need licensing, e.g. boat building. A maritime agent is based in Zenguelemo, on the island of Bazaruto. This agent's area of jurisdiction are the islands of Bazaruto and Santa Carolina.

Besides these institutions, there are others influencing the management of the archipelago, notably the National Tourism Authority and the provincial and district boards for Agriculture and Fishing, Commerce, and Industry and Tourism. Unfortunately, in spite of the large number of institutions participating in the administration of the archipelago, inter-institutional coordination is still lacking. Because the Regulations of the Bazaruto National Park have not yet been approved, (this is expected to happen this year), the park is for the moment governed by the Laws of Wildlife and Fishing, and by other applicable legislation.

Environmental and Development Problems

Opportunities for Development, Constraints and Threats

One of the major, if not the most important, constraints for the conservation and promotion of a rational use of the resources of the Bazaruto Archipelago, is related to the open access and uncontrolled nature of the system. Accordingly, people (in particular from the mainland) use existing resources in an opportunistic manner, without responsibility for their management.

This is on the one hand related to weak local capacity for administration and control of the archipelago, and on the other by a non-functioning administrative structure that has remained in place since the political, economic and social changes following the country's independence. These changes were aggravated by the unstable situation from which the nation suffered in past years, which rendered the traditional government weak and marginalised and incapable of fulfilling its important role in the regulation of natural resource use. To a large extent the ecological, socio-economic and development problems facing the archipelago today are intimately associated with these circumstances.

The practice of slash and burn agriculture, particularly in sandy dunes, and the felling of trees for fire wood and building material, have been two of the principal causes of soil erosion and loss of nutrients. Magaruque, for instance, has already lost around 80% of its cover over a period of six years (Dutton & Zolho, 1990). The great concentration of sheep and goat livestock in fragile habitats has also caused deterioration of the soil. In 1990, the island of Bazaruto held around 1 800 goats and 372 sheep, Benguérua 100 goats and 20 bovines, Magaruque 30 goats and Santa Carolina 20 goats (Dutton & Zolho, 1990).

Further problems for adequate management of the natural resources of the archipelago include:

- Non-licensed and uncontrolled fishing, perpetrated by people from the mainland, and the use of inappropriate fishing practices for the region (e.g. shark fishing nets) as well as semi-industrial fishing. These practices affect the stocks of some species of great economic value, such as lobster and sea cucumber. They also threaten the survival of some endangered species, such as turtles and marine mammals (dugong and dolphins).
- Inadequate treatment of hotel waste water, and pollution caused by heavy ships cleaning their storage tanks in the waters of the archipelago.
- Dependence on two districts and the absence of functioning administrative structures that permit supervision of the various development undertakings in the archipelago. It would be useful, for example, to control and register the movements and dwellings of people from the mainland. The current dual dependence has implications for operation of conservation programs and affects the resident fishermen and the resources for their sustenance.
- Non-existence of a policy or mechanism to transfer land and natural resources to the local communities (rule of community property). By informal rule, the land belongs to the local communities, although in practice, it could at any time be reclaimed by the State.
- Non-existence of mechanisms to retain and channel the returns to the communities.
- Absence of (approved) regulations for the Bazaruto National Park.
- Concessions without prior notice to local communities have in many cases led to conflicts of interest, as the local population has not been compensated for the concessions, nor benefited from them.

Despite these constraints, the archipelago still has excellent development potential, provided the following takes place in the short term:

- Approval of the regulations and new borders of Bazaruto National Park, broadened to embody all the islands and the adjoining waters of the archipelago. This would drive the formation of a zone that accommodates various resource uses and planning for their management.
- Greater coordination and concentration of efforts among the various state and government institutions that influence the management of the archipelago.

- Real participation of the local population in the management of the archipelago.
- Greater sensitivity on the part of the Government on environmental issues. The licenses issued in the last few years for new undertakings in the archipelago have shown an almost unfavourable attitude, putting economic interests in first place at the expense of the environmental issues.
- Clear definition of the Government's policy in relation to the protected zones and the role of the rural population living within or adjacent to such zones, the organisation and management of natural resources, and the establishment of mechanisms to channel benefits to the local communities.

The Bazaruto Project

In order to better understand the current phase of the Bazaruto project, it is important to make an analysis of its historic context. After the creation of Bazaruto National Park in 1971, there was never an actual presence of the National Forest and Wildlife Authority in the park. After a visit to the archipelago in 1988, Mr Roberto Zolho, fauna technician of the National Forest and Wildlife Authority, recorded various problems affecting the area and recommended the drafting of a directive plan for the archipelago and an increased presence of the National Forest and Wildlife Authority. In this setting, a first phase of the Bazaruto project, financed by the World Wide Fund for Nature (WWF) took place in 1989. The objective was to draft the directive plan for the long-term conservation and development of the Bazaruto Archipelago. This was completed in 1990. With continued financing from the WWF-South Africa, a second phase of the project was initiated in August 1990. This continued until December 1994 and was essentially directed at the implementation of the directive plan. Based on the objectives achieved and the experience acquired during the four and a half years of implementation, the current phase of the project was elaborated. It is financed by the European Union and implemented by the WWF. This phase, initiated in January 1995, planned to last for 30 months, has as its principal objective:

To maintain the social and ecological integrity of Bazaruto National Park through involvement of the resource users.

To achieve this, specific objectives were formulated:

- To extend the borders of the Bazaruto National Park to include all the islands of the Bazaruto Archipelago and to propose its candidacy as a World Heritage site.
- To establish mechanisms for co-management of Bazaruto National Park that would involve local communities, tourism operators, the National Forest and Wildlife Authority and other governmental institutions.

- To engage the local communities in the management and conservation of Bazaruto National Park.
- To improve the socio-economic conditions of the islanders, through distribution of the economic benefits generated by Bazaruto National Park.
- To implement training programs and ecological and socio-economic research to ensure appropriate organisation and management of Bazaruto National Park.
- To establish a mechanism for sustainable financing of Bazaruto National Park so that it may function by itself, once the project is concluded.

Despite some difficulties encountered by the project during the different phases, the project has achieved the following results to date:

- Drafting of the directive plan for the archipelago.
- A sound relationship with the local communities and gaining of their confidence.
- Recruitment, training and supervision of a group of guards, nominated by the local communities, who work as instructors, promoting conservation and sustainable use of the resources.
- Protection of some reefs, selected in consensus.
- Protection of islands where turtles and crocodiles nest.
- Drafting of two proposals – for modification of the borders of the Bazaruto National Park, and for its regulations.
- Establishment of a centre for preservation in Estone, Bazaruto Island.
- Initiation of research and monitoring programs.

Conclusions

Provided it is properly designed, managed and controlled, the Bazaruto Archipelago has every prerequisite for sustainable development, which would benefit the local communities, tourism and the ecology of the archipelago.

Taking into consideration the environmental fragility of the archipelago, it is of vital importance that all the institutions which have the archipelago as a platform, share the benefits that the area provides and do their duties and responsibilities by participating in its protection and preservation.

TOURISM, LAND USE AND CONFLICTS. BILENE – XAI-XAI – CHONGOENE

JOHN HATTON, CUSTODIO VOABIL AND ARLINDO MANJATE

Introduction

The Bilene – Xai-Xai – Chongoene coastline (ca. 62 km long) is classified as a parabolic dune coast, comprising dune forests, coastal barrier lakes and pristine beaches. Prior to independence in 1975, this stretch of coastline was frequented by tourists, but the tourist industry later declined dramatically. Since the signing of the Peace Accord in October 1992, many requests have been submitted to the provincial and district authorities for land concessions to establish holiday homesteads, camping grounds, "ecotourism" ventures, etc. Prime sites along the Bilene – Xai-Xai – Chongoene stretch of coast are being acquired without any long-term socio-economic or land use plan, and the options for Mozambique to gain maximally from this valuable asset are rapidly being foreclosed. This coastal zone area has a high potential for developing a sustainable and diversified sub-regional economy in such a way that Mozambique and its citizens gain maximum benefit from these unique resources. In addition, the exploitation of resources and land by coastal communities may result in direct conflict with the tourism developers. These suggest that alternative economic benefits would accrue to the local communities. However, it is by no means assured that local residents will gain more than they lose from these operations.

In this paper, recommendations are made to implement measures of preventing and/or reversing incompatible land uses and potential conflict along the Bilene – Xai-Xai – Chongoene coastline.

Biophysical Environment

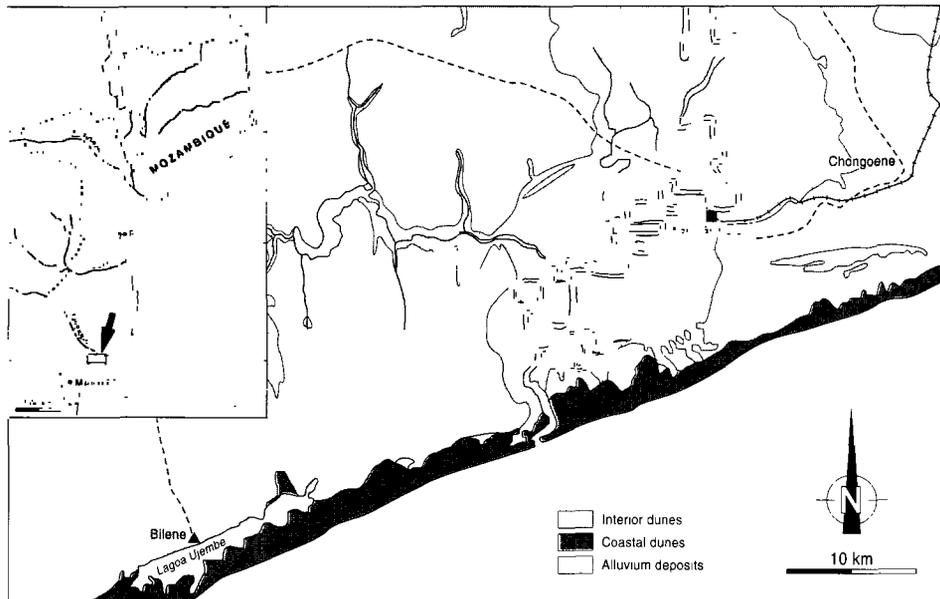
Geomorphology and Geology

A continuous belt of coastal sands of varying width occurs adjacent to the coast, with the exception of the mouths of the Limpopo River and the estuary. The eastern border of these coastal sands is characterised by a series of high dunes, generally parallel to the coast, which normally attain their highest elevations just inland of the high water mark. Behind these dunes are depressed areas with lakes and related dunes. Several of these lakes have periodical access to the sea (for example, the lagoon at Bilene).

Three main geological formations (Fig. 1) can be distinguished along the coastline:

- Alluvium deposits (QA1) of recent origin occur as a wide expanse along the Limpopo valley.
- Coastal dune formations (QDC) of recent origin and of varying width run parallel to the coast.
- The formation of interior dunes of Pleistocene origin (QD1) covers a large area inland from the dunes, north and south of the Limpopo River.

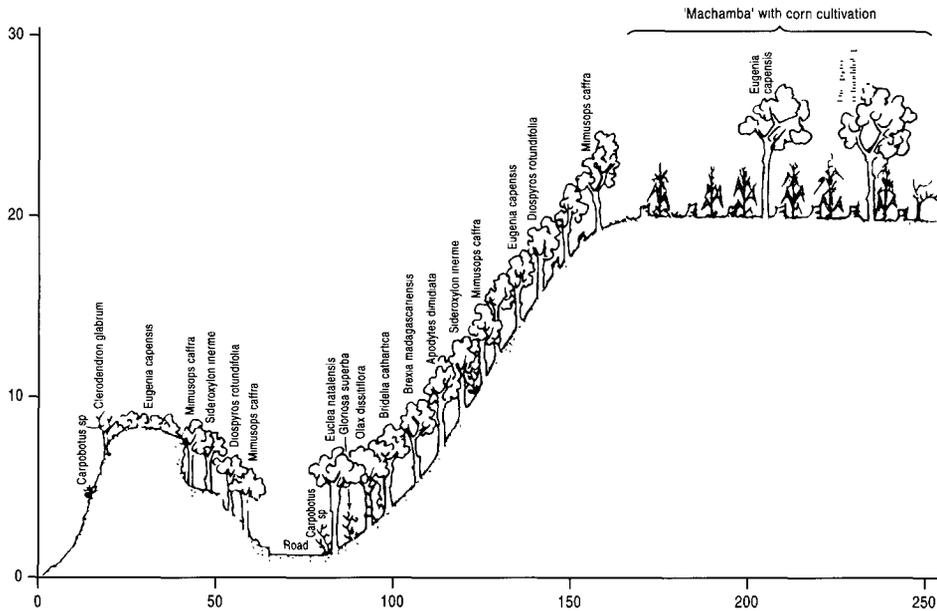
Figure 1. Geology of the region.



Vegetation

The Xai-Xai – Bilene coastline is classified as a parabolic dune coast (Tinley, 1971). The dune systems, attaining heights of 100 m, are considered to be the tallest vegetated dunes in the world. They are characterised by a vegetation cover comprising succulent herbaceous species on the foredunes (these may be considered to be pioneers) grading into well developed thicket or forest on the taller dunes on the landward side. The dune thickets and forests proper are species diverse, the most numerous species being *Diospyrus rotundifolia*, *Mimusopos caffra* and *Sideroxylon inermis*, while other commonly occurring species include *Euclea natalensis*, *Brachylaena discolor*, *Ozoroa obovata*, *Ochna natalitia*, *Vepris undulata*, *Apodytes dimidiata* and *Brexia madagascariensis*. A typical transect across the dune vegetation (Praia de Chongoene) is shown in Figure 2.

Figure 2. Schematic transect across the dune vegetation, Praia de Chongoene.



Coastal Barrier Lakes

Characteristic features of the southern coastal area are extensive lakes, swamps and temporarily rain-filled pans behind the dune systems. The most important coastal lake in the Bilene – Xai-Xai region is Lake Uembjeo/Lake Bilene (3 000 ha). The Mozambican coastal plain is Pliocene in age and was cut by a marine transgression. In the succeeding regression, the sea left a series of longshore dunes as sandy ridges running parallel to the present shore. The coastal lakes are now stranded water bodies behind the present coastal longshore dune system (Boane, 1996).

Unlike other coastal barrier lakes, Lake Bilene is occasionally linked to the sea via a channel, that closes by the formation of a sand bar. The sand bar was opened in 1994 to gain access to the sea for local fishermen and tourists. In March 1996 the sand bar was opened by natural coastal processes. Marine and brackish fish species occur in Lake Bilene. Interestingly, shortly after the opening of the sand bar, 90% of the tilapia (*O. mossambicus*) caught showed pathological symptoms termed anophthalmia (loss of one or both eyes). It is surmised that this was due to rapid changes in salinity levels following the opening of the low dune ridge linking the lake to the open sea (Hatton, 1995). The other barrier lakes, by contrast, do not have links with the sea and typical freshwater and brackish water fish occur in these water bodies.

Marine Habitats

A more or less continuous band of calcareous sandstone is running parallel to the beach (at a distance of ca. 100 m), and is exposed at low tides. The sandstone band separates the open sea from the shore. The littoral waters of this stretch of coast are renowned for sports-fishing. Species caught include sail fish, barracuda, marlin and the Zambezi shark. Two species of dolphin (*Tursiops truncatus* and *Sousa chinensis*) and five species of turtle (*Chelonia midas*, *Eretmochelys imbricata*, *Lepidochelys olivacea*, *Caretta caretta* and *Dermochelys coriácea*) occur in the littoral waters, two of which, the leatherback and the hawksbill turtles, nest along this stretch of beach. The calcareous sandstone formations support a wide diversity of molluscs (*Perna perna*, *Saccostrea cucullata*, *Cypraea* sp. and *Patella* sp.) and macro algae (*Ulva* sp., *Enteromorpha* sp. and *Padina* sp.). Occasionally, coral formations (e.g. *Acropora* sp. and *Pocillopora* sp.) are found on the seaward side of the sandstone belt. The rock lobster (*Panulirus homarus*) occurs in rocky habitats.

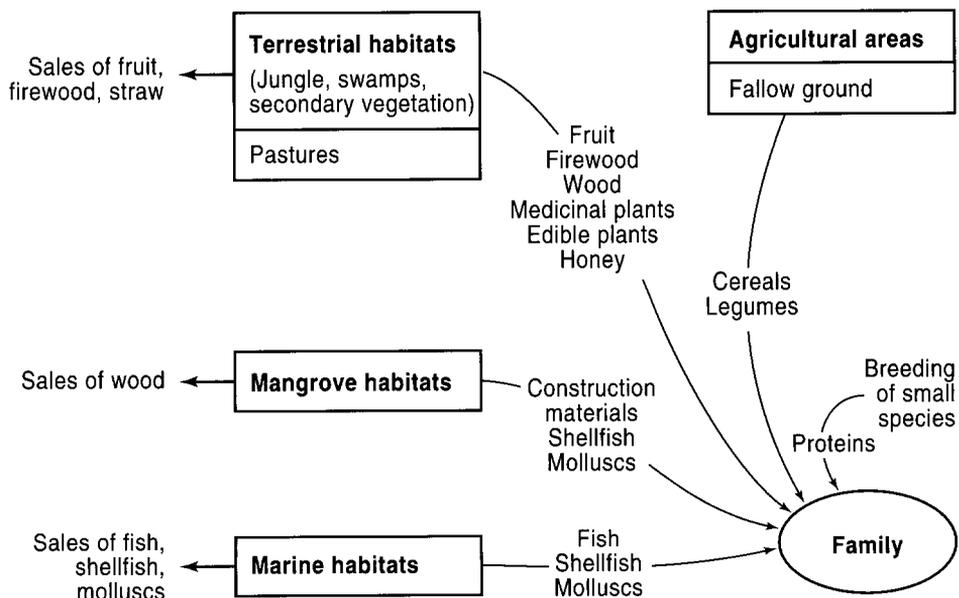
Socio-Economic Situation

Family Sector

Small-scale farming on land derived from slash-and-burn agriculture is common throughout coastal Mozambique. The most commonly grown crops are maize, cassava, beans and groundnuts. However, due to the inherent infertility of the soil, agriculture is marginal and cultivated land is given over to fallow three to four years after slashing and burning and a new cropping area is prepared. The small-scale farming system (comprising cultivated, fallow and grazing sub-systems) is but one component of the natural resource base that contributes to the livelihood of coastal communities. Dune forests, edaphic grasslands, mangroves, freshwater lakes and rivers, inter-tidal zones and littoral waters provide many additional services and goods. Plants yield a wide variety of services and products, including fruits, vegetables, medicinal plants, construction materials, fire wood and shade. Artisanal fishing is the economic mainstay for coastal communities (both for subsistence and sale). A variety of methods are employed: dragnets, seine nets, fence-traps, spear guns and line fishing. Coastal communities also harvest a wide variety of inter-tidal fauna, including clams, oysters, mussels, cockles, scallops and tritons, which are important sources of protein. Harvesting is carried out almost exclusively by women and children. The holothuria or sea cucumber ("magajojo", species *Holothuria nobilis*) is a marine invertebrate occurring in littoral waters. This organism, although not consumed locally, is considered a delicacy in the Far East where the dried product may fetch up to US\$40 per kg. This resource has been heavily exploited along much of the coastline by middlemen who employ local residents as part-time employees. Although the final product fetches a high price, local communities have, in fact, gained few economic benefits from this potentially valuable renewable resource. In addition to marine resources, fishery resources of the coastal barrier lakes in southern Mozambique have long been exploited by local inhabitants for subsistence and commercial purposes.

It is clear that coastal communities exploit a wide range of plant and animal resources for their livelihood, including forestry, wildlife, freshwater, inter-tidal, marine and mangrove resources (Fig. 3). Some of these are used for subsistence whilst others have (potentially) a high market value. However, local communities often gain little direct economic benefit from their resources. Instead, it is often outsiders who reap these benefits from the natural resource base. Although, at present, all land in Mozambique belongs to the State, the *de facto* situation is that land is being managed and allocated according to traditional customary land rights. Traditional boundaries are still recognised by local communities. The potential for conflict over land between local communities and "concession seekers" is therefore high. Due to the war, very few traditional farmers formalised their rights to the land under existing legislation. Consequently, tracts of land belonging to local communities have been requested by or given over to outsiders.

Figure 3. Use of coastal resources by local communities.



Commercial Farms

Large tracts of land in the Xai-Xai district have been acquired by commercial farmers for livestock production (mainly on the elevated sandy soils) and cultivation (mainly on the alluvial flood plain of the Limpopo Valley). Private sector farmers may acquire 50-year leases on land, according to existing legislation (Title of Use and Exploitation). The availability of land is determined from maps drawn up by the Directorate of Geography and Cadastre (DINAGECA). As local communities register their land, the potential for conflict is obvious, and only occasionally are the communities themselves consulted regarding land distribution.

Tourism

The coastal area of southern Mozambique has long been recognised as an area of highest tourism potential. Prior to Independence in 1975, this stretch of coastline was frequented by tourists, mainly from South Africa. Since the signing of the Peace Accord in 1992 and the return of peace and stability, coastal areas have experienced an increase in tourism activities (mainly casual visitors and concession seekers). The majority of casual tourists are campers bringing in their own equipment and supplies by road, usually in 4x4 vehicles. The illegal and uncontrolled activities of these tourists are causing increasing concern along much of the southern Mozambican coast. Illegal fish harvesting is widespread and it is estimated that many hundreds of kilograms of fish, including reef fish, are exported illegally to South Africa in portable deep freezers or refrigerated trucks. Other activities causing concern include the driving of 4x4 vehicles on the beach above the high-water mark, which poses a direct threat to the loggerhead and leatherback turtles currently nesting on this stretch of coastline, and the harvesting of corals by souvenir hunters. This type of tourism brings few economic benefits while causing maximum environmental degradation.

Many requests have been submitted to the provincial and district authorities for land concessions to establish holiday homesteads, camping grounds, "ecotourism" ventures etc. along the Bilene - Xai-Xai - Chonguene coastline. A substantial number of these requests have been made by South Africans following a growing perception that land is "up for grabs". These activities are the focus of the present study and are discussed in detail in the following section.

Tourism Initiatives in Bilene - Xai-Xai - Chonguene

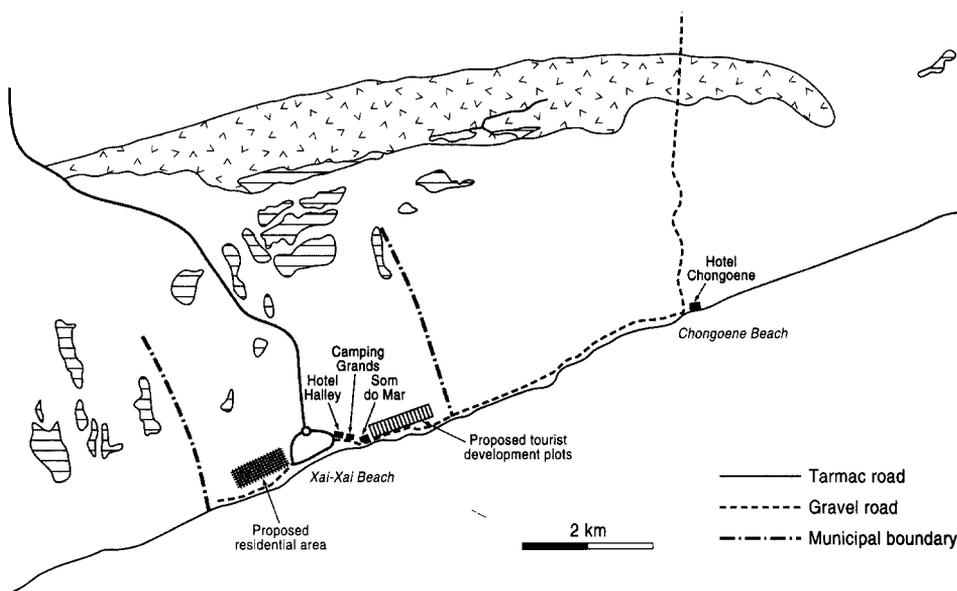
Proposed Tourism Development Plan, Praia de Xai-Xai

The stretch of beach running northwards from Hotel Halley for about four kilometres falls under the jurisdiction of the Municipal Council of Xai-Xai (Fig. 4). Two tourist facilities are currently operational, Hotel Halley and the Praia de Xai-Xai camping grounds. A prime site has apparently been awarded to an investor from Swaziland for the development of "time-share" accommodation (Som de Mar,

currently under construction). The stretch of shoreline from the north of the Som de Mar complex to the city council boundary is currently undeveloped for tourism, although the municipal council has drawn up a tourism development plan comprising a series of contiguous 50 x 50 m plots (Fig. 4). The layout is designed to incorporate the maximum number of plots along this coastal stretch, i.e. the 50 m boundary running parallel to the beach, with the 500 m boundary running perpendicular to the beach. The plan also envisages a ring road running around the development site with additional facilities such as petrol stations, restaurants, etc. Currently, most of these plots have been requested by potential developers (some asking for several contiguous plots) and, in a few cases, the Municipal Council has already received plans to develop the plots. If this tourism development plan proceeds it will result in a large number of operators competing side by side in a very limited area. In effect, the plan maximises the number of tourism operations and, if implemented, will result in the irreversible transformation of the social and natural environment along this prime stretch of ecologically sensitive coastline.

It should be noted that the plan clearly falls outside the National Tourism Policy, which advocates "high quality/low impact" tourism for the Xai-Xai – Chongoene coastal area. In addition, development of this nature will severely jeopardise any future tourism development along the adjacent Praia de Chongoene, which is linked to Praia de Xai-Xai by a common access road.

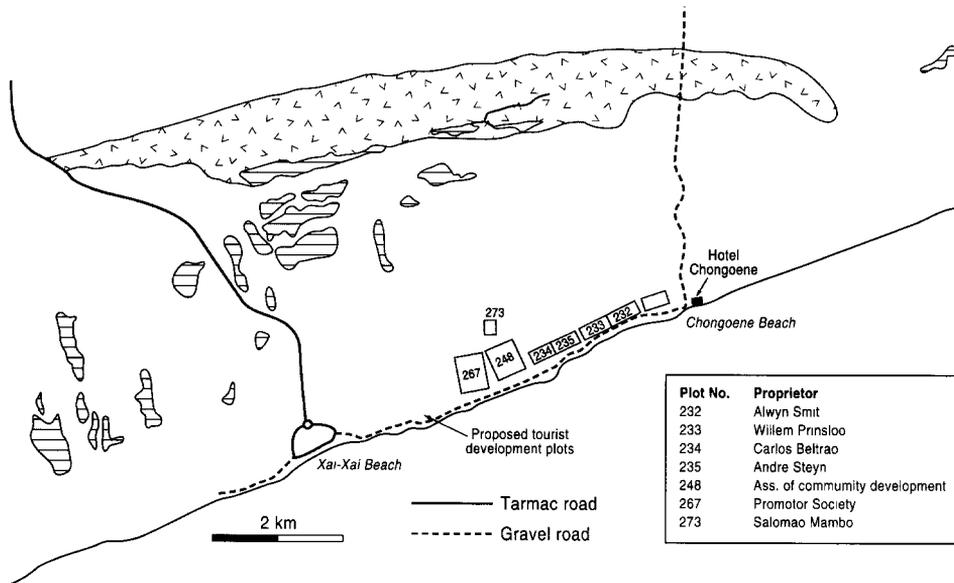
Figure 4. Tourism installations (existing and proposed), Praia de Xai-Xai.



Praia de Chongoene

The stretch of coastline running between the Xai-Xai municipal boundary to Hotel Chongoene (ca. 6 km) falls under the jurisdiction of the Xai-Xai district authorities. This entire stretch of coast is the subject of requests by a number of individuals and/or companies. Requests for concessions along the Chongoene coast have been made via various channels. Some requests were made directly to the District Administrator's Office. Concession seekers have paid a fee of Mt3 000 000 for one hectare. In addition a "fee" of Mt680 500 was paid to DINAGECA for delimiting their plots *in situ* ("Tramitação e Reconhecimento"). Such cases are Mr Edward Newton, Mrs Alison Newton, Mr Peter Green and Mr Pieter Labuschagne. These concession seekers have received a certificate stating that they have been "awarded" the land. Several requests were made to the former *Chefe do Posto Administrativo* de Chongoene (he has since been substituted by a new *Chefe do Posto*). It was not possible to substantiate how many requests were processed via this channel. In one case a request was made directly through the *Direcção Provincial de Agricultura* Office (by the *Associação para Desenvolvimento das Comunidades*). This plot has been delimited on the DINAGECA Provincial Services map and is registered as approved ("deferido") by DPA. Other proposals have been submitted directly to the *Centro de Promoção e Investimentos* (Maputo), for example, Bengusto Bay. Interestingly, Bengusto Bay has been approved by CPI but the request has neither been processed by DPA nor been registered or mapped by DINAGECA (Xai-Xai) (Fig. 5). The plot of land currently being sought by Bengusto Bay overlaps with several plots which have been attributed to individuals by the district administration.

Figure 5. Location of plots mapped by DINAGECA (Xai-Xai) in Praia de Chongoene.



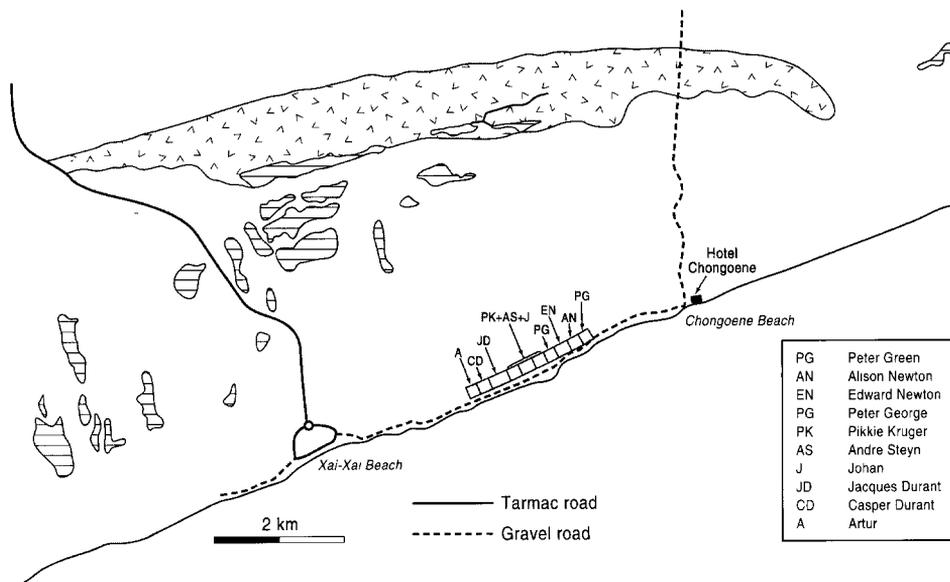
Consequently, there is much confusion over the location of the plots of land requested by the various concessions seekers, and in several cases there are overlapping claims to the land. In most cases, the provincial offices of the Ministry of Industry, Commerce and Tourism have not received details regarding the nature of the proposed tourist developments. Key factors resulting in confusion over requests for plots of land are:

- Lack of coordination between agencies.
- Lack of any uniform procedure for application for concessions.
- Failure to register and map requests at the provincial DINAGECA offices in Xai-Xai (housed in the Direcção Provincial de Agricultura e Pescas building).

In several cases, concession seekers have received a "Certidão" from the District Administrator's Offices and have had their plots delimited *in situ*, although these have not been registered or mapped by DINAGECA.

A ground survey carried out along Chongoene beach revealed that ten persons are currently "residing" along this stretch of beach or have staked claims to plots of land as indicated by signs and markers (Fig. 6). Most of these people had requested land from the District Administrator's (DA) Office. However, a comparison between "residents" and plots registered and mapped by DINAGECA (requested via other channels) on Chongoene beach shows that, except for one case, there is no correlation between plots registered and mapped by DINAGECA and those

Figure 6. Plots now occupied in Praia de Chonguene.



which currently have residents. The people currently residing on this stretch of beach were under the impression that they were "owners" of the land which they had legally "bought". On several of the plots, tourism facilities were at an advanced stage of construction (notably those of a "consortium" formed by three South Africans, where guests were being accommodated at the time of the survey). On another plot, a large area of dune forest had been cleared for a caravan park and a "house" constructed immediately adjacent to the road. Basic accommodation (reed huts) had been constructed on most of the other plots.

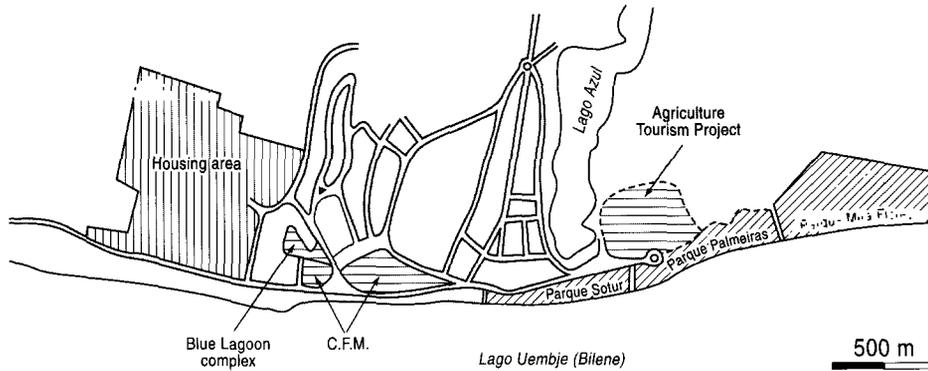
Praia de Zonguene

Praia de Zonguene is located on the south bank of the Limpopo River. While a few small plots of land have apparently been awarded in the area, the major tourism development is the "Agencia de Turismo de Mozambique, Lda.," a joint South African - Mozambican venture. The developers have been awarded 7 ha of land, and rustic style bungalows and associated facilities are in an advanced state of construction. The project will cater to sports-fishing tourists. It appears that the operators have the approval of the appropriate authorities to legally operate (Centro de Promoção dos Investimentos, Ministerio de Industria, Comercio e Turismo, DINAGECA, etc.) although no environmental impact assessment was undertaken. The investor has requested an additional 500 ha, surrounding the core 7 ha, for the creation of a "game farm" with the introduction of several large mammal species. This request is currently lodged with the Serviços Provinciais de Floresta e Fauna Bravia (Xai-Xai). It appears that no feasibility study regarding the introduction of wildlife into this habitat has been carried out. An assessment of the environmental and social impacts of the proposed expansion has not been made, nor indeed demanded by the provincial authorities. From interviews with local communities it appears that conflicts have already arisen related to the restriction of access to the estuary and associated natural resources. If the project is expanded, at least two families will lose access to their land (families Chicavele and Bundzula), while several others will lose access to both natural resources and sacred sites.

Praia de Bilene

The main tourism operations in Bilene are located adjacent to Lake Bilene/Lake Uembje. (Note: the shoreline of the lake is commonly referred to as Praia de Bilene). Three contiguous camping grounds are located immediately adjacent to the lake, from north to south: Parque Mira Flores, Parque Palmeiras and SOTUR (Fig. 7). Of these, only one - Parque Palmeiras - is fully operational. Parque Mira Flores is partially operational and the camp site at SOTUR is currently under preparation (the preparation of the campsite has resulted in removal of a substantial area of dune forest). Together, these three contiguous campsites run for a distance of 2.1 km along the shore of Lake Uembje and all are located within ten to twenty metres of the high water mark. No provision has been made to allow access to the lakeside and this is a major issue. Following negotiations with the local authorities, the

Figure 7. Tourism installations, Praia de Bilene.



tourism operators have stated that local people may have access to the lake, although in practice this is not always given. Two other establishments providing chalet-type accommodation are also operational, but these are located some distance from the shoreline and above the road running parallel to the lake. They are the Complexo Lagoa Azul and the CFM (Caminhos de Ferro de Moçambique) chalets.

Institutional and Procedural Weaknesses Related to Tourism Development Proposals

Here follows a list of the main institutional and procedural weaknesses related to proposals for tourism developments:

- Many requests for tourism concessions are made at the district level with little or no liaison with local authorities and local communities.
- The absence of clear guidelines results in several agencies processing concession requests that are often outside their jurisdictional competence.
- There appears to be no standard fee charged by the various agencies involved in processing applications.
- There is a lack of inter-institutional coordination and unclear jurisdictional responsibility.
- Local authorities have not been informed or updated regarding current tourist development policy and regulations.
- Institutional capacity to evaluate and process tourist investment proposals is weak (consequently, proposals by "opportunistic" developers are often approved).
- There is a lack of transport and communication at district or local level to monitor and control tourist activities.
- There is no Tourism Master Plan (this applies to coastal Mozambique as a whole).
- Higher level staff have not acted upon or supported recommendations and reports made by technical staff, resulting in low morale. (*Note: this occurs both within and between institutions.*)

Recommendations

Local Community Participation

Most of the tourism development proposals along the Bilene – Xai-Xai coastline comprise low- to medium-scale economic activities. Nevertheless, it is in the interest of the investor as well as local communities that socio-economic and environmental sustainability is assured. Currently, coastal communities lose more than they gain from tourism developments. To protect local people from potential adverse effects of these developments, and to ensure an equitable benefit, the local people must be empowered to negotiate their rights. However, given the present low level of capacity, it is necessary to develop and strengthen community institutions.

First, representative grass-root institutional structures must be developed. Such structures should be accountable, transparent and democratic. The assessment of community institutional needs and the strengthening of community institutions must be carried out by independent and *bona fide* non-governmental organisations such as GTA (Grupo de Trabalho de Meio-ambiente). The constitution is the foundation of a community institution. A constitution is basically a membership list and a set of agreements within the community.

A constitution should include:

- membership criteria
- list of members
- objectives of constitution/body
- rules and guidelines (e.g. use rights, management of shares, methods of decision making)

GTA could play a key role in assisting local communities to establish these community-based associations, so that they can properly negotiate their rights, enter into joint venture schemes with private investors etc., in order to achieve a "win-win" situation for communities on the one hand and potential investors on the other.

Note: The current policy of the Government of Mozambique is to decentralise power to the district and municipal levels. In principle, this will permit decisions to be taken at the local level, hopefully in participation with local communities. This should result in involvement of communities in decisions related to land distribution and access to natural resources. In addition, the decentralisation policy envisages increased financial autonomy so that local administrations can collect fees and administer their own budgets at the district and municipal level.

Standardising Criteria for Processing Tourist Development Proposals

It is recommended that a standard procedure is adopted for small-to medium-scale

tourism projects that will: (a) prevent overlapping claims to land, (b) ensure that local communities have a role in the decision-making process, and (c) ensure that tourism developments are of a sufficiently high standard with minimum environmental impact.

- The request should be lodged with the District Administrator's (DA) Office.
- It is incumbent upon the DA to liaise with the local authorities who have direct links with local communities, (see also local community capacity and institutional strengthening or building above). This is necessary to avoid conflicts at the local community level.
- If there are no land conflicts the area should be provisionally demarcated by the Provincial Cadastral Offices.
- The project proposal should then be sent to the provincial offices of the Ministry of Industry, Commerce and Tourism and evaluated by the Technical Commissions (see capacity building below).
- The proposal with comments is forwarded to the National Directorate of Tourism (DINATUR) which liaises with the Investments Promotions Office (CPI). (*Note: the two agencies are members of the same board for evaluation of tourism development proposals.*)
- If the project is approved, the National Directorate of Tourism (DINATUR) will be responsible for issuing the final licence. The proponent will be granted a title for the land to develop the project.
- The contract between DINATUR and the investor should contain a "develop by xx date" clause (for example two years). If unable to do so, the investor may lose the rights to develop the land.

Redefinition of the Tourist Development Plan for Praia de Xai-Xai

A tourism development plan has been drawn for the Xai-Xai beach front by the Municipal Council of Xai-Xai, comprising contiguous 50 x 500 m plots along the beach (see above). The presence of low cost tourism operations competing side by side with maximum impact on the natural and social environment would prevent the possibility of developing high return/low impact tourism. It is strongly recommended, therefore, that the development plan is reviewed as a matter of urgency and alternative plans are drawn for the site. The land use plan should be prepared jointly by the Planning Department (Municipal Council) and the Instituto de Planeamento Fisico. These two institutions should be provided with additional expertise in the form of consultants. The consultants would have the tasks of not

only drawing up the plan, but also assisting capacity building in the form of "on the job training". The following expertise would be required:

- land-use planner
- architect
- ecotourism specialist
- ecologist
- legal expert

The plan should include the drawing up of contractual arrangements with prospective investors, with clauses that specify the type of development and the deadline for development. The area for the proposed tourism development is relatively small and it is envisaged that a land use plan could be drawn up within two to four weeks. It is essential that measures are taken to redesign the proposed tourist development plan for Praia de Xai-Xai. If measures are not taken now, options for the development of tourism activities that fall within the National Tourism Policy will be foreclosed. Finally, the opportunity for Xai-Xai to gain maximally from its coastal resources with minimum impacts on the natural environment, will be irrevocably lost.

Redefining the Development Proposals for Praia de Chonguene

It is recommended that:

- The Technical Commission draws up a land use plan (with zoning) for this sensitive stretch of coastline.
- All current tourism developments are temporarily suspended and evaluated on the basis of the plan. Projects incompatible with the plan (type or location) must be modified, relocated or cancelled.
- The legal status of non-Mozambicans currently operating in the area must be determined. Illegal operators must be obliged to legalise their residency status, or their projects will be terminated.

Strengthening the Technical Commission

Tourism project proposals should be evaluated at the provincial level. The following institutes currently comprise the Technical Commission:

- DIPCTUR - Department of Tourism
- DPAP - Geography and Cadastre
- Serviços Provinciais de Planeamento Físico e Meio Ambiente
- DPAP - Depart de Florestas e Fauna Bravia
- Delegação Provincial da Administração Marítima

In order to properly evaluate project proposals, it is recommended that the capacity of the Technical Commission be strengthened, through provision of short courses on tourism, environmental conservation, legislation and land use, and rural sociology.

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BEIRA – MAIN ENVIRONMENTAL PROBLEMS AND POTENTIAL SOLUTIONS

HASSAN

Introduction

Beira, capital of the province of Sofala, is located at the entrance to the Bay of Sofala between the parallels 19°30' and 19°52' and meridians 34°30' and 35°10'. Its area is approximately 610 km². The Beira administrative area is bordered to the east by the Indian Ocean. To the north, the limit follows the Madzidze River in an east-west direction from the coast, until it reaches the left bank of the Pungué River, and from there until Ponta-Gêa, or the Mazanzane Bay, which marks its western boundary. The city of Beira was founded at the end of the last century; at the time, its area was 353 km². The first section to be urbanised was the harbour area around the mouth of the Chiveve River. The city then grew along two axes – the dune banks between the Chiveve River and the ocean (Chaimite, Ponta-Gêa, Palmeiras and Macúti neighbourhoods), and the banks of the Pungué River. The road and railway lines follow these axes. City planning and basic social infrastructure were devised for a population of 50 000 inhabitants, which increased to 100 000, accompanied by a constant growth of the social infrastructure. Since Independence, demographic development has been very rapid. One explanation, among others, is the influx of people fleeing from the war. The general population census completed in 1980 determined that Beira had 235 000 inhabitants. From 1980 to 1995, that number grew to 450 000, based on an estimated demographic increase of 4.4%. This rapid growth has caused numerous problems for the city, particularly where squatters have occupied unplanned areas. Once development of basic infrastructure began to lag behind population growth, the city became heavily overburdened. Beira is constructed on a marsh and is lower than average tide level. Moreover, tidal amplitudes reach six metres in this coastal belt, the largest in the country. These aspects are the cause of significant repercussions, particularly with regard to ground water level and flooding during the rainy season.

The objective of the work which follows is to, very briefly, establish the principal environmental problems and elaborate guidelines for their management, from various aspects, in the short, the medium and the long term. The sections cited below are those considered to have the greatest environmental problems. It should, however, be noted that they correspond only to ten to fifteen per cent of the 610 km² included in the Beira administrative area.

Natural, Social and Economic Resources

Beira is located in inundated lowlands where the land, sea, rivers and climate constitute the principal natural resources. The predominant climate of the city of Beira is tropical-humid, the average annual precipitation is 1 500 mm, and average annual temperature is 24–25 C°.

The rural population still continues to move into the city, enlarging the current population. Many of these people do not possess the professional or technical training to find employment. This has led to the practice of informal subsistence activities in the city. It is estimated that Beira now has a population of nearly 500 000 inhabitants and living conditions are so harsh that, for example, approximately 90% of the population lives on the outskirts, with only 10% in the built-up zones.

Beira's principal economic activity is the railway-harbour complex, which employs the largest number of workers, along with commerce, manufacture of material goods, fishing activities, the hotel sector, and to some extent the beaches in and outside of the city that attract tourism. Subsistence agriculture is of great importance, and has a noteworthy impact, especially in the domestic sector, placing the private and state sectors in the second and third place, respectively.

Principal Environmental Problems

Coastal Erosion

Coastal erosion in Beira has become a serious problem. Sea-water has infiltrated the unprotected ocean rim, causing damage to the road along the sea, to houses and to public properties. This erosion and the advance of the sea onto the mainland put the future of the city of Beira in peril, judging from the constant regression of the dunes that form a natural protective barrier. All of Beira's coastal zone is affected by this erosion which, apart from natural causes, stems from the following:

- Lack of maintenance of the buttress and sand retention wall.
- Destruction of the dunes and felling of casuarinas.
- Destruction of mangrove in some areas.
- Removal of sand from the beaches for construction.
- Construction of public buildings on the ocean rim.

Sanitation

The sanitation in Beira is very poor. For life to be healthy, the current situation must be addressed and an appropriate sanitation system put in place. The existing sewage system does not extend to outlying residential areas, and even in the zones covered by it, performance is poor due to obsolete equipment and to the overload. The

overload stems from the fact that the system was originally designed for about a quarter of the volume it now receives. The surrounding residential suburbs that lack a sewage system and drainage ditches for rainwater are also the most densely populated areas. There have been some attempts to repair the public baths in Munhava, and to construct improved latrines in Beira's peripheral suburbs. But, in the case of the latter, efforts have been hampered by several factors, including the high ground water level, flooding, heavy concentration of and proximity between houses, and poor economic conditions among the population. These factors, together with over-population, contribute notably to the well-known open air toilet habits in the city. While networks to drain rainwater exist in the built-up zones, they function inefficiently because of obstructed gutters. This has led to flooding in streets and gardens. In the built-up areas, the Chaimite, Ponta-Gêa, Esturro, Pioneiros and Matacuane neighbourhoods are those most affected by the lack of sanitation. In the suburbs and periphery, the most affected areas are Munhava, North Chipangara, Inhamudima and Goto.

The following can be considered as the principal causes of these problems:

- No sewage system or network in the outer neighbourhoods.
- Obsolete equipment of the sewage system.
- Overload of the sewage system in the built-up zone.
- Weak maintenance capability.
- Unregulated land occupancy.
- Accumulation of waste in access routes.
- Lack of access ditches for rainwater drainage.

Water Supply

Beira's water supply is deficient, both in terms of quantity and quality. The problem of quantity is caused by the insufficient size of the mains for the water supply, which does not correspond to the actual demand. This dearth of water has caused problems for both consumers and industries in the city of Beira and in Dondo. Often people resort to consumption of water from the existing wells in the city, without any treatment at all. In multi-storey buildings, the shortage of water, in addition to blocked pumps for raising the water to the upper levels, has further aggravated the already poor conditions of the city's housing. Water quality is also problematic. Supply to the city is frequently restricted, due to the lack of chemicals for treatment. Moreover, when the region goes through a period of drought, the Pungué River's flow volume diminishes considerably, thus allowing sea water to

enter up to the point where the water collection station is located. Finally, the ageing condition of the water mains allows infiltration of contaminated water, lowering water quality even after treatment at the Water Treatment Station. The principal causes of water supply problems are as follows:

- Lack of capacity in water mains to supply a higher volume of water.
- Lack of expansion to the outlying neighbourhoods of existing network for water distribution.
- Obsolescence of the general water mains.
- Lack of maintenance of the general water mains.
- Blockage of water pumps in multi-storey buildings.

Urban Planning

The growth of the city of Beira without adequate planning has aggravated the existing environmental problems in the surrounding neighbourhoods. This unregulated land occupancy causes not only environmental problems, but it also affects the aesthetic, economic and cultural aspects of the city. The suburbs or neighbourhoods of Munhava, Chipangara, Inhamudima and Goto are the most critical in terms of environment problems, including flooding, lack of sanitation facilities and trash.

The principal causes of the problem can be summarised as follows:

- Unregulated growth.
- Lack of plans for regulation.
- Lack of land planning.

Pollution

Water pollution is a problem for the municipality. To date, there have been no studies undertaken regarding treatment of the waste water that is discharged in the Dama area (estuary of the Pungué River) and Ponta-Gêa (Grande Hotel). In the Palmeiras, an area where there are drainage ditches, the sea-water has been polluted by waste water, since the ditches carry faecal residue, trash, dead animal remains and anything else that will float in the current to the sea. In the harbour zone, no records have been kept of hydrocarbon spills that could result in pollution, although it is believed that spills occur as a result of ship movements, loading and off-loading of fuels. In general terms, water contamination in the estuary of the Pungué River, on the beach in Ponta-Gêa or on Palmeiras beach constitutes a danger for public health and marine life.

The principal causes of the problem are as follows:

- Lack of waste water treatment.
- Lack of maintenance of the drainage ditches.

Mangrove Cutting

Mangrove cutting for building material and fire wood occurs frequently in Beira. On the islands of the Pungué River estuary, and at the mouth of the rivers Búzi and Maria, cutting of mangroves has contributed to erosion. There are accounts that mangrove cutters in these areas travel in "chatas" (motor boats) and when they are caught by controlling patrolmen of the Maritime Administration, they are able to escape in their power boats, as long as the officials do not have the means to stop them.

The following are the principal causes of the problem:

- Lack of control over mangrove cutting.
- Lack of capacity to stop offenders.
- Lack of legislative instruments to penalise the cutters.

Inter-institutional Coordination

Beira has a number of institutions dealing with environment and the various issues discussed here. As a general rule, there is no coordination between these institutions and some overlap occurs. The Municipal Council has struggled to undertake some actions for the protection of the coast. Other projects are either underway or starting which seek to restore sanitary and water distribution infrastructure and improve sanitary conditions in the city.

Environmental Management Plan

The objective of a global environmental management plan would be the improvement of living conditions for the population and development of the city of Beira. Here follow some proposed measures to be included in such a plan.

Coastal Erosion

Objective

The objective is to stop coastal erosion and limit the advance of the sea onto the mainland, thus avoiding further destruction of infrastructure on the shoreline.

Strategy

Coastal protection of Beira should be considered as urgent. Therefore, in the short term, the following should be undertaken:

- Restoration of the flood-gates of the drainage ditches.
- Construction or restoration of the sand retention wall.
- Limitation of occupancy on the shoreline to public properties.
- Placement of metal signs along the coast, that list inappropriate uses of the coast and the beach. (These could be written both in Portuguese and in the vernacular idioms).
- Restoration of the buttress.
- Replacement of the casuarina trees.
- Improvement and maintenance of the drainage ditches.
- Drafting of laws to regulate use of the coast and the shoreline.

Sanitation

Objective

The purpose is to create a healthful environment in the city, reducing the proliferation of trash, eliminating pressures on the sewage system, and curtailing frequent street and garden flooding.

Strategy

As described above, the following should be undertaken:

- Plans to reorder and parcel out new areas such as Manga, Inhamízia etc.
- Resettlement of families from the most densely populated areas of the city to the newly parcelled areas, and of families living in outhouses and garages of the built-up zone.
- Rehabilitation and extension of the sewage system.
- Regular maintenance of the drainage network for rainwater.

Water Supply

Objective

This is intended to improve Beira's drinking water supply, both in quality and quantity.

Strategy

In order to supply enough water to the residents, the construction of a weir in the collection zone would have a twofold advantage. On the one hand, it would permit more water to be collected at the station, and, on the other, it would impede penetration of salt water upstream from the station. The following activities, among others, should be carried out:

- Extension of the internal network for water distribution to the outer suburbs.
- Rehabilitation of public fountains.
- Repair of water lifting pumps in buildings.
- Construction of a weir at the water collection station on the Pungué River.

Urban Planning

Objective

The objective of improved urban planning is to control land occupancy in order to preserve city's aesthetic qualities and create better conditions for its residents, whether through installation of public works and technical infrastructure or the environmental and health benefits which would result from this process.

Strategy

To overcome existing urbanisation problems, appropriate urban planning and re-organisation must be undertaken for the suburbs of Manga, Inhamízia, Chipangara, Inhamudima, Munhava and Goto, respectively. To do so, technical staff to implement the plans and coordinate them with various local efforts. Equipment such as trucks, bulldozers etc. are also needed for earthmoving. Finally, the families for whom such planning has been undertaken will need to be resettled in the new locations, where population density is estimated to be approximately 50 to 70 inhabitants per hectare.

Pollution

Objective

The objective is to reduce both production of pollution as well as its impact on the coastal and open sea waters adjacent to Beira.

Strategy

With regard to waste water pollution, studies should be made of available means to establish an adequate treatment system for waste water prior to its disposal at sea.

Mangrove Cutting

Objective

The objective is to reduce mangrove cutting and to restore the areas that have already been destroyed.

Strategy

A strong campaign against inappropriate or excessive use of the mangrove in the periphery and city must be undertaken. Replanting should also be carried out where there has been extensive cutting. The mangrove would recover relatively easily. Areas with more evident and advanced damage to the mangrove (Maria River, Praia Nova, the Pungué River delta) should be selected and addressed. For this purpose, mangrove from areas where it has less problems should be transplanted. In parallel, a strong campaign to educate the public should be undertaken, so that the people who normally use the mangrove can assist in its restoration.

Institutional Strengthening

Objective

To strengthen existing institutional capacity, the objective is to assist the institutions concerned to become more effective and efficient, and to avoid overlap of duties.

Strategy

To effectively implement an environmental management plan, the institutions involved must first be well organised and coordinate their activities. To this end, a technical team or working group should be formed, whose functions would be to oversee, study and propose better environmental management and development of the city of Beira. This group should be constituted by common consent of all the institutions. One possibility would be the Municipal Council of Beira.

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ENVIRONMENTAL PROFILE OF THE ISLAND OF MOÇAMBIQUE

RUI FONSECA

Physical Environment and Natural Resources

The Island of Moçambique is located on the coast of the republic of Moçambique, at around 15°S, and four kilometres from the mainland. It is situated at the mouth of the Moçambique Bay. The island is around three kilometres long and 200 to 500 metres across, with a total area of one km² and linked to the mainland by a more than three kilometres long bridge. The town of the Island of Moçambique is also the capital of the Moçambique district, which also covers part of the adjacent mainland, in total an area of 245 km², thus forming an administrative enclave on the seaboard of the Mossuril province. The district is made up of two administrative communities, namely, the municipality of Lumbo (covering the mainland) and the central municipality (the Moçambique, Goa and Sena islands).

The topography of the island is only a little irregular. The highest point is 9.07 m on the north and the lowest is 1.11 m on the south point, i. e., 50 cm below the high tide mark. On the mainland, the level above the sea never exceeded the 100 m line. The island territory is composed of corals of Quaternary origin and is partly covered by old dunes. The mainland is of the same origin, but constituted of sedimentary rocks with sandy or clayey-sandy alluvium. Only a small zone to the west differ by its calcareous formations from the upper Jurassic era. The area belongs to the hydrographic basin of the Monapo River in the south, which also is the boundary of the district. In the island areas, the ground water level is high and relatively constant at around 0.8 m above average sea level. The climate is sub-equatorial (tropical humid) with two distinct seasons, one hot and rainy (November–April), and one fresh and dry (May–October). The average relative humidity is rather high, as is the average temperature of the warmest month (26°C). The average water temperature is above the air temperature and salinity is 35 g per litre.

The Moçambique Bay, which hosts a very rich marine environment, stretches over approximately 11 km between Sanculo and Cabaceira Pequena and is relatively shallow and regular. The entrance of the bay is stocked with coral and sand banks, because of which access to the port normally is gained through the canal north-east of the island. The coastal zone is very indented, having deep entering coves providing good shelter for the traditional fishing and transport vessels. In the north, there are two large bays, the Condúcia Bay and Chocas Beach, and in the south the Mocambo Bay. The anchorage in the Moçambique Bay has a depth of 10 to 11 m

and a maximum width of 375 m. The maximum tidal range is 3.5 m. In the bay, like all along the coast, a large variety of fish is found, and also several species of sea cucumber which are collected to be exported. Shrimps are not abundant. Bottlenose and spinner dolphins, giant tortoises and various species of molluscs and crustaceans, including rare species, are common. The entire coastline of the Moçambique Island, particularly the so-called "opposite shore" in the south-east, is affected by marine erosion. Coral crags may be seen on the seashore, which form a natural but not much effective protection against the sea's erosive effect. Another factor of great ecological interest, for their significance in the marine biodiversity, are the coral banks situated around the bay as well as in the Sancul area on the mainland. There are also mangrove areas along the whole coast, especially in many coves and indents.

The Matibane area is an integral reserve, by virtue of its many plant species, including the Mcurusse plant. The area is characterised by sandy soils with very low fertility and low water retention. The predominant vegetation is bushes and trees of savannah type. The soil is barely suitable for cultivation and only plants which do not need any irrigation, such as corn, cassava, cashew, coconut and sisal agave are grown. The district's agricultural potential is sub-utilised in terms of cultivated land area. Of a gross area of 2.2 ha per family, only 0.7 ha are used. The best soils are employed for monoculture planting. In the west, there are some patches with good pastures, suitable for cattle farming and unaffected by the tse-tse fly.

Socio-economic Situation

According to the census of 1980, the island district had the highest population density in the country, with over 90 inhabitants per km², in contrast to the much less populated interior districts. From 1980 to 1991 (at the time of the demographic inquiry), the district's population went through an increase of 26.4%, going from 30 152 to 38 100 inhabitants. Of these, 11 988 reside on the islands and the remaining 26 112 on the mainland. The population density rose to 156 habitants per km². In this way, with the observed rate of increase, the population will double until the year 2023, reaching 76 000 residents. The war, which constituted the principal factor of demographic mobility, did not alter the previous scenario, but only pushed away the dwellers to the more secure river areas, increasing the demographic pressure on the Island of Moçambique. During the same period, the urban population almost doubled, growing at an average annual rate of around 5%, in contrast to the rural growth rate of only 1%. The population is characterised by a male index of 95.5 to 100 (a small decrease in comparison with 1980) and by a median age of 18.5 years (c.f. 21.2 years in 1980). All in all, the island has a young population with a high fertility rate and potentially high migration index for the adult population. Another significant characteristic of the young population is the high rate of dependency (around 97.6 dependent persons to each 100 adults), which must be seen in the context of the subsistence economy and the predominance of the informal sector.

In 1991, 64.4% of the district population were active in the economy, according to the indicators of the National Board of Statistics. Thereof, in the island area, merely 29.5% were women actively taking part in the economy, whereas on the mainland this proportion was around 52.5%. Of the economically active population, only 40% are on salary or employers, the remaining 60% being either self-employed or non-remunerated family members. Of the total working population, 62.5% are found in agriculture, 11.2% in fishing, 9.7% in industry, 6.8% in commerce, 3.5% in salt mines and 6.4% in other occupations. On the whole, the economy is predominantly of subsistence, though a market economy is found in its first developing steps. Being most expanded in the island area, it cannot generate employment for the entire economically active population. The problem of work does not solely reside in unemployment, but fundamentally in under-employment, given the seasonal character of the principal occupation, subsistence agriculture. There is a high rate of sub-utilisation of hand labour, reaching 32.4%, and a predominance of under-employment, of low productivity work and of low earnings which do not ensure an adequate livelihood.

The economy of the district is incorporated in the economy of the administrative region, the Nampula province. The work force qualification is low and the capital accumulation process is slow, and cannot be transferred into new investments in the short term. In the island and coastal areas, the predominant activities are traditional fishing and sales of products from the sea, and on the mainland it is subsistence agriculture. The latter is itinerant work and based on a reduced number of alimentary produce, notably cassava, rice and the harvesting of coconuts and cashew for sale.

The Provincial Government Reconstruction programme for 1993–1996, with help from the international community, forecasts an economic and social restoration in the province, in which infrastructure and family agriculture stand out particularly. However, the resources which in this way will reach the Island of Moçambique, will always be short of the necessities of the island.

The traditionally most active economic trade is commerce, considering the highest number of the province of shops per resident. Fishing is primarily traditional and is directed towards self-consumption and sales. Similarly, the women devote themselves to catching molluscs in low tides, for self-consumption and handicraft. The industrial sector is of a minor dimension, with obsolete tools and management problems. It includes enterprises for soap production, sisal shredding, small mills, a graphics company, a sawmill, joineries, bread making and hulling of cashew nuts. The salt production is under restoration, with an installed production capacity of 60 000 tonnes per year. Despite the great potential of the region, tourism is sparse, of domestic origin, with only one 20-room hotel in decay.

The area is relatively well served in terms of transport and access roads. A tar road

in need of urgent maintenance links the Island of Moçambique to the capital of the province and with Monapo, the industrial area of the region. Through the Nacala corridor, it has railway access to the Nacala harbour. An over three kilometres long bridge, which needs urgent maintenance, links the Island of Moçambique to the mainland. The interior settlements, the plantations as well as Mossuril and Chocas are accessible by rough-hewn trails. The old railway from Lumbo to Monapo which connects the district to the provincial railways is not operational since 1975. A well-conserved, tar airstrip of around 1 650 m in Lumbo allows for air connections to the rest of the country, although there are no regular routes at present. The already re-installed telephone system is linked to the national satellite network by radio beam, via Nacala.

The Island of Moçambique is served by two electric lines linked to the Cahora-Bassa and to the alternative thermo-energy plant at Nacala. All internal electric network was recently recovered. However, the local utility services are debating management problems and control of fraudulent, sneak hook-ups. Lumbo and some salines also make use of electric energy.

Some 44 salines are found in the low, swampy coastal areas, only half of which are operational.

The island is completely urbanised, with a well-defined borders between the "town of stones and whitewash" and the "town of macúti" (traditional straw-thatched huts covered with palm-tree leaves). There is no room for expansion. The concentrated population of Lumbo tends to re-assemble in scattered settlements bordering to cultivated land, maintaining a strong bond to old house styles. With the end of the war, re-settlement is also seen along the principal access roads, particularly in the junctions.

The network for delivery and distribution of water collected on the mainland was recently restored, providing a better service for the users. Nevertheless, the high installation costs preclude the large majority of the population from access to running tap water, and they barely supply themselves from the public fountains reasonably well distributed throughout the urban neighbourhoods. The sewage water system of the "town of stones and whitewash" is not functioning. The drainage of the rainwater in the "macúti" neighbourhood is deficient and the public latrine systems are inoperative in spite of recent efforts of restoration. The infrastructure system and essential services are precarious. The education sector is the best equipped, with ten primary schools, one secondary school, one vocational school and one arts and crafts school to be restored shortly. Yet, the basic education system is insufficient for the population's needs. The district possesses two health centres (Island of Moçambique and Lumbo) and two health stations in the interior. The most severe cases are transferred to the Monapo Rural Hospital, 47 km away.

Some development projects with external financing are under way or in their finale phases, notably, the restoration of hospital units, the improvement of the system for running water, the telephone network, the vocational training for artisans, the outfitting of primary schools, the "small schools" and the restoration of the arts and crafts schools. To be initiated shortly is the bridge reconditioning project, whereas the marine archaeological project has been interrupted.

Institutional Framework

The area constitutes one of the districts of the Nampula province, led by a District Government composed of directors and departments of various responsibilities, and is headed by an Administrator, also the town's Executive Council President. The foreseen structure, already in an experimental stage, is the Municipal Council which will combine the former two, the District Government and the Executive Council, and which will be elected by direct vote, as will its president. The Island of Moçambique is included on the UNESCO list of world heritages, is a part of UCCLA and endeavours a twin city policy with other historical communities internationally. One civil community institution is particularly active in the problematic issues of island conservation, namely the Association of Friends of the Island of Moçambique (AAIM). A technical cabinet founded by the Ministry of Culture, Youth and Sports is presently looking over the problems of restoration and development of the Island of Moçambique in a scientific and multi-disciplinary approach.

Major Environmental and Development Problems

Deterioration of the Cultural Heritage

The deterioration of the urban environment and of the building heritage is one of the most prominent problems of the Island of Moçambique. The infiltration of the rain water due to lacking maintenance of terraces and walls, the growth of weed, especially the African fig tree, and vandalism on part of man stand out as the main causes to the problems. Yet an important factor is water rising by capillary forces, transporting dissolved salts. Around forty-five monuments or important public buildings, 400 houses of stone and limestone and 1 200 "macúti" huts need restoration urgently. The present legislation and municipal ordinances (or the absence of regulation) do not allow for a legal framework which would force users to preservation. The situation is worsened by the majority's weak economic, cultural and educational level.

Sanitation and Drainage

There are two fundamental problems: the usage of the beaches by residents as a privy, and the unhealthy situation in the "macúti" neighbourhood where the drainage of rainwater is inadequate due to lack of conclusion of an old sanitation project. Some of these areas are below the high tide mark. In 1983, analysed cultures of sea-water samples taken alongside the island already showed a concentration of *E. coli* bacteria in all parts, lesser in the northern end and greater next to the southern

neighbourhoods. The degree of contamination makes it highly probable that other micro-organisms responsible for intestinal, respiratory and other infections also are present. The old public latrine systems (the "sentinas") is out of order. The low-cost sanitation programme (improved latrines) has not yet reached the island, and the lack of running water, for reasons of religious nature, does not allow for use of the existing ones. The island does not have an efficient system for collection and disposal of trash. There is no collection schedule, nor any laws or regulations demanding a specific recipient.

Water Supply and Quality

The collection, conduction and distribution system for running water, having a capacity of 125 m³ per hour, was recently restored through external financing. The water is collected in the Monapo River and in Entete around 20 km from the island. The cost of connection to fresh water is prohibitively expensive, why access is still low. The majority of residents get their fresh water from public fountains. Another important source of fresh water is the over 150 traditional cistern receptacles, some in bad condition. The receptacles are found abandoned and open, with stagnant water where diseases can proliferate.

Marine Environment

The coral reefs around the bay have great natural richness and biodiversity and must be preserved, if nothing else for their significance in the reproduction of economically important species. The uncontrolled collecting of corals for export and local handicraft are already common practice, placing the present fragile equilibrium in peril. There has been no comprehensive inventory of the fish stocks, nor of the reproductive capacity of the bay. The fishermen complain saying that the bay around the Island of Moçambique "is dead" and that they now have to travel farther to catch enough fish. The principal fish species include black ray, box fish, file fish, groupers and parrot fish. Larger crustaceans are also abundant. A comparison of aerial photos show that at least 40% of the sandy beaches of the island have been lost over the last 27 years. The openly exposed beaches in the south-east and the north-west are the most vulnerable. The ascent of the average sea-water level, at the rate of one millimetre per year also contributes. The large walls of the so-called "opposite shore" is presently undergoing restoration, but need extension.

Plant Resources

Fire wood, the principal energy source used, comes from the secondary forests on the mainland. It is usually a side-product from the practice of slash and burn in the preparation of ground for cultivation. The difficult access during the war years provided for a good reproduction of the secondary forests, and species of rapid growth can make a good base for supply of fire wood. Still, the business of bread making, for which the total bulk spent is 522 tonnes of wood per year, should be taken into consideration. Total daily fire wood consumption on the Island of Moçambique reaches 26 tonnes. The mangrove species are not generally used for

fuel, except for the cooking of sea cucumbers. The ample variety of tree species also yields material for boats and houses, and manufacture of utensils and medical preparations, without great implications on the ecological balance.

Usage and Planning of the Urban Area

The Island of Moçambique is completely urbanised and does not have any more land for expansion. Still, some buildings, more or less elusive, appear in areas reserved for green spaces next to the south point. The "macúti" neighbourhoods are completely crowded because of the large land holdings, resulting in constant loss of living quality. The access to the interior of the neighbourhoods is poor and open spaces and greenery are scarce. The proportion of services is not uniformly distributed on the island, and are to a large extent concentrated to the "town of stones and whitewash". There is no data of any sort on the urban area occupancy, which makes its management difficult.

Proposals for an Environmental Management Plan for the Island of Moçambique

The concept of environmental management must not confine itself to the simple protection of nature, but also treat the control and correction of man's actions, and the effects of over-population. This should be kept in mind whenever intervening in any place in the region. When settlers occupy the territory, the destruction of the natural wealth that cannot be substituted must be avoided. The harmonious development of the activities of the primary sector (agriculture and fishing), the secondary (food and artisanal industry) and the tertiary (tourism, special equipment and services) should be the fundamental objective of any environmental management plan, for development in this coastal area. The basic problem and what conditions all sustainable development is the over-population of the coastal zone and the island area. This causes a pressure on the natural resources, particularly the marine which presently make up the principal source of protein in the diet.

Therefore, a proposal for a management plan must base its strategy on the following principles:

1. Management of human occupancy and centres of attraction, by not allowing more settlements in the coastal zone and placing services of attraction on the mainland, and assisting the diversification of economic activity, thus relieving the pressure on the marine resources and environment.
2. Effective, legal protection of the coastal resources, creating a "nature protection zone" divided in areas of interest, according to the biodiversity and the habitats that exist:
 - A protection area for the rich coral reefs.
 - A protection area for fish species suitable for cultivation.
 - A protection area for dunes, mangroves, and the characteristic fauna and flora of the coast.

3. An integrated directive plan for the tourist development which would promote selected tourism, boosting all the cultural and environmental potential of the axis: Matibane – Chocas – Mossuril – Lumbo – Islands of Moçambique and Goa – Lunga. (The boarding tourism on the Island of Moçambique and hotel tourism in Lumbo, connections to Chocas, to Lunga and to the interior zones, cultural, "eco" and adventure tourism, entertainment, casinos and water sports and development of transports.)

Other development aspect to consider should be:

- Restoration of the building heritage (monuments, public edifices and services, groups of houses, traditional houses), solving the problem of the dissipation of the state property and creating a support project for assisted reconstruction, but by the community itself.
- Urban re-planning and management (management and recreation of greens and commons, re-planning of the "macúti" zones, traffic, and infrastructure maintenance).
- Rudimentary sanitation, with view to improve the quality of life for the population and for tourists (restoration of public latrines, building of improved latrines, restoration of the old sewage system, drainage of rainwater in the "macúti" neighbourhoods, support for managing the water company, restoration of the cistern receptacles, collection and disposal of trash etc.).
- Control of the coastal erosion on the Island of Moçambique and monitoring in the long term, promoting the restoration and extension of the concrete walls, cultivation of plants helping to bind the soil, and a study of the need for construction of breakwaters.
- Improvement of access roads, and the construction of a seaside road that would encompass the whole coastal region and facilitate efficient control of the territory.
- Actions to "build capacity" for overseeing institutions (municipal council, port authority, restoration, agriculture, fisheries and other cabinets) which would include the institutional strengthening, the shaping and creation of a database (geographic information system).
- The establishment of a Moçambique Island Institute (by development of the present technical cabinet), for investigation, control and monitoring of the resources, the legislative initiatives, accessory to decision-making entities, environmental conscientiousness of the community etc.

THE ARUSHA RESOLUTION

RECOGNISING, that coastal areas contain a number of critical terrestrial and aquatic habitats, as well as diverse and valuable resources, and that coastal ecosystems are intimately linked with social, economic and cultural development processes:

WHEREAS, many major cities of the Eastern African region are located in coastal areas, and these areas include significant populations and are focal points of human activity, and the economies of the region are extremely dependent on the continuing productivity of activities, such as fishing, forestry, agriculture and mining, which are based on natural resources, and important food and cash crops are grown in coastal areas, and fish and other aquatic resources provide food, materials, employment and income for many coastal people, and the region's coastal areas also provide many other economic opportunities, especially tourism and shipping,

WHEREAS, experience in other regions of the world shows that the nature or intensity of coastal activities can give rise to natural resource and environmental management concerns and lead to serious deleterious impacts on the productivity of coastal ecosystems, adversely affecting the food security, health, nutrition and economic welfare of coastal populations,

WHEREAS, coastal management problems in the Eastern African region are serious, and there are some localised areas where there are acute problems such as oil pollution,

WHEREAS, experiences in Integrated Coastal Zone Management (ICZM) in other regions have shown that prevention is better than cure, as well as the importance of balanced use of coastal resources;

WHEREAS, economic and social development of coastal areas and protecting the resource base and the environment must be mutually supportive if development is to be sustainable, and the purpose of integrated management is to allow multi-sectoral development to progress with the fewest unintended setbacks and the least possible imposition of long-run social costs,

WHEREAS, coastal planning efforts cannot be divorced from terrestrial management and must be integrated with national economic and physical planning,

WHEREAS, poor planning and management in coastal areas can increase the loss associated with natural processes such as coastal erosion and catastrophic events such as major storms, floods and oil spills,

WHEREAS, there is a lack of capacity in the region to deal effectively with complex coastal management issues,

WHEREAS, political leaders can contribute to meeting this commitment in the region, and government decision-makers and the private sector, including NGOs, can play a crucial role through their support of management plan development and implementation, and their encouragement of coastal communities to act cohesively to enhance prospects for sustainable development of coastal areas, and community participation is essential and should actively involve all stakeholders, particularly women and resource poor groups,

WHEREAS, international organisations and donor agencies can likewise contribute meaningfully to the course of development of coastal areas by ensuring that all sectoral projects funded are congruent with multi-sectoral development plans,

WHEREAS, it is important to increase public awareness regarding the importance of coastal resources, the dependence of continued prospects for economic development in coastal areas and the proper management of coastal resources,

WHEREAS, coastal resources will continue to be essential for the economic welfare of future generations in the Eastern African region, and there is a growing awareness on the part of governments of the region regarding the need for sustainable development of coastal areas,

WHEREAS, in recognition of the need for effective coastal management strategies, the countries of the Eastern African region have affirmed their concurrence with the mandate in UNCED's Agenda 21 for new approaches to development and management of coastal areas that are more integrative, precautionary and anticipatory,

THEREFORE, we the Heads of Delegations participating in the policy Conference on Integrated Coastal Zone Management in Eastern Africa Including the Island States hereby resolve and recommend that the countries of the Eastern African region give emphasis to the sustainable development and integrated management of coastal areas for the primary benefit of coastal communities by:

- Establishing policies that promote and enhance integrated planning and management of coastal areas by integrating the coastal zone into national economic and physical planning.

- Developing and implementing ICZM programs which address environmental concerns, particularly resource over-exploitation, environmental degradation and loss of biodiversity, and emphasise action at the local level.
- Promoting effective sectoral implementation of ICZM programs through creating mechanisms and means for cooperation of and coordination among sectoral agencies, and among regional, national and local agencies.
- Clarifying the jurisdictional mandates of agencies and governmental units (geographical, sectoral and trans-sectoral) governing the use of coastal resources and assessing and clarifying all legislation (formal and customary) relating to access to coastal resources in particular property rights, occupancy patterns, and user rights in coastal areas.
- Promoting further links between marine and social sciences and the decision-making process.
- Strengthening management capabilities of relevant agencies, particularly at the local level, for effective management of the overall environment, especially coastal areas.
- Implementing and rigorously enforcing effective legislative instruments and supporting incentives to reduce resource use conflicts as well as to prevent and control environmental degradation in coastal areas.
- Investing in public education and awareness programs to create a broader and stronger constituency for proper management of coastal areas.
- Promoting approaches and strategies, such as alternative livelihood programs and economic diversification, to reduce pressure on coastal resources.
- Promoting the involvement of all stakeholders in the development and implementation of ICZM programs, particularly the involvement of local communities, including women and resource poor groups.
- Providing appropriate incentives and guidelines for the private sector to develop environmentally friendly economic activities.
- Promoting bilateral and multilateral training relationships between countries of the Eastern African region, and between these countries and other countries with more highly developed coastal zone management capability.
- Supporting the building of local capacity, *inter alia*, through establishment of centres of excellence for ICZM training in the region, such as Mbegani Fisheries Training Centre.
- Encouraging the preparation and implementation of contingency plans for handling oil pollution disasters.
- Establishing and strengthening other appropriate institutions, such as the proposed Marine and Coastal Biodiversity Centre in the Seychelles.
- Giving consideration to the special problems faced by small island states.

We also recommend that scientists should adopt a multi-disciplinary research approach involving ecological, economic and other social sciences to holistically address management problems in coastal areas, and provide information, including documentation on indigenous knowledge relevant to coastal development and

management, particularly in providing a diagnostic profile of the coastal areas, resource valuation and environmental accounting, identification and analysis of resource use conflicts and their resolutions, policy and management options as well as investment opportunities.

We recognise the importance of the Nairobi Convention on the Protection, Management and Development of the Coastal and Marine Environment in the Eastern African Region and related protocols for the regional follow-up of this resolution, and encourage Governments, which have not done so, to decide upon their ratification or accession in the shortest possible time, as well as other conventions relevant to coastal zone management, in particular the International Convention on Pollution of the Sea from Ships.

We agree that a meeting at a ministerial level be held within three years as a follow-up to this policy conference, and invite the Government of the Republic of the Seychelles to consider hosting such a meeting, provided financial resources from external sources are available.

We recognise the role of UNEP in coordinating the Eastern African Action Plan, within the framework of the Nairobi Convention, and the role of other international organisations in the promotion of ICZM, further, considering the importance of this Policy Conference and the need for follow-up, invite the Government of the United Republic of Tanzania to serve as coordinator for this purpose.

SIGNED April 23, 1993, on behalf of the Governments of:

Republic of Madagascar

Hon. Mr Etsifosaine, Minister of Water and Forests

Republic of Mauritius

Hon. Mr Cuttaree, Minister of Housing, Lands, Town and Country Planning

Democratic Republic of Mozambique

Hon. Mr Kachimila, Minister of Mineral Resources

Republic of the Seychelles

Hon. Ms Danielle de St. Jorre, Minister of Environment, Economic Planning and External Relations

United Republic of Tanzania

Hon. Mr Juma Omar, Minister of Tourism, Natural Resources and Environment

In the beginning of May 1993, Hon. Mr Sambu, Minister of Natural Resources signed the Resolution on behalf of the Government of the **Republic of Kenya**.

THE SEYCHELLES CONFERENCE STATEMENT

WHEREAS, the Governments of the Republic of Kenya, Republic of Madagascar, Republic of Mauritius, Republic of Mozambique, Republic of Seychelles, and the United Republic of Tanzania were signatories to the Resolution of the Policy Conference on Integrated Coastal Zone Management in Eastern Africa including the Island States, held in Arusha in 1993 (the ARUSHA RESOLUTION):

WHEREAS, the ARUSHA RESOLUTION and NAIROBI CONVENTION commits the countries of the Eastern African region, including island states to give emphasis to the sustainable development and integrated management of coastal areas for the primary benefit of the coastal communities,

WHEREAS, there is now a significantly higher public awareness of the declining state of resources and the deteriorating environmental conditions of the coastal and marine areas, and also increased political will and commitments to address the environmental problems since the ARUSHA Policy Conference through the implementation of ICZM projects and programs throughout the region,

WHEREAS, there are increased national and international investment in preventing and mitigating coastal pollution, promoting sustainable use of marine and coastal resources, protecting marine biodiversity, and support for research and capacity building in marine science and coastal management,

WHEREAS, donor agencies and international communities are taking positive steps to work together in addressing common environmental and resource management issues in the East African region,

WHEREAS, the scientists in the region have made significant contributions in providing useful scientific assessment and evaluation of the coastal and marine environment in the region, and are undertaking interdisciplinary research in addressing management problems,

WHEREAS, the technical meetings of regional ICZM experts held in Tanga, Tanzania, in August 1996, and again in the Seychelles in October, 1996 have evaluated the progress and effectiveness of ICZM efforts in the region with special reference to institutional and legal arrangements, compliance to regulations and enforcement measures, capacity building, financing, public awareness, stakeholder participation, research, monitoring and information exchange,

WHEREAS, in recognition of the analysis made by the technical experts as contained in the documents *The Journey from Arusha to Seychelles*” and *Proceedings of the Experts and Practitioners Workshop on Integrated Coastal Area Management for Eastern Africa and Island States*” particularly the recommendations to improve the efficiency and effectiveness of ICZM program development and implementation; interagency coordination, collaboration and coordination amongst donors and international agencies,

WHEREAS, despite the significant progress made by the concerned national governments, the environmental management problems and the issues of sustainable natural resources use in the coastal and marine areas are far from being satisfactorily addressed,

WHEREAS, the Integrated Coastal Zone Management approach is effective in addressing coastal and marine environment management problems, the planning and implementation process requires considerable time and resources, and the cyclic process of ICZM development requires maturation time to have measurable impacts,

WHEREAS, in recognition of the fact that the coastal and marine areas contribute to the livelihoods and welfare of 60–75% of the population, and that the coastal and marine resources are the mainstay of economic development in the region including coastal tourism, fisheries and other maritime trades,

THEREFORE, we the heads of delegations participating in the Second Ministerial Conference on Integrated Coastal Zone Management for the Eastern Africa including the Island States hereby resolve and recommend that the countries of the region further support the efforts and initiatives being made in the implementation of Agenda 21 particularly in the integrated approach for the management of the coastal and marine areas, and that it be agreed to:

A. Policies and Institutions

- Undertake to fulfil the provisions of the Nairobi Convention and the Arusha Resolution now that they have come into force; particularly the establishment of the Regional Coordinating Unit initially with the interim unit in 1997 at St. Anne Marine Park, Seychelles, and the updating and implementation of the East African Action Plan.
- Ensure that the planning of land and sea resource use harmonises development with the conservation of natural habitats, biodiversity, and socio-economic aspects.
- Establish multi-sectoral coordinating mechanisms for ICZM activities and streamline procedures at all levels to facilitate participatory and collaborative decision making, planning, and implementation, including at international levels.

B. Legislation

- Harmonise ICZM-related legislation vertically and horizontally across sectors, such as between physical planning, tourism, fishing, maritime activities, and environmental protection, and others.
- Harmonise ICZM related legislation in conformity with existing international and regional conventions and agreements such as the Nairobi Convention, UNCLOS, and others.
- Call upon states that have not ratified the Nairobi Convention, to do so.

C. Compliance and Enforcement

- Strengthen preventative and enforcement mechanisms, and capacity, in order to address problems such as dynamite fishing and other destructive practices related to the use of coastal and marine resources.
- Ensure the implementation of EIA procedures within coastal resource use activities.
- In order to gain the cooperation of local communities in conservation of coastal and marine resources, steps should be taken to include stakeholders in participatory management and incentive-based approaches rather than relying solely on command and control enforcement measures.

D. Financing

- Encourage the allocation of adequate budgets for ICZM planning and implementation at all levels of government.
- Call upon donors to support, review, revise and harmonise programs of support for ICZM in a partnership manner which builds on progress to date, identifies gaps, and allocates resources as effectively as possible.
- Promote the participation of the private sector, NGO's and CBO's to contribute to development in an ecologically and socially responsible manner.

E. Capacity Building and Public Awareness

- Develop and implement a strategy for capacity building and identify institutional needs for ICZM that ensures establishment of a critical mass of personnel and appropriate incentives to retain them.
- Promote awareness, education and continuing training at all levels, incorporating indigenous knowledge and using local expertise.
- Optimise use of existing expertise and training facilities in the region including intra-regional sharing of experience, and establish centres of excellence for the various aspects of ICZM.

F. Stakeholder Participation

- Continue to provide strong political support and commitment to ICZM.
- Ensure the long term sustainable use of the coastal zone through the participation and empowerment of coastal communities taking into consideration the requirements of public interest, and maintaining a balance between local, regional and national interests.
- Encourage participation by the private sector, NGOs, and CBOs.

G. Research, Monitoring and Information Exchange

- Establish mechanisms to monitor and evaluate progress towards sustainable development with the aim of balancing short term needs against long-term costs and benefits.
- Develop a strategy that will improve the knowledge of coastal ecosystem function in the region and establish mechanisms for applying scientific knowledge to optimise the use of, and sustainably manage, coastal resources.
- Further develop mechanisms, protocols and codes of conduct for gathering, processing, exchanging and sharing information, including vertical and horizontal integration, and communication between and within institutions, and between scientists and coastal policy makers.

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