

**INTRODUCTION TO THE FIRST REVISION (2000 - 2005) OF THE
1997 - 2001 MANAGEMENT PLAN FOR THE MAPUTO SPECIAL RESERVE**

This is a first revision of the first Management Plan for the Maputo Special Reserve (MSR), which was published in January 1997 by the National Directorate for Forestry and Wildlife (DNFFB) with technical and administrative assistance from IUCN and GEF/The World Bank.

The plan covered the period 1997 - 2001, but was never approved. Its execution was further compromised by a variety of factors including lack of operative and capital funds, and most importantly the signing of a management agreement (forming part of a much wider concession) between DNFFB and private investors (Blanchard-Sodetur). The agreement placed most of the responsibility for the execution of the MP and management of the MSR in the hands of the investors. The agreement was terminated in November 1999 by the Council of Ministers as a result of lack of engagement of funds and/or planned activities by the concessionaire.

Given that:

- responsibility for the management of the MSR has reverted fully to DNFFB;
- three of the five years of the original operating period of the MP have expired;
- certain circumstances had changed over time; and
- that the MP has yet to be ratified

DNFFB have conducted this first revision of the Maputo Special Reserve Management Plan. The timetable of the revised document has been brought forward to the five-year period 2000 - 2005, and no significant changes in objectives and/or activities of the MP have been made given that these have been largely untested since its publication, and the basic premises surrounding the original management plan remain largely unaltered.

Signed:.....
Director of Wildlife

PART 1 - SETTING, VISION, OBJECTIVES AND ZONING

1 INTRODUCTION

1.1 Background to Management Plan

The purpose of this management plan for the Maputo Special Reserve (MSR) is to provide a framework for the rehabilitation and development of the reserve over the five years 2000 – 2005, and will provide guidance for management staff. This includes the integration of all donor, NGO, private sector, institutional and Government of Mozambique (GoM) activities in the Reserve.

The plan is based on existing information contained in the first 1997 – 2001 Management Plan for the MSR, on field work undertaken between 1996 - 1999, and on the results of consultation with relevant stakeholders. Stages of the planning process were as follows:

- formation of the planning team
- collection of existing information on the reserve
- fieldwork to collect further information required
- consultation with government, communities, private sector and non-government organisations over their interests, ideas and aspirations for the reserve area in the future
- identification of issues facing the reserve and review of options for future management
- definition of management objectives, strategies and detailed prescriptions for their implementation
- consultation over the draft plan
- finalisation of the plan document.

Ideally a greater amount of community consultation should have been done. Historically, the relationship between communities and reserve has been very poor, and it will take time for communities to trust and collaborate with the reserve administration as tangible benefits become available to them. The planning process promoted this dialogue, which will be continued during plan implementation.

This management plan is not rigid. It contains basic objectives, activities and strategy for the five years 2000 - 2005, but implementation must be flexible and adapt to the rapidly changing situation in Mozambique in general, and this region in particular.

The plan is in two parts:

Volume 1: background, purpose and significance, issues, management objectives, strategies and actions

Volume 2: compilation of information on the area, focusing on as yet unpublished information collected during plan preparation.

The original 1997-2001 management plan was produced by a planning team comprising:

- Mateus Chambal (Reserve Administrator during planning period)
- Paulo Tomás (Reserve Administrator during planning period)
- Sr Matias (Matutuine District Administration, during planning period)
- Bartolomeu Soto (Head of Wildlife Department, DNFFB)
- Augusto Correia (Head of Protected Areas, DNFFB, during planning period)
- Felismina Atanásio (Marine Biologist, DNFFB)
- Charlotte Boyd (Natural Resources Economist, DNFFB, during planning period)
- Judy Oglethorpe (DNFFB Wildlife Planning Advisor, planning coordinator, during planning period)
- Peter Goodman (Chief Ecologist, Natal Parks Board)

Planning work was funded by Phase 3 of the Transfrontier Conservation Areas and Institutional Strengthening Project (now referred to as the TFCA Project) financed by the Global Environment Facility through the World Bank and IUCN (The World Conservation Union), and funding was also received from the Gorongosa-Marromeu Emergency Programme through the component for institutional support to DNFFB at national level, financed by the European Union.

The planning team would like to acknowledge the assistance of all those who assisted in the preparation of this plan. A list of people consulted during the process is given in Volume 2.

1.2 Setting of the plan

1.2.1 General

Maputo Special Reserve was originally established in 1932 to protect the elephant population in the area. It lies in Matutuine District of Maputo Province in Southern Mozambique, south of Machangulo Peninsula. Its current boundaries are: Maputo Bay in the north; the Indian Ocean to the east; the Maputo River, the Futi River and a line 2 km east of the Salamanga-Ponta do Ouro road in the west, and the southern end of Lake Xingute and the southern restriction of Lake Piti in the south (Map 1).

The reserve contains both coastal and inland components, with a wide variety of habitat types. It has a remarkably high biodiversity value, lying within the Maputaland Centre of Global Plant Diversity which has high species diversity and endemism at specific and subspecific levels, particularly in the flora, avifauna, herpetofauna and ichthyofauna. Values of the reserve are reviewed in more detail in section 4.2.

Up until the early 1980s the integrity of the reserve was severely affected by human settlement, livestock and other activities occurring inside its boundaries. The subsequent civil war had large impacts on the reserve, resulting in a great reduction of most of the remaining large mammal populations, the evacuation of most of the local people resident in the reserve and surrounding rural areas to safer places, and the destruction of their livestock herds. This resulted in recuperation of degraded habitats, and the reserve is now in excellent condition apart from the depleted larger mammal populations.

With the coming of peace, local people are moving back into the reserve, although numbers are significantly lower than before the war. Their level of activity is low and there are virtually no cattle or goats. Currently, the Transfrontier Conservation Areas and Institutional Strengthening Project (TFCA Project), funded by the Global Environment Facility, carries a mandate to rehabilitate the Reserve, but expected funding was withdrawn following the granting of a concession (including the area of the MSR) to Blanchard Sodetur. The TFCA Project is involved in a five-year programme within DNFFB, promoting the creation of three TFCAs (Chimanimani, Gaza-Kruger-Gonarezhou and Lubombo) between Mozambique and its neighbours. The MSR falls within the north-east of the Lubombo LTFCA, which covers a total area of 25,000 km². The coordination of the Mozambican sector of the Lubombo LTFCA is the responsibility of the Maputo SPFFB in collaboration with the TFCA Project, employing a Regional Coordinator and short-term Technical Advisor working together with Swazi and South African counterparts.

1.2.2 Previous plan

The 1997 – 2001 management plan followed on from an eighteen-month emergency plan (Zolho 1995) produced to guide management during the rehabilitation phase until the longer term plan was available. Its objectives were to:

- create a management committee capable of tackling the existing management problems and facilitating the formulation of a general management plan;
- guarantee the maintenance of biodiversity of the reserve;
- establish legal, institutional and operational mechanisms to generate funds for the self-financing of the reserve;
- improve the protection of people and their goods for the neighbouring populations
- improve the anti-poaching work; and
- create mechanisms to guarantee opportunities for consultation with and participation of adjacent communities over the management plan.

Some of these objectives have been partially achieved (see Volume 2). A network of anti-poaching posts has been established and protection of crops on the western boundary has been intensified. Consultation with adjacent communities has developed. In general terms the biodiversity of the reserve has continued to be protected, although illegal hunting of large mammals has not stopped. Some funds are being generated by the Reserve, and mechanisms to collect and regulate revenue from the Reserve have been established.

1.2.3 Main issues facing the reserve

The main issues facing the reserve include:

- low numbers and species diversity of large mammals;
- local communities living inside the reserve - it appears that this process is escalating;
- continued illegal hunting;
- uncontrolled burning;
- conflicts between elephants and local people outside the reserve;
- undeveloped tourism potential;
- changing hydrological situation;
- inappropriateness of the boundaries;
- access within the reserve and to Machangulo; and
- low management capacity.

Ecologically, the MSR is in good condition apart from the low numbers of larger mammals. People living inside the reserve are currently low in number (about 1,000) compared with pre-war figures (up to 10,000), but the increasing levels of returnees is a cause for concern in the absence of any clear strategy with which to deal with the problem. Levels of their resource use are generally low and localised, apart from illegal commercial gill-netting in some of the lakes. There is hardly any livestock, and vegetation has largely recovered from pre-war overgrazing. This situation is transitory. - if more people return to the reserve, resource exploitation will increase and livestock numbers may build up again, and the situation could evolve to the point where the MSR objectives are compromised.

The MSR is at a critical point in its history, requiring decisions and initiatives to be taken to ensure its integrity, whilst at the same time working out a solution for the local people which is fair and acceptable to them.

These issues are outlined in greater detail in Volume 2, and are summarised in sections 8-17 below.

2 NATIONAL FORESTRY AND WILDLIFE POLICY

Maputo Special Reserve falls under the remit of the National Directorate of Forestry and Wildlife (DNFFB). Its long-term policy objective (República de Moçambique 1996a) is:

To protect, conserve, use and develop forest and wildlife resources for social, ecological and economic benefit for the current and future generations of the Mozambican people.

Encompassed in this are the following specific objectives:

Social objective: *to strengthen the role of forest and wildlife resources in the alleviation of poverty and increase in community participation in the management and use of resource.*

Ecological objective: *to protect and conserve forest and wildlife resources and emphasise the role of forest resources in soil and water conservation and other environmental benefits*

Economic objective: *to strengthen the role of forest and wildlife resources in the promotion of economic development, in satisfying demand for forest produce and in generating income and increase in national income through efficient revenue collection*

Medium-term strategic objectives with regard to protected areas include protection, management and use of these areas to promote sustainable development at national and local levels, good land-use and conservation of biological diversity. Specific strategies in protected areas cover rehabilitation and management of forests and wildlife to conserve their biological diversity; conservation of mangroves and other fragile ecosystems; protection of dunes, water catchments and corals; and collection and use of germplasm for improvement, propagation and scientific research.

The policy envisages the State, rural communities, private sector, donors and NGOs as taking active roles as partners in the development of the forest and wildlife sector. Local community involvement in integrated management, use and conservation of resources is to be increased, including involvement in management of protected areas through mechanisms yet to be established. DNFFB will promote private sector involvement in resource management and use including in protected areas, contributing to gross national product and employment. Activities will include industrial development and ecotourism.

Donor support will continue to be sought to provide the initial investment required to promote development of the sector. In the long term the aim is to achieve self-sufficiency in resource management, poverty alleviation and development of democratic institutions in rural populations to improve the conservation of biodiversity and sustainable use of resources. NGOs will be encouraged to continue to build local capacity for this purpose, and to assist in obtaining additional funding for the sector.

The strategy also covers institutional development at national, provincial and district levels within government including staff development. It includes consolidation of applied research and development of a new approach to the management of community resources.

Other national policies relevant to the plan are outlined in Volume 2, including the new Land Law.

3 REGIONAL INFLUENCES

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The Maputo Special Reserve is located near to Maputo, the capital city of Mozambique, and is close to South Africa and Swaziland. Many developments have been proposed in the nearby areas, including commercial agriculture, commercial forestry, tourism, private game reserves, and livestock husbandry. Plans exist to reopen the limestone quarry and the lime factory at Salamanga. There are many local communities nearby who are heavily dependent on natural resources for their livelihood.

There is a proposal for official recognition of the Futi Corridor to promote conservation of biodiversity and sustainable development for local communities, which will be driven and supported by the Transfrontier Conservation Areas (TFCA) Project. MICOA is collaborating with KwaZulu Natal Nature Conservation Services on a proposal to create a marine reserve linked to the St Lucia Marine Reserve (itself now part of the St Lucia World Heritage Site), and there is a recent move to apply for World Heritage Status for the area extending from Inhaca Island to Ponta do Ouro (including the Maputo Special Reserve).

The road from Bela Vista to Ponta do Ouro is to be upgraded under the trinational economic development agreement known as the Lubombo Spatial Development Initiative (LSDI), which will have large direct and indirect impacts in the area, including employment, settlement, tourism development, and both legal and illegal resource extraction. Under the same LSDI protocol, the old road from Siteki in Swaziland to Goba in Mozambique, is being upgraded. The national electricity grid will also be extended to the region.

A land use plan for Matutuine District has recently been prepared in order to resolve some of the potential conflicts among the various land uses, and establish a framework for future development (INPF 1996). The draft plan proposes the whole of the area east of the Maputo River for conservation and tourism, with promotion of community management of natural resources. Additionally, an Environmental Strategy for Maputo Province is being prepared by MICOA, funded by Danida.

4 PURPOSE, SIGNIFICANCE AND VISION

4.1 Purpose

The MSR was originally established to protect the elephant population in the area. Its purpose in the 1960s was expanded to include the protection of other large mammal species. In the 1990s its purpose has again been broadened with the growing recognition of its wider biodiversity importance, and now is:

To contribute to the protected areas system of Mozambique by conserving the exceptional biodiversity of this coastal zone which lies in the Tongaland-Pondoland biogeographical region and combines coastal and inland components.

4.2 Significance

The main attributes of the reserve are outlined below.

- **Maputaland Centre of Plant Diversity:** the Maputo Special Reserve is situated in part of this centre of globally significant plant endemism, one of only four identified in southern Africa. The MSR lies in a strategic position at the southern limit of the tropics where many species are at the southern limit of their range, and also contains species from more temperate zones to the south. The status of endemics found in the reserve is poorly known, but by extrapolation from similar areas nearby, endemism is likely to be high.
- **Plant community diversity:** the reserve supports an impressive variety and combination of terrestrial plant communities and ecosystems, some of which are not protected elsewhere in southern Africa. They include floodplain, savanna, mangrove, swamp forest, dry licuati forest and woodlands on sand, coastal dune forest, dry grasslands, and hygrophilous grasslands (fresh and saline). Associated with this is likely to be a high species richness, not yet fully inventoried.
- **Wetland communities of international significance:** the reserve and its immediate surroundings contain a diverse variety and extensive system of wetland communities, including riverine and estuarine communities, seagrass beds, mangrove, saline and freshwater hygrophilous grasslands, reed and sedge beds, swamp forest, fresh and saline coastal lake systems, and marine shoreline with sandstone reefs supporting the subregion's most diverse coral communities. The reserve would qualify under the RAMSAR convention as a wetland site of international significance, should Mozambique become a signatory to the convention.
- **Fish:** the reserve supports at least three fish species which are endemic or near endemic to the Maputaland Centre.
- **Reptile populations:** the marine shoreline is an important nesting site for leatherback and loggerhead turtles. The reserve contains a healthy population of Nile crocodiles, considered by Tello (1973) to be the largest in Mozambique south of Gorongosa. All these species are currently on CITES Appendix 1. Levels of endemism are high, especially in fossorial species in the dune forests.

- **Birds:** the reserve supports a wide variety of bird species due to its broad range of habitat types, including several that are CITES listed, and three species and 47 subspecies which are near-endemic to the Maputaland Centre.
- **Large mammal populations:** the MSR contains a breeding population of over 200 elephant, concentrated in the north-western part of the reserve. This is the last remaining large population of elephants in Maputo Province, and the most southerly in Africa apart from those in Tembe Elephant Park and Addo National Park (South Africa). It is suspected that, together with the Tembe elephants, these elephants constitute a genetically distinct population. Historically, the reserve supported a wide range of species, protecting populations of national importance.
- **Scenic beauty:** the MSR encompasses land- and seascapes of exceptional beauty. The former include extensive vistas of an undulating landscape of marshes, grassland, woodland and forest capped ridges, while the latter comprise turquoise seas and white sand beaches bounded by forested coastal dunes.
- **Sacred and cultural sites:** a number of sacred burial and ceremonial sites of great significance to current and past residents of the area exist within the boundaries of the MSR.
- **Strategically situated tourist destination:** situated close to Maputo and its international airport, South Africa and Swaziland, the reserve is well positioned to potentially receive national and international tourists.
- **Environmental education:** proximity to Maputo and district centres and relatively easy accessibility, coupled with its distinctive natural features, gives the reserve excellent potential for environmental education at all levels.

Resources: natural resources in the MSR form a very important part of the subsistence of resident and adjacent communities. These include fish, honey, building materials (poles, grass and reeds), wild food plants, medicinal plants and game. Small but significant areas are cultivated inside the reserve. Some resources such as mangrove produce, game meat and fish are removed by non-residents.

4.3 Vision for Maputo Special Reserve

Maputo Special Reserve will be managed to conserve through protection and wise use the exceptional terrestrial and marine biodiversity of this area, and will form a key part of a larger international biodiversity conservation area. The reserve will offer opportunities for tourism development, and community involvement and benefit.

Specifically, the vision encompasses the following aspects.

- **Biodiversity conservation:** the biodiversity of the MSR will be conserved (ecosystems and landscapes, species diversity including endemics, and genetic resources); the large wild land mammal populations which once characterised the area will be re-established and maintained.
- **Conservation of marine systems:** the limits of the MSR will be extended to ensure conservation of the adjacent marine systems and their plant and animal communities, including threatened species.
- **Ecological connectivity:** linkages with other new and existing protected areas will be enhanced in order to maintain their connectivity with the reserve and promote the viability of this core area of biodiversity. Specifically this will be done through extension of reserve limits in the north and east, and the promotion of the Futi Corridor and conservation of habitats in other areas south and west of the reserve, and through the inclusion and integration of the of the MSR within the proposed Lubombo LTFCA.
- **Involvement of local communities:** communities living inside and adjacent to the reserve will participate in and share responsibility for reserve management; current conflicts will be mitigated through continued access to sacred sites and the sustainable use of certain natural resources, and the integration of local development with conservation and tourism.
- **Tourism, recreation and education:** diverse opportunities will be created for citizens and foreigners to appreciate the natural values of the reserve, for the purposes of enjoyment, education and revenue generation.
- **Local and national development:** the reserve will play a role in promotion of local development through attraction of investment funds, employment creation, revenue generation and support to local rural development, and will also contribute to national economic development.

5 MANAGEMENT OBJECTIVES

The management objectives of the Maputo Special Reserve are listed below.

5.1 Legal aspects

- To extend the limits of the Reserve to include adjacent marine and riverine systems not currently covered by the Reserve, which have a high conservation value and ensure ecological connectivity;
- To harmonise the development and management of the Reserve with that of the Futi Corridor, and provide active support to the Corridor.

5.2 Vegetation

- To maintain indigenous plant species richness and community diversity;
- To ensure the conservation of endemic, endangered and rare plant species and rare or threatened vegetation types;
- To provide adequate protection to those plant communities important for the maintenance of critical hydrological processes;
- To provide vegetation of an adequate quantity and quality for the maintenance of herbivore populations;
- To phase out the presence of exotic plants in the Reserve except for those on which communities are dependent; and
- To review the future of the Futi eucalyptus plantation.

5.3 Fauna

- To re-establish and maintain an indigenous animal community (the historical diversity) of genetically viable populations in which the specificity of the local gene pools is conserved;
- To ensure the conservation of endemic, endangered and rare animal species;
- To reinstate, or if this is not practically possible, simulate through management, those ecological processes and regulatory mechanisms which are now no longer operative;
- Where appropriate to allow the sustained harvest of faunal populations, provided this does not conflict with the primary objective of maintaining biological diversity; and
- To mitigate conflicts between elephants and local people.

5.4 Other terrestrial and aquatic resources

- To conserve the soils of the Reserve and take preventative and remedial action against accelerated erosion;
- To monitor the hydrological situation of the Reserve and take appropriate remedial measures; and

- To develop management of the Maputo River within the Reserve, and to liaise with watershed initiatives upstream.

5.5 Marine systems

- To initiate and develop conservation and management of the adjacent marine systems if the Reserve boundary is extended.

5.6 Local communities

- To promote participation by the local communities in Reserve management;
- To promote the sustainable use of natural resources by local communities in the Reserve; and
- To mitigate conflicts through the integration of local development with Reserve management.

5.7 Cultural, historical and archaeological aspects

- To document and preserve archaeological, historical and cultural sites; and
- To gain an understanding of traditional cultural practices and enable their continuity.

5.8 Tourism

- To create diverse opportunities for Mozambicans and others to appreciate the natural values of the Reserve, for the purposes of enjoyment, recreation and awareness creation;
- To generate income to fund Reserve management and create benefits for local communities living in and adjacent to the Reserve; and
- To ensure that tourism development occurs in a planned, controlled fashion which does not have unacceptable social, socio-economic or environmental impacts.

5.9 Education and information

- To promote understanding and awareness of the Reserve, issues affecting it and the local communities, and possible future solutions.

5.10 Regional influences

- To participate actively in the planning of local and regional developments impacting on biodiversity and communities to ensure that development is appropriate and compatible with the Reserve and proposed Futi Corridor.

5.11 Institutional framework

- To promote an appropriate institutional framework to guide and undertake the management of the Reserve, involving the principal stakeholders

5.12 Research and monitoring

- To promote research which will contribute to a better understanding of the Reserve's biodiversity, ecological functioning, socio-economic situation and sustainable use of natural resources, develop a baseline for monitoring, and enable recommendations for improved management, resolution of conflicts and appropriate development; and
- To monitor and evaluate biodiversity trends, tourism and its development, community aspects and the effectiveness of management interventions, and provide feedback to management.

6 ZONING

6.1 Zoning classification

The following zoning classification is used:

- **Protection Zone:** protecting a particularly important or vulnerable site, e.g. a plant community, or a cultural or historical site. No consumptive use is permitted and non-consumptive use (if any) is carefully controlled.
- **Wilderness Zone:** area with no infrastructure or vehicular access (with the possible exception of management access by vehicle). Ecotourism, research and education are possible. Light, occasional consumptive use by local communities is permitted. Access across wilderness zones by local people occurs in places.
- **Extensive Use Zone:** area where uses can include game-viewing from vehicle; and light, sustainable extraction of natural resources by local communities but with no transformation of the vegetation.
- **Community Use Zones:** including settlement and cultivation areas, and heavier (but sustainable) use of natural resources.
- **Intensive Use Zones:** management and tourist camps; guard posts.

6.2 Zoning of the Reserve

Zoning is shown on Map 3. Zones are as follows:

6.2.1 Protected zones

- all terrestrial coastal forest and beach vegetation: for their extreme vulnerability to disturbance, their important protective functions, and the coastal forest's biodiversity value.
- all swamp forests: for their rarity and biodiversity values (a comprehensive list should be drawn up of all swamp forests and the zoning map updated once vegetation mapping is complete).
- all sacred sites: for their social, cultural and religious importance. They may not all be fully documented yet; those known are:
 - Chicomo near the coast between Lake Piti and Lake Cowine (ceremonies for rain, more fish and to repel bad spirit)
 - Invucuza near Lake Cowine at Dobela, 500 m from the coast (ceremonies for rain, more fish and to repel bad spirit)
 - coastal forest near Dobela south of Lake Cowine (cemetery for Muvukuza family)
 - Wamphulana south of Lake Maunde (central ceremonies for Muvukuza)
 - Membene along the beach (ceremonies for the people of Natazimbe, and also by people from Muvukuza during the war)

- archaeological sites: for their cultural importance (sites known on the coast.; the list should be expanded when more information is available).

6.2.2 Wilderness zones

- the beach along the whole coastline except 500 m either side of Dobela and Milibangalala. These areas may be used by tourists who walk to them; no driving on the beach will be permitted. Light consumptive use of resources by communities will continue; policy will be developed on sport angling from the beach.
- the central north-south section of the Reserve west of the community zone and east of the extensive use zone incorporating the Lake Nyame/Sinde and Hube Forests/Futi driving circuit, and south and east of the Liundo-Wingane community zone. Also excluded is a strip of land along the line of the road linking the main camp and Milibangalala. Parts of this area will be used for wilderness walking, particularly in the south and in the north-west (Maputo River-Planície dos Elefantes-Bihikuo Forest-Libani Forest).
- a strip of land between the Machangulo-Muvukuza community use zone and the coastal forest, protecting the grass dunes facing the sea, north of the Lake Maunde-Milibangalala road (the status of this area may be reviewed once more detailed information is available on community use of this area).

6.2.3 Extensive use zones

- Lagoa Piti - used by local communities and fishing licensees from further afield.
- mangroves and associated lakes: these are currently exploited for poles and fish and it is likely that sustainable use of the mangroves at least for poles will continue. It is recommended that the levels of exploitation be investigated and recommendations for conservation of the mangroves area made.
- beach 500 m either side of Dobela and Milibangalala, which may be used for tourist beach activities, as launch sites for boats, for angling (which will be subjected to further zoning), and for community use of shellfish, line fishing etc. No driving will be permitted on the beach apart from launching and retrieving boats. Any conflicts between community and tourist use will be resolved through consultation and refined zoning.
- strip of land between the coastal forest and community zone west of Milibangalala and Dobela, since there are no communities known to live here but the area is near the Dobela and Milibangalala access road so cannot be wilderness zone.
- main camp-Lago Nhame-Libani-Futi valley-Maputo River-western boundary road network: this will be used as the main game-viewing area from vehicles and provide access to a possible boat cruise departure point and possibly a camp on the Maputo River. The existing cultivation in the Futi River will be phased out if possible to protect the ecological functions of the river, though continued light use of resources such as reeds and water will be permitted.
- the area south-east of the main camp which will be developed for nature trails for tourists arriving from the main road.

- a corridor 2 km either side of the main camp-Milibangalala access road; the presence of the road precludes this area from being a wilderness zone.

6.2.4 Community use zones

- general area of Wingane and Liundo currently used by these communities, including settlements and *machambas*
- a strip of land running from north to south of the Reserve, inland from the coast, from Cholumbane to Muvukuza and Gala covering areas used by these communities for settlements and machambas (further refinement may indicate that it is not necessary to have this zone in a continuous band from north to south)
- north-east end of Bitukulo forest covering the area of settlement and intensive community use there
- central north-south strip of Canguela forest covering settlement and intensive community use there

(the boundaries of the community use zones will be refined as more community consultation is undertaken)

6.2.5 Intensive use zones

- the area of the main camp
- possible tourist camps at Milibangalala and Dobela, Chemucane and Rio Maputo mouth, and possibly Cholumbane

PART 2 MANAGEMENT PROGRAMME

7 RESERVE LIMITS

7.1 Issues

7.1.1 Coastal boundaries

The Reserve's legal boundary currently stops at the high tide mark. It does not include any inshore waters, reefs or corals. The conservation status of the intertidal zone is ill-defined; this includes mangroves which are important fish and prawn breeding grounds, and the beaches where turtles nest. These areas have high conservation values and tourism potential. In Maputo Bay the inshore waters are over-fished by commercial fishing boats, and there is competition with local fishermen.

Further information and discussion are presented in Volume 2, Chapters 2 and 4.

7.1.2 Maputo River

None of the Maputo River is included in the Reserve; its estuary has great importance for young prawn and fish populations and it has high potential for tourism. (See Volume 2, Chapter 4 for further information)

7.1.3 Terrestrial limits

The terrestrial limits exclude important parts of the natural system. They do not cover:

- all the elephant range, including the Manhoca area, the forests and other dense vegetation on the west bank of the Futi (also important for protection of the river); and forests between the Futi and Maputo Rivers; Baixa Nhambse (also important for aquatic birdlife including some species not recorded within the Reserve); and the Maputo River floodplain near Salamanga which may have once been an important feeding area for elephant cow herds
- the whole of the forests between Mechingane and Gala, and the whole of the swamp forests of Lakes Xingute and Piti
- the southern part of Lake Piti

To maintain genetic diversity and fitness, it is important that the Reserve's plant and animal populations do not become isolated from others in the region, or they may become unviable. It is therefore important that connecting corridors are maintained for the flow of genetic material. It is recommended that the boundaries of the Maputo Special Reserve be analysed using a variety of criteria, and the above and any other identified areas included within the MSR boundaries, or are protected by the creation of buffer zones. The implications of boundary renegotiations should be discussed with local communities, and the possibilities of joint management arrangements considered.

The establishment of some form of protected area status over the Futi Corridor will be pursued as a priority, with support from the Transfrontier Conservation Areas (TFCA) Project. The objective of the Corridor is to promote biodiversity conservation and

community management of natural resources, securing community use rights to land and resources. The Corridor has already been approved in principle by the Council of Ministers as part of the project.

See Volume 2, Chapters 2 and 9 for further information.

7.2 Objectives

To extend the limits of the Reserve to include adjacent marine and riverine systems not currently covered by the Reserve, which have a high conservation value and ensure ecological connectivity

To harmonise the development and management of the Reserve with that of the Futi Corridor, and provide active support to the Corridor

7.3 Strategies and actions

7.3.1 Marine and riverine limits

Strategy

A proposal was recently produced for the following extensions to the Reserve (Volume 2, Chapter 4):

- a zone three nautical miles from the coast eastwards into the Indian Ocean
- a zone one nautical mile into Maputo Bay from the Reserve boundary
- the Maputo River north of Bela Vista

The eastern extension covers the major part of the continental shelf to a depth of 50 m, including reefs and corals, and the Baixo de São João and adjacent areas. It would ensure protection for nesting turtles, corals and associated fish fauna. It would also facilitate appropriate tourism development in these areas, in conjunction with the Reserve. Ultimately, through the various coastal zone developments currently being proposed, it might be possible to link this extension to the Reserve with marine protected areas in South Africa through the creation of an additional marine conservation area to the south of it. This would greatly promote the conservation of shared marine resources and facilitate international collaboration in their management, similar to that proposed for terrestrial systems through the TFCA Project.

The northern extension would enable protection of the prawn and fish breeding/rearing grounds in Maputo Bay and the estuary of the Maputo River.

Proposed extensions are shown on Map 4.

Actions

- 1 Complete the consultation process including local communities, fishermen, and district, provincial and national government (**Reserve Administrator, Community Liaison Officer, NGOs**)
- 2 Amend the proposal if necessary in light of consultations (**Fisheries Biologist, DNFFB**)
- 3 Submit the proposal to the Minister of Agriculture and Rural Development (**Director and Lawyer of DNFFB**)
- 4 Submit the proposal to the Council of Ministers and publish in the *Boletim da República* if approved (**Minister of Agriculture and Rural Development**)

7.3.2 Futi Corridor

Strategy

While the management plan provides overall guidelines for the management of the Reserve for the next five years, it is important that it is flexible enough to adapt to changing circumstances in the area. A management plan and proposal is being developed for the Futi Corridor, and Reserve management should be adapted if necessary to ensure compatibility with this. Provisional limits of the Corridor are shown on Map 5.

Actions

- 1 Complete the consultation process on the Futi Corridor (**LTFCA Regional Administrator, Community Liaison Officer**)
- 2 Finalise the proposal for the Futi Corridor boundaries and submit it to the Minister of Agriculture and Rural Development (**TFCA Project, Director of DNFFB**)
- 3 Submit the proposal to the Council of Ministers and publish in the *Boletim da República* if approved (**Minister of Agriculture and Rural Development**)
- 4 Participate in management planning for the Futi Corridor, and adjust Reserve management if appropriate (**Reserve Administrator, Community Liaison Officer in collaboration with UEM**)

8 TERRESTRIAL AND AQUATIC VEGETATION MANAGEMENT

8.1 Issues

8.1.1 Biodiversity value

The Reserve's vegetation has a remarkably high biodiversity value in terms of species diversity, endemism, and variety of vegetation types. Priority plant communities and species in the Reserve include:

- coastal dune forest
- swamp forest
- sand (licuati) forest
- wetlands including the Futi and Maputo River flood plains
- mangrove communities
- unique endemic-rich dwarf savanna
- rare and endemic plant species

See Hatton *et al.* (1995) and Hatton (1996a and b) for further information. Critical areas defined because of their high biodiversity value, fragility or critical ecological functions, are shown on Map 6.

8.1.2 Threats

The major perceived threats to the vegetation are:

- indiscriminate cultivation of the swamp vegetation and soils associated with the Futi channel; there is a risk that the channel will undergo long-term alterations resulting in further drying up of the river, with implications for communities and wildlife dependent on this water source, and for the inland delta of the Futi (see Volume 2, Chapter 8);
- loss of woodland and forest and spatial pattern in the grasslands and savannahs through indiscriminate, extensive and frequent burning, with consequent impacts on forage availability and habitats for large mammals, and scenic impacts;
- damage to coastal dune forest and dune front colonising communities, due to insensitive tourism development and damage by vehicles and trampling along the dune front, with risk of dune blow-outs and fragmentation of the forest (Volume 2, Chapter 3);
- damage to vegetation due to overuse of roads in areas of steep slopes and fragile soils, resulting in soil erosion (Volume 2, Chapter 3);
- cultivation of bottom land wetlands and wetland fringes including Lake Piti and Lake Maunde, with loss of some of this habitat type and possible long-term hydrological changes, and disturbance to wild animals (Volume 2, Chapter 3);

- unquantified impacts on the mangroves from cutting poles for markets in Maputo; over-exploitation of the mangrove could result in loss of breeding grounds for prawns and fish, and erosion of sediments; and
- risk of establishment of *Chromolaena odorata*, an invasive shrub which could threaten the coastal forest and riverine vegetation of the Reserve, and possibly other areas with high water table (see Box 8.1).

8.1.3 Plantations

The eucalyptus plantations to the south-west of the Reserve were informally linked with the Reserve and the SPFFB in 1995, in order to generate revenues to help with law enforcement. These plantations are in very poor condition, as they have been neglected for many years and badly burnt. They occupy a strategic location in the Futi Corridor and are very near the Futi River, so may have negative impacts on its hydrology. See Volume 2, Chapter 12 for further information.

In 1999, the local NGO Fórum Natureza em Perigo obtained funding through the WILD Foundation to manage the plantations for the benefit of communities and MSR.

Box 8.1

***Chromolaena odorata*, the paraffin bush**

Chromolaena odorata is an exotic shrub from South-east Asia. It grows in high rainfall areas or in areas with high water-table. It competes aggressively with indigenous vegetation. It is light tolerant and establishes in forest gaps or on the fringes of forests. From there it spreads into the forest, reaching the canopy and eventually shading out the other trees. It is dispersed by wind and also by vehicles (especially logging vehicles).

It is highly flammable, even when green, as it contains flammable chemicals (hence its name). When established on forest fringes it greatly increases the risk of forest damage by fire coming from adjacent grassland or savannah.

Chromolaena has become widespread in parts of KwaZulu and Natal, with large impacts. It is already present at the confluence of the Pongola and Usuthu (Maputo) Rivers and on the Mozambique-South African border at the coast. In St Lucia National Park, the KwaZulu-Natal Nature Conservation Service spent over R1 million in 1996 on chemical control measures. Chemical control involves spraying with a selective chemical which does not harm the indigenous vegetation, or cutting and treating stumps in areas where *Chromolaena* is very heavily established. Biological controls have not yet been successfully developed in Southern Africa.

Chromolaena may be present in the Futi eucalyptus plantation. As yet there is no sign of it in the Reserve. The threats to the Reserve and Futi Corridor are considerable, particularly to the coastal forest, riverine vegetation along the Futi and Maputo Rivers, and vegetation in other high water-table areas.

(information from Dr P. Goodman, KwaZulu-Natal Nature Conservation Services)

8.2 Objectives

To maintain the indigenous plant species richness and community diversity

To ensure the conservation of endemic, endangered and rare plant species and rare or threatened vegetation types

To provide adequate protection to those plant communities important for the maintenance of critical ecological processes

To provide vegetation of an adequate quantity and quality for the maintenance of large herbivore populations

To phase out the presence of exotic plants in the Reserve except for those on which communities are dependent

To review the future of the Futi eucalyptus plantation

8.3 Strategies and actions

8.3.1 Fire management

Strategy

Fire will be used as a management tool, to:

- maintain or enhance spatial heterogeneity of the vegetation
- ensure adequate fodder throughout the year to support the large wild mammal populations
- retard woody plant growth where appropriate
- reduce the risk of an accidental or arson fire occurring that will threaten the survival of plant species or destroy the composition or structure of a priority vegetation community.

Fire, both lightning- and man-induced, is thought to have played a major role in the development of the Reserve's vegetation. In applying fire as a management tool, it is intended that natural processes are allowed to prevail over those that are obviously artificial. For this reason, no attempt is made to apply a rigidly defined burning programme with specific frequencies and block boundaries.

The following prescriptions will be followed:

- wild and arson fires should not be extinguished unless a priority plant community or installation is being threatened;
- between a third and two thirds of the grassland and savannah vegetation types should be burnt annually;

- fire that is intended to create green flush can be burnt in any month of the year, and these should be applied so as to create or enhance the burnt/unburnt grassland mosaic;
- fire that is intended to reduce woody plant encroachment should be burnt under warm dry conditions generally during the dry season prior to the spring rains;
- no controlled burning should be implemented prior to the implementation of protective measures around infrastructure and boundaries;
- the distribution and extent of each fire should be mapped and a composite map for each calendar year produced. This map is an essential tool for the planning of the following year's fire programme.

A fires campaign will be developed as part of the ongoing community programme, looking at the range of reasons for burning, and working out ways of adapting communities' needs for fire within the burning programme, or if necessary developing viable alternatives to fire with the local people.

Actions

- 1 Before the rains start prepare a burning map for areas of the Reserve that have been burned during the previous dry season, using a GPS (**Reserve Administrator and Biologist**)
- 2 As part of the community consultation, work closely with local communities to determine their reasons for burning, the areas concerned and the times of year for each purpose (**Community Liaison Officer**)
- 3 Assess how compatible or otherwise this burning pattern is with the ideal regime for the Reserve (**Reserve Biologist and Administrator**)
- 4 Explain to local communities the Reserve's ideal regime and the reasons for it; discuss with them the feasibility of any adaptations needed to their burning to fit in with this, and seek viable alternatives to burning where there is incompatibility (**Community Liaison Officer, Reserve Administrator and Biologist**)
- 5 Maintain consultation with the communities and explain burning plans each year; adapt plans to suit their use of natural resources where feasible; let them implement parts of the burning programme if appropriate (**Community Liaison Officer and Reserve Administrator**)
- 6 To develop the annual burning plan, at the start of each calendar year examine the burning map from the previous year and identify areas that were not burnt during this period; inspect each of the identified areas in the field and assess the desirability of burning. If desirable, determine what type of fire (high or low intensity) (**Reserve Administrator and Biologist with possible collaboration of communities**)
- 7 Select ignition points with due regard for the direction of the prevailing winds, so that each of these areas can be burnt (**Reserve Administrator/communities**)
- 8 Light controlled fires under the desired conditions throughout the year, starting in February/March with small, low-intensity fires and ending in September/October with larger, higher intensity fires. Unless a controlled fire threatens infrastructure or an

important community or species locality, leave it to determine its own extent (**Reserve Administrator/communities**)

- 9 Record fire data on a recording form and on a new map for each year, showing the extent of the burn and date (**Reserve Biologist**)

8.3.2 Law enforcement

Strategy

Monitoring and remedial action will be undertaken to avoid overuse of plant resources by local communities or illegal use by people from further away. The latter includes law enforcement to prevent commercial logging of timber in the reserve.

Actions

Actions are covered under sections on fauna (law enforcement) and communities (monitoring and control of community use of plant resources).

8.3.3 Management of threatened plant species and vegetation types

Strategy

A biodiversity inventory will be undertaken in the Reserve and Futi Corridor to identify endemic, endangered and rare species and rare or threatened vegetation types. Priority taxa are:

- plants
- invertebrates
- fish
- small mammals

Hot spots for endemic and rare species, and priority vegetation types will be identified so that appropriate management measures can be taken to ensure their conservation. Specific management prescriptions will be developed once results of the inventory are available.

Actions

- 1 Plan and undertake biodiversity inventory and include recommendations for management in the report (**Department of Biology, UEM in collaboration with Reserve Biologist**)
- 2 Complete the vegetation map for the Futi Corridor and Reserve started for the Mosa Florestal environment impact assessment (**Department of Biology, UEM in collaboration with Reserve Biologist**)

- 3 Review the need for further management prescriptions based on the recommendations of the inventory, and incorporate them in annual work programmes for the Reserve
(Reserve Administrator and Biologist)

8.3.4 Protection of vegetation which maintains critical ecological processes

8.3.4.1 Coastal dune forest

Strategy

Restoration of areas of coastal forest damaged by man will be promoted, focusing on Milibangalala where there is a severe risk of the continuity of the coastal forest being severed due to clearance for camping sites in very sensitive areas. Some action will also be taken at Dobela, where a wide footpath opened to the top of the forest is unaesthetic and risks damage to the exposed forest opening due to salt spray. The dynamic equilibrium of dune erosion and changes in the dune forest cover associated only with natural forces on this unstable coastline will be left to follow their own course unless the conservation status of the forest is threatened. See Volume 2, Chapter 11.

Actions

- 1 Rehabilitate the area of the existing Milibangalala campsite taking the following measures:
 - no more sweeping, camping or fires (camping should be confined to the grassland of the dune, taking care not to start fires)
 - protect the ground with brushwood and thorn branches to exclude people and prevent trampling
 - protect and encourage the growth of sprouts from remaining trees
 - if necessary germinate seedlings of the forest tree species occurring near the beach from seed and transplanted, with protection of the brushwood
 - the small entrance to the beach from the large, recently cleared area should be closed off using thorn branches and brushwood to protect the strand vegetation which will prevent more sand from blowing in; strand species should be germinated from seed if necessary and planted at the top of the beach in front of the path
 - visitor access to the entrance of the large area from the beach at the far end of this site should be closed; action should be taken as above if it shows signs of fresh erosion (it is used by local people currently so could be difficult to close completely; they could use the access through the camp itself if necessary)**(Reserve Administrator and Guards at Milibangalala)**

- 2 At Dobela allow the recently cleared path from the camp to the top of the dune to narrow naturally, and monitor the opening to the viewpoint for signs of salt or wind damage; if this occurs take remedial action (**Reserve Administrator and Guards at Dobela**)

8.3.4.2 Futi valley

Strategy

Cultivation of the floor and banks of the Futi Channel inside the Reserve will be gradually phased out, in negotiation with local communities and with development of alternatives for them. This might include, for example, promotion of organic farming techniques outside the boundaries of the Reserve to the west, perhaps using regulated quantities of water from the Futi channel for this purpose. However, the problem of elephant damage would have to be resolved. Other alternatives could involve the promotion of other benefits for the communities, including use of the Fund (see community section below).

Actions

- 1 Continue discussions and negotiations with the community of Massuahane to stop cultivating the Futi valley (**Community Liaison Officer, Reserve Administrator**)
- 2 Jointly with the community, seek alternative means of livelihood for the people; this could include other forms of cultivation elsewhere and promotion of other economic activities and benefits from the reserve (**Community Liaison Officer**)

8.3.4.3 Other eroded sites

Strategy

In general, other degraded areas will be assessed to determine how important they are in terms of ecological processes (e.g. old *machamba* sites and roads). Those which are not critical will be left to recover naturally, unless they are very unsightly and their recuperation through intervention is relatively easy. Any that are critical will merit priority action.

Action

- 1 Inventory and assess the seriousness of other degraded sites (**Reserve Biologist**)
- 2 Develop recuperative measures when merited (**Reserve Administrator and Biologist**)

8.3.5 Futi eucalyptus plantations

Strategy

The presence of these plantations in the area of the Futi Channel and the MSR is ecologically undesirable. The Matutuine District Plan does not permit the planting of exotic species in ‘protected areas’ (it does not state whether the “vigilance area” is considered to be a protected area). See Volume 2, Chapter 12. As of mid-2000, the Fórum Natureza em Perigo managed a short-term input funded by the WILD Foundation, to remove the local *Eucalyptus* plantations while providing some employment to local communities.

Actions

- 1 Undertake an inventory of the standing stock of the plantation and develop a cutting plan if economically viable (**Inventory Section, DNFFB**)
- 2 Contract out any logging by public tender; if possible retain revenue for investment in the Reserve and law enforcement in the region (**SPFFB and Lawyer, DNFFB**)
- 4 Draw up a plan for the future management of the area (to be incorporated at a later date into the Futi Corridor management plan) (**Head of SPFFB, Community Liaison Officer, Head of Forestry Department and others as appropriate**)

8.3.6 Management of exotic plants in the reserve

Strategy

Exotic (alien) plant species such as eucalyptus, cassias and fruit trees growing in the Reserve which are not used by local communities will be systematically removed, after consultation with communities if appropriate. No new exotic plants will be introduced by the Reserve Administration. Collaboration will be promoted with communities to discourage the introduction of new exotic species, especially those which might cause problems. A careful watch will be kept for the presence of *Chromolaena* in the Futi Corridor and Reserve, and if detected action will be taken immediately to control it.

It is probably not feasible to control exotic aquatic weeds such as *Eichhornia* and *Pistia* in the Reserve.

Actions

- 1 Warn Reserve staff of the risk of *Chromolaena*, provide with identification chart and request to report any incidence in the Reserve or Corridor (**Reserve Administrator, Community Liaison Officer**)
- 2 Discuss control methods with UEM, and prepare methodology for control action (including identification of sources of supplies of equipment and chemicals required) (**Reserve Administrator and Biologist**)
- 3 Control any occurrence of *Chromolaena* in the Reserve or Corridor as soon as possible (**Reserve Administrator**)
- 4 Inventory the occurrence of all other exotic plants in the Reserve outside *machambas* and settlements. As part of ongoing community consultation, ask communities if they

use these plants or if they have owners; explain reasons for wanting to remove them
(Reserve Biologist and Community Liaison Officer)

- 5 Systematically remove exotic plants which are not of value to communities **(Reserve Administrator)**
- 6 Hold discussions with communities to monitor whether they plan to introduce new exotic plants; if possible assess beforehand whether there will be negative impacts, and seek alternatives in this case **(Community Liaison Officer)**

9 TERRESTRIAL AND AQUATIC ANIMAL MANAGEMENT

9.1 Issues

9.1.1 Biodiversity value

Priority animals for conservation include:

- elephant: a population of about 200, local genotype
- suni: small population of local genotype, regionally rare
- four-toed elephant shrew: current status unknown
- pangolin: current status unknown
- red squirrel: rare
- birds: several species which are CITES listed, including greater and lesser flamingo, and pink-backed pelican, and known endemics
- reptiles: Nile crocodile (large population of local genotype); rock python (current status unknown); marine turtles; endemics
- fish: *Croilia mossambica* (rare, near-endemic to Maputaland Centre),
Serranochromis meridianus (rare, near-endemic to Maputaland Centre),
Aplocheilichthys myaposae (endemic to Maputaland Centre)

See Volume 2, Chapter 3.

9.1.2 Threats

- **Illegal hunting:** this is the main threat to the Reserve's large mammals. The species most affected are common and red duiker, suni, elephant, common reedbuck, and leatherback and loggerhead turtles. Hunting includes subsistence hunting by local communities, commercial/sport hunting by people with vehicles from outside the Reserve, and hunting by people who come by boat from Maputo to the north of the Reserve. Animal numbers are at extremely low levels at present because of hunting during and since the war. The Reserve administration currently has low capacity to control illegal hunting (see Box 9.3).
- **Uncontrolled fires:** these can have a negative impact on large mammals by reducing the amount of available forage. Effects are particularly serious when very large areas burn, as in late 1996. Small, less mobile animals suffer direct effects of fire.
- **Fishing:** impacts of commercial and subsistence fishing in Lake Piti are currently unknown.

9.1.3 Wild animals/agriculture conflict

Crop damage occurs outside the Reserve, mainly by elephants but also by hippos and wild pigs. The Reserve boundaries cut across the traditional range of the elephant population. The breeding groups leave the Reserve to use Miscuacuati Forest and other areas south of Salamanga. Traditionally they may have moved to the Maputo River floodplain for more nutritious feeding. With the recent drying up of the Futi River they may now also be moving

out for water. Bulls traditionally moved along the Futi River, meeting up with another cow herd which uses an area of the present Tembe Elephant Reserve and formerly used the floodplain of the Maputo River just north of the international border. This route is now closed by an electric fence along the border.

The elephants damage crops when they leave the Reserve, particularly to the west of the Futi River near to Salamanga. This conflict has existed for decades, and before the war a series of guard posts in the Futi Corridor had the function of scaring elephants back to the Reserve and trying to protect crops. Crop damage is currently the major cause of conflict between local people and the Reserve.

Damage by bushpigs is less serious to communities. This may be because they control the pigs themselves, thereby obtaining a source of animal protein.

See Volume 2, Chapters 2 and 8.

Box 9.3: Law enforcement and animal control system

1 Existing system

The current law enforcement and control system is based on 5 guard posts, 1 community post and the main camp, and 1 mobile brigade (see Map 7). Guards currently patrol on foot from the posts.

The principle objective of the posts on the west side of the Reserve is to protect people and their fields from elephants, hippos, bushpigs, monkeys and other species. The aim of the Gala post is to control traffic entering the Reserve from the south, in particular for illegal hunting. It also patrols all the southern boundary. The coastal posts are for monitoring of turtle nesting/hatching, protecting turtles and nests against harvesting, and controlling tourist activities on the coast.

2 Problems with the current system

Problems with the current system include:

- incomplete coverage of the Reserve by the system of law enforcement posts (no posts in the northern area or at Membene or Matonde on the coast)
- lack of communication between posts and with main camp
- inadequate transport for law enforcement
- inadequate supervision (due to lack of transport and communication for Reserve Administration)
- inadequate equipment in the posts, including firearms (there are not enough firearms of appropriate calibre)
- lack of training for law enforcement personnel, and the advanced age of some guards (very few of the existing guards received law enforcement/problem animal control training before the war – a six-month training exercise has been conducted by the then KwaZulu-Natal Parks Board, but refresher courses are necessary; some guards received military training during the war.
- poor staff motivation and corresponding opportunities for collusion with illegal operators.

9.2 Objectives

To re-establish and maintain an indigenous animal community (the historical diversity) of genetically viable populations in which the specificity of the local gene pools is conserved

To ensure the conservation of endemic, endangered and rare animal species

To reinstate, or if this is not practically possible simulate through management, those ecological processes and regulatory mechanisms for large mammals which are now no longer operative

Where appropriate allow the sustained harvest of animal populations, provided this does not conflict with the primary objective of maintaining biological diversity

To mitigate the conflicts between elephants and local people

9.3 Strategy and actions

9.3.1 Law enforcement

Strategy

Hunting of large mammals and other illegal activities in the Reserve by both local communities and people from outside will be brought under control by the Reserve Administration. The Administration will also be responsible for controlling illegal forest and wildlife use in the Futi Corridor, focusing on illegal commercial and sporting activities there.

Within the Reserve the number of law enforcement posts will be increased by up to 5 (the number of posts and their location will be kept flexible, depending on where pressures are greatest and on available resources). The mobile team and posts in the west of the reserve and in the corridor will also undertake crop protection work (see section 9.3.6). Law enforcement will be strengthened through intensified patrolling from the network of posts and by the central mobile team. The law enforcement section will be adequately equipped, trained and supported to ensure an efficient operation.

Law enforcement efforts in the Reserve will concentrate on non-residents. At the same time, dialogue will be promoted with local communities in the Reserve to explore alternative benefits from the Reserve, instead of hunting (see community section). Collaboration will be promoted between law enforcement and community personnel to ensure that their activities are harmonised with regard to the communities.

The number of posts per unit area in the Reserve is very high, mainly because of the need for problem animal control. This may be reduced as a result of the electric fence along the west of the MSR. In the longer term it should become possible to dispense with some of the posts once illegal activities are reduced to a low level: for example if other control methods are developed for problem animals, and if the mobile brigade succeeds in undertaking some of

the work of the posts. Alternatively, once the new system has become effective and illegal operators realise that there is a serious management force in place it may be possible to dispense with a permanent mobile brigade.

All new guardpost developments should be either simple rustic buildings made from local materials or tents. Investment should be minimised as far as possible while at the same time ensuring reasonable working conditions for the guards.

The following Table and Map 7 indicate present status and short- to medium-term developments planned for the system of law enforcement and animal control.

Table 9.1: Law enforcement and problem animal control posts in the reserve

Post	Present status (November 1996)	Strategic importance and future status	Short-term priority	Longer term priority	Future no. of guards	Future equipment
Massuahane	rustic camp constructed; needs roof improving; occupied	control traffic from Salamanga; control problem animals	high	?	3	radio; binoculars; firearm; camp furniture and equipment; uniforms
Viane	old building rehabilitated; needs roof improving; not occupied	maintain for control of problem animals	high	?	3	radio; binoculars; firearm; camp furniture and equipment; uniforms
Golongolane	old building rehabilitated; needs roof improving; not occupied	maintain for control of problem animals	high	?	3	radio; binoculars; firearm; camp furniture and equipment; uniforms
Tembe	rustic camp constructed; currently staffed by community	maintain for control of problem animals	high	?	?	radio; binoculars; firearm; camp furniture and equipment; uniforms
Futi 1	old building rehabilitated; not occupied	maintain for control of problem animals and to control traffic over bridge	?	?	?	radio; binoculars; firearm; camp furniture and equipment; uniforms
Futi 2	under construction; occupied	maintain for control of problem animals and traffic across Futi on main road if Salamanga bridge post is not occupied	?	?	3	radio; binoculars; firearm; camp furniture and equipment; uniforms
Milibangalala	partly rehabilitated; occupied	abandon except in turtle season; possibly resite depending on tourism development	low	low	2 (turtle season only)	radio; binoculars; camping equipment; uniforms

Dobela	partly rehabilitated; occupied	control of beach traffic until Matonde established; patrol future marine extension to reserve; protect turtles; possibly resite depending on tourism development	high	high	3	ocean-going boat; beach buggy; radio; binoculars; camp furniture and equipment; uniforms
Gala	rustic camp constructed; occupied	maintain to prevent illegal hunting from south	very high	high	3	radio; binoculars; automatic firearm; camp furniture and equipment; uniforms
Matonde	does not exist	Establish to control beach traffic from south and protect turtles	high	high	3	beach buggy; radio; binoculars; firearm; camp furniture and equipment; uniforms
Membene	does not exist	establish if needed to protect turtles and control beach entry from north (seasonal)	low	low	2	radio; binoculars; camping equipment; uniforms
Cholumbane/ Wingane	does not exist	establish to control resource use in north	very high	high	3	boat for Maputo Bay; radio; binoculars; firearm; camp furniture and equipment; uniforms
Salamanga bridge	tent; occupied	maintain to control illegal traffic out of reserve and Futi Corridor	high	high	3	
main camp	being rehabilitated; occupied	maintain for problem animal control and control of vehicles entering	high	high	2	radio; binoculars; firearm; furniture and equipment; uniforms
mobile brigade	recently established with 8 people	established to provide rapid response and high mobility, to complement outposts	high	high	8 ¹	vehicle (pickup); radio; binoculars; firearms; uniforms

¹ some with driving licence

Note that this table does not include posts further south in the Futi Corridor, for example near Manhoca

A detailed strategy for law enforcement in the Futi Corridor needs to be developed, and undertaken by Reserve staff. It should not be undertaken only at the expense of the Reserve. Subsistence hunting by local communities will be treated leniently.

Actions

- 1 Remove older guards from this work and recruit young, fit, motivated guards with at least sixth class (new system) to ensure they can write reports (**Reserve Administrator**)
- 2 Open two new posts: Chilumbane (to control activities in the mangroves, lakes and other northern parts of the Reserve) and Matonde (to control vehicles driving along the beach). Membene may also be necessary though it is lower priority (to control entrances from Machangulo, probably only during the turtle season) (**Reserve Administrator**)
- 3 Appoint a chief for the law enforcement/problem animal control section of the Reserve, to work directly under the Reserve Administrator (**Reserve Administrator**)
- 4 Provide short in-service training for the guard force as a unit to improve its effectiveness, instilling a sense of teamwork, pride and purpose in the guards (**Reserve Administrator**)
- 5 Rotate guards between posts and if necessary between protected areas in Mozambique to promote transparency (**Reserve Administrator**)
- 6 Equip posts adequately and ensure reasonable living and working conditions; this includes firearms, transport and radios (**Reserve Administrator**)
- 7 Install the radio system as soon as possible (**Reserve Administrator**)
- 8 Review the law enforcement/control system every three months, and streamline if possible (**Reserve Administrator**)
- 9 Develop a strategy and detailed plans for law enforcement in the Futi Corridor (**Chief of SPFFB, Reserve Administrator, UEM representative**)
- 10 Develop a detailed plan for the involvement of UEM (**Reserve Administrator, UEM representative**)
- 11 Develop a systematic reporting system for law enforcement, and a monitoring system for law enforcement effectiveness (**Reserve Administrator, KZNNCS representative**)

9.3.2 Re-establishment of large mammal community and a dynamic ecological equilibrium with its habitat

Strategy

Reintroductions of game should only be made into the Reserve when illegal hunting is under control. Only species which occurred historically in the area should be translocated to the Reserve. Discussions will be held with local people beforehand about proposals for and implications of restocking of the Reserve with harmless indigenous large mammal species. Status of large mammal species and recommendations for re-introductions are shown in 9.2.

Species recommended initially for introduction are: zebra, warthog, oribi, kudu, nyala, waterbuck, roan, eland, wildebeest, Lichtenstein's hartebeest and possibly buffalo. Numbers recommended for introduction are up to half of the estimated carrying capacity of each species. Species such as rhino could be introduced in a second stage if their security can be assured. The predators which are known to have occurred in the Reserve in the past should not be introduced until prey populations have achieved numbers which allow their exploitation. Lions should never be introduced because of the presence of local communities. Scavenger populations will be maintained at a level which is at equilibrium with the amount of carrion available.

Two species for which no solid evidence of past occurrence is available but whose status is endangered in Mozambique are included. These are roan antelope and Lichtenstein's hartebeest; it is felt that the Reserve can play an important role in conserving viable populations in the country.

Table 9.2 Past and present status of larger mammal species with recommendations for introductions, management and monitoring

Species	Past Status	Present status	Number to introduce	Management / Monitoring
Bushbaby	Abundant	Present	-	Monitor Status
Night-ape	Present	Present	-	Monitor Status
Samango Monkey	Present	Present	-	Monitor Status
Vervet Monkey	Frequent	Frequent	None	None
Pangolin	Very rare	Unknown	-	Determine Status
Aardwolf	Rare	Unknown	-	Monitor Status
Spotted Hyena	Rare	Rare	-	Monitor Status
Cheetah	Very rare	Extinct	-	Defer intro. to later date
Leopard	Abundant	Absent	-	Monitor Status
Lion	Unknown	Extinct	None	Incompatible with land use
Serval	Widespread	Present	None	Monitor Status
Hunting Dog	Extinct	Extinct	None	Defer intro. to later date
Side-striped Jackal	Very Rare	Present	-	Monitor Status
Black-backed Jackal	Rare	Unknown	-	Determine Status
Spotted Neck Otter	Present	Present, Futi	-	Monitor Status
Honey Badger	Present	Present	-	Monitor Status
Civet	Very Rare	Unknown	-	Determine Status
Antbear	Rare	Present	-	Monitor Status
Elephant	< 350	100-200	None	Monitor Status
Zebra	Occurred	Extinct	600 (200)	Monitor Introduction
White Rhino	Unknown	Absent	50 (30)	Monitor Introduction
Black Rhino	Unknown	Absent	40 (40)	Monitor Introduction
Bushpig	Abundant	Abundant	None	Monitor Status
Warthog	Unknown	Absent	200 (50)	Monitor Introduction
Hippo	270 (Tello, 1973)	Widespread	None	Monitor Status
Common Duiker	Abundant	Abundant	None	Monitor Status
Red Duiker	Abundant	Abundant	None	Monitor Status
Suni	Rare	Rare	None	Monitor Status
Oribi	Unknown	Extinct	30 (30)	Monitor Introduction
Steenbok	Abundant	Abundant	None	Monitor Status
Kudu	Occurred	Extinct	150 (50)	Monitor Introduction
Nyala	Abundant -> Rare	Rare	300 (150)	Monitor Intro & Status
Bushbuck	Rare	Rare	None	Monitor Status
Reedbuck (common)	Abundant	Common	None	Monitor status
Waterbuck	Unknown in range	Extinct	150 (50)	Monitor introduction
Roan antelope	Unknown within	Extinct	30 (30)	Monitor introduction
Eland	Unknown in range	Extinct	150 (30)	Monitor introduction
Buffalo	Occurred	Extinct	800 (100)	Monitor introduction
Wildebeest	Occurred	Extinct	400 (100)	Monitor introduction

Notes

- 1 There are a number of species for which the current status in the Reserve should be established prior to consideration for introduction
- 2 Under the number to introduce, the unbracketed figure represents the desirable number to introduce, while the bracketed figure represents the minimum viable number.

The inter-relationship between animal community and vegetation will also be monitored, with the aim of attaining a dynamic equilibrium between the two. The over-riding purpose should be to maintain populations at levels which retain the indigenous species richness of the Reserve. Management interventions should be made if the survival of a particular species or vegetation type is threatened. In practice decisions will have to be made to define the ideal balance, with likely trade-offs in vegetation damage, game-viewing quality etc. Interventions could include reduction or limiting of levels of certain species, for example by sanctioned community use, culling or perhaps translocation to the Futi Corridor or elsewhere. However, it is unlikely that this situation will occur during the period of this plan.

Actions

- 1 Initiate dialogue with communities on the possibility of re-introductions and future benefits for them (**Community Liaison Officer**)
- 2 Undertake census of large mammals and assessment of habitat status to provide baseline data and develop a monitoring system (incorporating work already under way by UEM on animals and vegetation). Animal counts can be done partly by air census but should be combined with direct and indirect ground surveys. Monitoring should use techniques which will be affordable in the future after donor support terminates. Methodology should take into account the likely increase in animal species and numbers due to re-introductions. Monitoring will also assess animal impacts on vegetation (**Reserve Biologist, DNFFB, Biology Department of UEM**)
- 3 Seek sources of animals which are genetically as similar as possible to historically occurring stock, and seek funding for animal purchase and translocations (**LTFCA Regional Administrator, Reserve Biologist, Head of Protected Areas (DNFFB), UEM representative**)
- 4 Investigate and arrange logistics of translocations including veterinary clearance (**LTFCA Regional Administrator, Reserve Biologist, DNFFB Protected Areas Specialist, UEM representative**)
- 5 Introduce herbivores (**Reserve Biologist, UEM representative**)
- 6 Monitor success of establishment, survival and growth of introduced herbivore populations, interactions with existing populations and impacts on vegetation (**Reserve Biologist**)
- 7 Reintroduce carnivores and scavengers when herbivores reach a satisfactory level (**Reserve Biologist, UEM representative**)
- 8 Monitor the balance between herbivores and carnivores, and vegetation and herbivores. Draw on ongoing studies by UEM of vegetation productivity for carrying capacity assessments. Take remedial action if necessary (**Reserve Biologist, UEM representative**)

9.3.3 Conservation of threatened animal species

Strategy

Special attention will be paid to elephants, given their status and regional conservation importance, and the fact that they were the primary reason for the gazettement of the MSR. They will be protected in the Reserve and the Futi Corridor, and prevented from damaging crops outside the Reserve as much as possible (see sections 9.3.1 and 9.3.6). Other species will generally be conserved through normal Reserve management; as more information becomes available on them specific management practices may be implemented for a given species during the period of the plan if necessary.

Actions

- 1 Ongoing bird monitoring is to be encouraged, with fieldcards returned to the Mozambique Bird Atlas Project which can supply data summaries to the reserve. Tourists interested in birdwatching should be advised about the Bird Atlas Project. **(Bird Atlas Project, Forum Natureza em Perigo)**
- 2 Undertake inventory of priority animal biodiversity in Reserve and Futi Corridor and incorporate recommendations in management programmes if feasible (see section 8.3.3)

9.3.4 Control of exotic animals in the Reserve

Strategy

In principle no domestic animals such as goats, cattle, pigs, sheep, cats and dogs will be permitted in the Reserve (see section 12 on communities). Poultry will be permitted provided it is kept within settlements. Care will be taken to avoid introduction of any other species of exotic animal. Routine monitoring will record the presence of new exotic species and appropriate action will be taken.

Actions

(community livestock is covered under section 12 on communities)

- 1 Alert Reserve personnel to watch for new exotic species and include in the patrol report forms; take appropriate action if exotic species are discovered **(Reserve Administrator)**

9.3.5 Consumptive use of animals

Strategy

Fishing activities will continue in the south of Lake Piti under licence to local communities. This will be monitored to ensure that catches are sustainable (see Volume 2, Chapter 4). Sanctioned off-take of large mammals is unlikely to occur within the five year period of this management plan, but will be important in the longer term to prevent overstocking. Benefits from any harvesting in the future will go at least in part to local communities. A policy on

ownership of wildlife which is introduced and is bred in the Reserve should be clearly defined and understood by all stakeholders. This could become an alternative to livestock husbandry.

Actions

- 1 Promote collaboration between the Reserve and the District Directorate of Agriculture and Rural Development on issuing of fishing licences only to local communities for the reserve and Futi Corridor (**DDAP, Reserve Administrator, Community Liaison Officer**)
- 2 Monitor the impacts of fishing, both in terms of sustainability for target species and in terms of impacts on rare and endemic species. Incorporate any recommendations resulting from this work into management programmes, in collaboration with the local communities (**Biology Department of UEM, Reserve Biologist, Reserve Administrator, DDA**)
- 3 Develop a policy on ownership and use rights to wildlife in the Reserve in collaboration with all stakeholders before wild animals are introduced (**Reserve Management Board**)

9.3.6 Mitigation of elephant-community conflict

Strategy

The problem of crop damage in the Salamanga area on the western boundary and possible solutions to it are discussed in Volume 2, Chapter 8. In the short-term, efforts to scare elephants away from crops to the west of the Reserve in the Futi Corridor will continue, with Reserve staff working in collaboration with communities. Scaring will continue to involve use of fires and noise, and shooting over the elephants' heads. Other techniques might include experimentation with pepper gas. If possible, no further elephants should be shot. Communities should continue to control wild pigs themselves. Hippos should be controlled with low thorn fences around *machambas*.

The Blanchard Sodetur concession started the construction of an electric fence along the west bank of the Futi Channel, which has proved largely successful in lessening human-elephant conflicts. Community problems regarding access through the fence to parts of the MSR remain, however. The management plan for the proposed Futi Corridor will cover further fence alignment and ecological and socio-economic impacts.

Actions

- 1 Continue elephant scaring measures, with improved equipping and training of patrols (**Reserve Administrator, UEM representative**)
- 2 Undertake feasibility study for continuation of the electric fence to the south along the Rio Maputo, including detailed community consultation and environmental and socio-economic impact assessments (**Reserve Administrator, Community Liaison Officer, possible consultancy input**)

- 3 Continue the ongoing study of elephant movements if means can be obtained to collar new animals, to gain a greater understanding of reasons for movements and their extent, including distribution of watering points used by elephants. Establish baseline data on crop damage and elephant crop raiding patterns building on existing work, and develop a regular monitoring system **(Reserve Biologist, Biology Department of UEM)**
- 4 Draw up a detailed strategy for future control measures based on these studies **(Reserve Management Board if in existence; UEM representative)**

10 OTHER TERRESTRIAL AND AQUATIC RESOURCES

10.1 Issues

10.1.1 Soils

Most soils in the reserve are very fragile, especially:

- dune slopes in savannah and coastal grasslands where sand is large-grained, single-sized and loose, and basal cover of the vegetation is low;
- the ecotone between seasonally wet grassland and dry forest, in the white sand areas; and
- the fore-dunes above the beach, and the large coastal dunes especially on the seaward side (strand vegetation and coastal forest).

In wetter areas near rivers and lakes, repeated cultivation exposes the organic peat layer which oxidises, resulting in:

- eventual loss of soil fertility;
- likelihood of erosion; and
- greatly reduced capacity to retain water and therefore maintain dry season water-table levels locally.

10.1.1.1 Threats

The primary actual or potential threats are from:

- use of roads in excess of their carrying capacity, as has happened in the past year in the Gala-Machangulo road;
- off-road driving;
- overgrazing by livestock or wildlife;
- trampling by people (e.g. in coastal dunes or other sensitive places where tourists might concentrate);
- inappropriate development of tourism installations; and
- *machambas* both in the wetter areas with higher soil organic matter, and on sandy soils.

See Volume 2, Chapters 3 and 10.

10.1.2 Hydrology

The flow of the Futi River has declined in the past few decades. In the Reserve the Futi maintains the riverine vegetation along its course, and the wetlands of its inland delta. It also provides water for people and animals. Possible reasons the changes are:

- the presence of the Futi eucalyptus plantations;

- the regional decline in annual rainfall (though the flow of the Futi is thought to have started to decrease before the present decline in rainfall);
- destruction of the peat layer in parts of the river valley by fire some years ago which might have destroyed the sponge effect of the river bed and resulted in disruption of dry season downstream flow; and
- cultivation of the river bed and banks.

More recently the levels of the lakes have dropped, probably because of the recent drought years. Despite good rains in 1996 and subsequently, the levels have not recovered. It may be that aquifer recharge is taking place, leaving surface water levels low. In the longer term, habitat changes will occur if the recent trend continues. Bands of mangrove have already died on higher ground, presumably because of the drought.

See Volume 2, Chapter 3.

10.1.3 Maputo River

The ecology of the Maputo River as it flows past the Reserve is poorly understood. The estuary is thought to be an important feeding area for young prawns and fish, which are probably being over-fished. The river has high potential for tourism. Various developments are planned on this section of the river and upstream which could have impacts for the Reserve. Since the river currently lies outside the Reserve it has never been incorporated in its management. See Volume 2, Chapters 2 and 4.

10.2 Objectives

To conserve the soils of the Reserve and take preventative and remedial action against accelerated erosion

To monitor the hydrological situation of the reserve and undertake appropriate remedial measures

To develop management of the Maputo River within the Reserve

10.3 Strategies and actions

10.3.1 Soils

General vegetation management to conserve soils is covered in section 8. Overstocking of large wild mammals or build-up of domestic animals must be avoided (sections 9.3.5 and 12). Expansion of *machambas* will be actively discouraged (section 12); cultivation in the Futi Valley will be phased out if possible (section 8.3.4). Tourism development is covered in section 14.

Vehicle impacts will be controlled by:

- minimising the use of roads within the Reserve, encouraging tourists to walk and use hides rather than drive;
- if feasible promoting access to Machangulo by boat;
- upgrading frequently used roads in susceptible places;
- prohibiting off-road driving;
- tourist use of vehicles in the Reserve will be largely restricted to transport in operators' vehicles; and
- realigning and upgrading roads where appropriate in sensitive areas.

In realignment, general principles are to follow dune ridges and avoid steep slopes. If possible no new roads should be cut through forests. In fragile ecotone areas between seasonally wet areas and forest (e.g. Membe) it may be advantageous to have separate dry season and wet season routes, so that the fragile areas can be rested in the dry season when lower lying routes are passable. Material for upgrading roads should be brought from outside the reserve if possible. Attention should be paid to road drainage to avoid accelerated erosion. Any wetland crossing should not impede drainage.

Actions

- 1 Study problems in existing road system using remote sensing and field visits, making proposals for realignment and upgrading where appropriate, always minimising adverse impacts **(Reserve Biologist, UEM representative, consultancy input if necessary)**
- 2 Undertake realignment and upgrading **(Reserve Administrator, possibly through contractor)**
- 3 Monitor the use of roads and impacts, and take further remedial action as required **(Reserve Biologist, Reserve Administrator, UEM representative)**

10.3.2 Hydrology

Strategy

The flow of the Futi, the level of the main lakes in the Reserve and water quality will be monitored, with particular reference to elephants.

Any further development of the plantations will be kept well away from the Futi River and other areas of high water-table to avoid reduction of stream flow, and through the Futi Corridor programme adverse upstream developments will be avoided. (See Volume 2, Chapters 2 and 3.)

Pumping water from the Maputo River to the Futi should not be implemented. The water quality of the two rivers is quite different (e.g. the Maputo has a high silt load and is nutrient rich; the Futi is low in silt and has acid peat), and the Futi system would suffer considerable ecological changes should this be done.

Actions

- 1 Establish and implement a water monitoring system, building on work already undertaken by UEM (**Reserve Biologist, Biology Department of UEM**)

10.3.3 Maputo River

Strategy

Studies will be undertaken to gain a better understanding of the biodiversity, ecology and natural resources of this lowest section of the Maputo River. The study will take into account existing and planned developments along the western bank (e.g. rice factory and sewage disposal in Bela Vista) and developments upstream (e.g. quarry, lime factory, sewage disposal and other developments in Salamanga), and make recommendations for Reserve management and impact mitigation. Concurrently efforts will be made to include the river in the Reserve (section 7).

Collaboration between Reserve Administration, the National Directorate of Waters and any other appropriate initiatives will be promoted to ensure that the needs of the Reserve are taken into account in decisions affecting management of the Maputo River. This will extend to future developments which will affect discharge volumes and flow patterns (e.g. new dam construction, dam management and water extraction schemes). (See section 16).

Actions

- 1 Undertake a study of the biodiversity and ecology of the Maputo River, consult with existing and future river users and those undertaking impacting activities, and identify major threats
- 2 Incorporate findings into management strategy (**Reserve Administrator**)
- 3 Promote dialogue and collaboration with impacting sectors to minimise adverse impacts, working through government where relevant (**Reserve Administrator, SPFFB and DNFFB**)

11 MARINE SYSTEMS

11.1 Issues

11.1.1 Biodiversity values

These include:

- **corals:** sandstone reefs supporting a wide diversity of hard corals lie offshore from the Reserve in the zone currently proposed for the Reserve extension, with their associated fauna and flora; there are also soft corals in the area;
- **fish communities:** including pelagic, coastal pelagic, rock demersals and coral reef species; as well as some vulnerable species with low growth and reproductive rates endemic to the region;
- **turtles:** leatherback and loggerhead turtles nest on the Indian Ocean beaches, with a particularly high incidence south of Dabela;

- **dolphins:** two species occur in the Indian Ocean near the coast of the Reserve; and
- **mangroves:** in the bay mangroves provide important breeding grounds for prawns and fish, and stabilise sediments.

11.1.2 Threats

Threats to the marine system are thought to include:

- fishing on the reefs off the Reserve by semi-industrial fishing fleets which may be damaging the corals and depleting populations of threatened species;
- damage to reefs and associated fish populations by tourism if diving and angling are not adequately controlled;
- unsustainable fishing in the estuary of the Maputo River and Maputo Bay by people from Maputo and Inhaca, in areas important for young fish and prawn stocks, causing competition and hardship for local people;
- possible unsustainable harvesting of mangrove poles in the bay; and
- possible unsustainable harvesting of intertidal invertebrates on the Indian Ocean.

See Volume 2, Chapter 4.

11.1.3 Inadequate coverage of marine aspects by management

Nearly all Reserve management actions are land-based. Reserve staff currently have very little knowledge of the northern part of the Reserve adjoining Maputo Bay, including the status of the mangroves. The Reserve has one boat with which to manage the coastal areas and the Maputo River margin, but staff are poorly trained in marine management aspects. This will become more critical if the marine limits of the reserve are extended.

11.2 Objectives

To initiate and develop conservation and management of the adjacent marine systems

11.3 Strategy and actions

Strategy

Seasonal monitoring and protection of turtles and their nests will continue.

Surveys will be undertaken of priority marine resources to gain an understanding of their biodiversity and socio-economic values, their current status, and actual and potential threats. This will provide a baseline for monitoring. Concurrently, approval and gazettelement of the extension to the Reserve will be sought (section 7). Detailed management prescriptions will be drawn up from the survey information, in consultation with stakeholders. Management and monitoring will be established. Management will include sustainable use of certain

resources with zoning; zones will be demarcated. Management capacity will be developed for the marine sector, possibly by developing a DNFFB/MICOA/UEM team.

In principle local communities will be permitted to continue their current uses of fish and other marine resources except in cases where this is clearly unsustainable or otherwise undesirable on conservation grounds. In the latter case alternatives will be sought for them. Where competition occurs between local fishermen and outsiders, the activities of the outsiders will be regulated to give priority to local people. This includes the semi-industrial fishing in the bay within 1 nautical mile of the reserve by people from Inhaca and Maputo. It is likely that all industrial or commercial fishing on or near to offshore reefs will be prohibited. See Volume 2, Chapter 4.

Actions

- 1 Expand current turtle research and monitoring programme to include the whole of the Reserve coast and the rest of the Machangulo Peninsula, and incorporate recommendations for improved management into the Reserve's programmes (**Reserve Biologist, UEM, Ponta Malongane management**)
- 2 Draw up and implement an inventory programme with biological and socio-economic studies, developing baseline information on the following:
 - determination of the location, depth and extent of reefs, corals and related organisms, inventory of reef biodiversity; and assessment of use and impacts
 - inventory of inter-tidal marine invertebrates and assessment of use and impacts (bay and Indian Ocean)
 - assessment of the likely impacts of subsistence fishing and increased sport angling in the proposed Indian Ocean extension to the Reserve
 - study of fish and prawn stocks in the southern part of the bay and Maputo River estuary and assessment of level and impacts of current use
 - inventory of local and 'outsider' fishermen and their fishing methods and equipment
 - field inventory of mangrove to complement satellite interpretation covering: mangrove species, quality, use and yield; impacts of use and recent climate fluctuations; and ecological functions and economic importance (**DNFFB**)
- 3 Undertake detailed consultation with stakeholders, particularly local communities, on possible management strategies including solutions to problems of unsustainable and inappropriate use of resources (**Community Liaison Officer**)
- 4 Develop a management strategy and detailed prescriptions for management including: conservation of marine biodiversity; use of marine resources by the different users; community programmes; zoning; demarcation of zones; development of regulations on use and their communication to users; law enforcement; monitoring; ongoing consultation (**Reserve Administrator, DNFFB**)

12 LOCAL COMMUNITIES

12.1 Issues

12.1.1 Current situation

Local communities who lived in the Reserve before the war are moving back again. Population numbers are estimated at between 1,000-1,300, which are much lower than the pre-war 5,000-10,000 estimate (quoted in Matias & Carter 1979). Their distribution is shown in Map 8. Any social services created inside the Reserve could act as an attractant to people from outside and refugees who have not returned, increasing the pressure on the Reserve.

Communities cultivate small *machambas* in the Reserve, mostly on a basis of shifting cultivation which damages the vegetation. Cultivation in more fertile areas near lakes and rivers is having serious impacts on the Futi River (section 10.3.4). Since the productivity of the valley is relatively high, communities are unwilling to stop the practice. There is a risk of serious social and ecological implications.

Long-term ambitions of the communities are to re-establish their large livestock herds, which formerly caused severe overgrazing in parts of the Reserve, and competition with for wild animals.

The local economy is based on subsistence agriculture and use of natural resources, including those within the Reserve. Local communities also use certain sacred forests for ceremonies and burials. With the return of people to the Reserve the area is again being burnt extensively each year with various impacts (section 10.1).

In general, subsistence use of natural resources in the Reserve is currently localised near to settlements and on a relatively small scale. It is therefore generally considered to be sustainable at present levels, with the exception of hunting, cultivation of ecologically sensitive areas and burning.

See Volume 2, Chapters 6-8.

12.1.2 Future perspectives

If the number of people living in the Reserve increases, if greater commercialisation of terrestrial resources occurs, or if the general standard of living and wealth of the people improves and they build up livestock inside the Reserve, people will start to have significant adverse impacts on the Reserve and its biodiversity again.

As DNFFB recognises in the *Preliminary Guidelines and Action Plan for Communities Natural Resources Management* (World Bank 1996) in Mozambique and elsewhere in southern Africa and the world, moves towards co-management of natural resources by states and local communities have reflected the growing realisation by conservation managers that this approach is more cost-effective, sustainable and equitable than conventional approaches to biodiversity conservation.

The poorest and most vulnerable sectors of rural populations are often the most dependent on renewable natural resources for income generation and risk management strategies. Rural communities often bear direct and indirect costs from living in or near conservation areas, in terms of loss of access to resources, and damage to or loss of crops, livestock and human life caused by wildlife. To become partners in biodiversity conservation, local communities must derive sufficient benefits from it to compensate for these costs, and participate in and share responsibility for Reserve management.

12.2 Objectives

To promote participation by the local communities in Reserve management

To promote the sustainable use of natural resources by local communities

To mitigate conflicts through the integration of local development with Reserve management.

12.3 Strategy and actions

12.3.1 Community participation in Reserve management and promotion of sustainable resource use

Strategy

Through a process of dialogue, co-management agreements will be negotiated with target communities, identified by the following criteria:

- expressed desire of community to develop co-management approach
- potential for conflict.

These communities will be encouraged to form associations with a membership list of households and a representative decision-making structure, which will be the basis for participation in Reserve management.¹ Part of the association agreement will be a commitment on the part of the community to adhere to the basic regulations of the Reserve. In order to ensure biodiversity conservation, the primary objective of the Reserve, the following restrictions on natural resource use are inevitable:

- no **hunting** of large mammals in the Reserve, at least until animal numbers have increased;
- no **livestock** shall be kept within the Reserve except poultry;²
- no **cultivation** shall be permitted in ecologically sensitive areas or outside the community use zones; and

¹ The exact relationship will depend on the structure of Reserve management.

² Livestock such as cattle and goats may be kept outside the Reserve. This is probably best arranged through existing kinship mechanisms, unless communities themselves suggest an alternative mechanism.

- no **social services** shall be permitted inside the Reserve.

These restrictions and other costs associated with the Reserve will be compensated through a range of direct and indirect benefits, including continued access to **sacred sites**, the sustainable harvesting of certain **natural resources** within the Reserve and **sharing of Reserve revenues** (see below).

Within the above restrictions, communities will be encouraged to continue customary resource use and management using existing or former traditional control mechanisms. They will be supported by the Reserve Administration, for example in controlling pressures from outside. Community use zones and extensive use zones will be identified through participatory mapping techniques, and demarcated. Systems will be established for joint monitoring of natural resource use. This process will enable communities themselves to become aware if resource use becomes unsustainable, and increase their sense of ownership of the resource, as well as generating useful information for Reserve management.

For example, no further licences for fishing in Lake Piti should be granted to outsiders. In collaboration with Reserve staff, the fishing community will be responsible for monitoring and regulating fish catches. Controlled burning programmes will be established in conjunction with communities living inside Reserve, accommodating communities' genuine needs for burning within the Reserve's fire programme requirements.

Peer monitoring and self-regulation by local communities will be encouraged. Infringements by registered users will imply loss of certain direct benefits for the entire community for a fixed period. Further penalties will be the responsibility of the community. Non-registered users will be dealt with directly by Reserve staff.

Implementation of the above strategy will need to be both gradual and flexible, and in particular responsive to the expressed concerns of local communities.

Actions

- 1 Monitor all settlements in and adjacent to the Reserve and establish number of households (**Community Liaison Officer, UEM**)
- 2 Identify target communities (**Community Liaison Officer and Reserve Administrator**)
- 3 Hold workshops and field visits with target communities to do participatory mapping:
 - to identify resources used by communities, and identify the areas concerned so that community zones and extensive use zones can be delimited in detail
 - to identify traditional resource management systems including resource use and control, whether they are still operating, and their degree of effectiveness
 - to identify with the communities the current status and trends of the resources they use, with a view to determining whether current use is sustainable
 - if resource use is unsustainable or otherwise inappropriate, initiate discussions to find alternatives (**Community Liaison Officer and Reserve Administrator**)

- 4 Support communities in promoting improved resource use where needed (this will include law enforcement to control pressures from outside, limiting of fishing licences to local people, and any other measures deemed appropriate) **(Community Liaison Officer and Reserve Administrator)**
- 5 Establish community resource use monitoring systems **(communities with support from Community Liaison Officer)**
- 6 Discuss with communities the possibility of creating associations to enable participation in new benefits from the Reserve **(Community Liaison Officer and Reserve Administrator)**
- 7 Support the formation of associations, including the production of a register of members by the associations and definition of associations' resource base (e.g. probably fishing for Gala) **(Community Liaison Officer)**
- 8 Establish baseline data (where they do not already exist) and monitor:
 - the number of households in the Reserve, and in particular new settlement **(Community Liaison Officer)**
 - economic well-being of communities **(Community Liaison Officer)**
 - changes in their socio-economic conditions **(Community Liaison Officer)**
 - community attitudes to the Reserve **(Community Liaison Officer)**
 - use of the Reserve for agriculture **(Biologist)**
 - the presence of livestock (including impacts of dogs and cats if possible) **(Community Liaison Officer and Biologist)**

12.3.2 Integration of local development with Reserve management

Strategy

A percentage of Reserve revenues will be allocated to a Community Development Fund, for use in financing projects defined and developed by community associations. This Community Development Fund may be used to improve social services outside the Reserve, which should gradually attract households out of the Reserve. It may also be used to strengthen community associations, through skills development and community exchanges.

As mentioned above, in order to form an association and be eligible for this Fund, communities must commit themselves to adhere to the basic regulations of the Reserve. Infringements may be penalised by a reduction or withdrawal of these benefits for a fixed period, or any other measures found to be appropriate. The value of the Fund will be linked directly to Reserve revenues, thus integrating local development with Reserve management.

Some community members will also receive indirect benefits from the Reserve through employment opportunities, and linkages between the Reserve and the local economy. Communities will be encouraged to develop small enterprises linked to conservation or tourism activities.

However, these benefits will only become significant in the long term, and there is a short term need to offset direct costs, in terms of wildlife damage and restrictions on livelihoods, and to provide incentives to local communities to adhere to the basic regulations of the Reserve. Consideration may be given to creating a special fund as subcomponent of the Community Development Fund specifically to offset the additional costs that people in the Reserve face, while longer term solutions and developments are being sought.

Actions

- 1 Establish the Community Development Fund as a legal entity (**Director of DNFFB and Coordinator of TFCA Project**)
- 2 Consult with communities as to how the fund should function, and establish operating mechanisms within the associations (**Community Liaison Officer, community associations, LTFCA Regional Administrator**)
- 3 Assist communities to identify priorities for funding and prepare proposals (**Community Liaison Officer**)
- 4 Assess training needs within associations and develop community training programme (**Community Liaison Officer and LTFCA Regional Administrator**)
- 5 Distribute funds and monitor (**Community Liaison Officer and LTFCA Regional Administrator**)

13 CULTURAL, HISTORICAL AND ARCHAEOLOGICAL ASPECTS

13.1 Issues

The Reserve is known to contain various Early Iron Age sites; there may also be Stone Age sites (Volume 2, Chapter 5). The area has strong cultural importance for local communities, including the existence of cemeteries and ceremonial sites. However, its cultural, historical and archaeological values have not yet been comprehensively documented or given full attention in management strategies to ensure protection of all sites and rights of communities to continue traditional practices.

13.2 Objectives

To document and preserve archaeological, historical and cultural sites

To gain an understanding of local history and how it relates to traditional cultural practices so as to enable their continuity

13.3 Strategy and actions

Strategy

Surveys will be undertaken to add to existing knowledge on archaeological and cultural sites. Important sites will be given special protected status through zoning. Certain sites may be opened up to visitors if appropriate.

Actions

- 1 Complete the ongoing survey work as part of a larger anthropological survey of the southern Mozambique coastline through fieldwork by experts and collaboration with Reserve guards in locating sites; sites will be documented and recommendations will be made for their conservation (**Archaeology and Anthropology Department of UEM**)
- 2 Undertake any necessary additional work as part of the environmental impact assessments for tourism developments, particularly on the coastal sites (**tourism EIA team**)
- 3 Take any management measures necessary to ensure preservation of archaeological and cultural sites, including control of tourist access (**Reserve Administrator and Tourism Officer**)
- 4 Collect existing information on recent local history and use it to help in understanding traditional resource management systems (**Community Liaison Officer**)

14 TOURISM

14.1 Issues

14.1.1 Potential for tourism

The Reserve has never been well developed for tourism, though it has extremely high potential. Attractions include:

- Indian Ocean coast with outstanding scenery, clear waters and opportunities for water and beach activities;
- inland areas with high scenic value and good potential for game-viewing, wilderness walking and other activities;
- Maputo River and Maputo Bay with opportunities for boating, birdwatching and game-viewing;
- wide variety of bird species and plants; and
- cultural attractions including archaeological sites and local community traditions.

The location of the Reserve close to Maputo and the borders with South Africa and Swaziland, and the planned upgrading of the Salamanga - Ponta do Ouro road make it accessible to large national and regional markets. This is being enhanced by the development of the Maputo Corridor and promotion of regional economic growth through the Lubombo Spatial Development Initiative (LSDI) between Mozambique, Swaziland and South Africa.

Identified markets include:

- **Mozambique:** Mozambicans in the top and medium income brackets, particularly from Maputo; foreigners resident in Mozambique, and their visiting friends and relatives; other tourists to Mozambique (e.g. business people);
- **South Africa and Swaziland:** top, middle and lower segments of the market;
- **International:** top and medium segments, in the longer term

The national tourism policy zones this area for the upper and middle market sectors (República de Moçambique 1995d).

14.1.2 Limiting factors

The main limiting factors are:

- fragility of many of the ecosystems (Volume 2, Chapter 3)
- access problems related to fragility and maintenance of wilderness sense (Volume 2, Chapter 10)
- climatic limitations (very hot and wet in the summer months)
- current low number of large mammals

- general limiting factors for tourism in Mozambique (República de Moçambique 1995d).

Tourism issues and strategies are outlined in more detail in Volume 2, Chapter 11.

14.2 Objectives

To create diverse opportunities for Mozambicans and others to appreciate the natural values of the Reserve, for the purposes of enjoyment, recreation and awareness creation

To generate income to fund Reserve management and create benefits for local communities living in and adjacent to the Reserve

To ensure that tourism development occurs in a planned, controlled fashion which does not have unacceptable social, socio-economic or environmental impacts

14.3 Strategy and actions

Strategy

Ecotourism in its true sense will be promoted rather than nature tourism³. The Reserve's scenery, wilderness, coast and biodiversity will be emphasised in the tourist experience. Game-viewing will play a larger role later on when animal numbers increase. Cultural and traditional uses of the Reserve will also be covered. Most activities will be by boat or on foot, because of the fragile environment. Facilities for day visitors will be provided on the west side of the Reserve; the east side and central areas will cater more for overnight visitors. The upper segment of the market will be focused in the east and centre; other segments will be in the west and centre.

Planned developments are indicated in Map 9. They are:

- small, up-market, high-cost lodges at Milibangalala (30 beds), Dobela (30 beds) and Chemucane (30 beds) on the coast (and at a later stage possibly at Membene), and at the Rio Maputo mouth (30 beds). These four sites are within exclusive-use concession areas that have been defined by DNFFB (see *Proposal for four lodge sites and ecotourism concessions in the Maputo Special Reserve*, DNFFB draft document, August 2000);
- community tented camp(s) on the Maputo river and possibly Maputo Bay (20 beds maximum each);

³ Ecotourism is based on biodiversity, and involves travel to relatively undisturbed natural areas to appreciate the scenery, wild plants and animals, and any existing cultural aspects. It differs from some of the more traditional forms of nature tourism (e.g. gameviewing in African national parks, and coastal tourism) by encouraging sensitivity to and awareness of both the ecosystem being visited, and the importance of conservation in general. The visitor contributes financially (or less frequently through labour) to the conservation of the site and the well-being of the local residents. The host country maintains ecotourism sites with the cooperation of local residents, controlling visitor activities and using the proceeds of the enterprise to fund the area's management as well as local community development.

- boat trips on the Maputo River and Bay (maximum 10 boats on the river for aesthetic reasons);
- wilderness walking in north and south (48 people);
- game viewing near the Futi River/Planicie dos Changos(maximum 6 vehicles); and
- nature trails and an interpretation centre near the main camp.

These are all outlined in greater detail in Volume 2, Chapter 11, including types of developments and activities, and carrying capacities.

Private sector involvement will be sought to promote tourism on a concession basis. Benefits for communities will be promoted. Mechanisms will be developed to retain at least part of the tourism revenues in the Reserve, for reinvestment in Reserve management and benefit of communities inconvenienced by the existence of the Reserve. The ultimate aim is for the Reserve (including the Futi Corridor) to be come financially self-sustaining.

Tourism development will follow the detailed proposals developed in the management plan which have tried to ensure compatibility with other management objectives. Consultation will be carried out in depth with communities before any developments take place. Tourism development and operation will be monitored to ensure that unacceptable impacts do not occur.

Actions

- 1 Pre-qualification and tender documents will be prepared and tenders held for tourism operations at Milibangalala, Dobela, Chemucane and Rio Maputo mouth, and for operation of a boat on the Maputo River (see Volume 2, Chapter 11) (**LTFCA Regional Administrator, Director of DNFFB, DINATUR, District Administrator**)
- 2 Successful tenderers will draw up detailed proposals (**developers**)
- 3 Proposals will be subjected to EIAs which will follow standardised procedures of MICOA, take into account architectural guidelines for tourism developments (Fiebig and Siteo) and environmental factors outlined in Volume 2, Chapter 11. Developments will be evaluated both individually (i.e. site-specific) and in together (i.e. to assess cumulative effects) (**MICOA, DNFFB, developers**)
- 4 Detailed discussions will be held between developers and Reserve Administration, through the Management Board and informally, on how they will work together. Discussions will also be held with the communities as to how community participation will be promoted, with brokership of Helvetas (**developers, Reserve Administrator, Board, Community Liaison Officer, Tourism Officer**)
- 5 Contracts will be drawn up for concessions in which detailed conditions will specify rights of the concessionaires, powers of the warden, participation of the concessionaires on the Board, and detailed conditions over aspects such s visitor numbers and activities, development of tourist facilities, waste and sewage disposal, energy sources, use of water sources, forms of access, and involvement and benefits to local communities (see Volume 2, Chapter 11) (**Board, Reserve Administrator, Director of DNFFB, DNFFB Lawyer**)

- 6 Developments will proceed (**concessionaires, supervised by Administrator**)
- 7 An interpretation centre will be developed, on a small scale at first and later expanded, near to the main camp. Displays will cover history, terrestrial, aquatic and marine ecology, biodiversity, community aspects, management including fires, law enforcement, restocking and crop protection, community participation, and current issues and threats (**Tourism Officer, EWT, UEM, concessionaires**)
- 8 Other interpretation facilities will be developed, including trained guides, interpretation by the concessionaires and possibly written materials; tourists will be encouraged to understand how they contribute to the Reserve and how they can help to conserve it (**Tourism Officer, EWT, UEM, concessionaires**)
- 9 Nature trails and hides will be planned and developed near to the main camp, driving trails and camps/lodges (**Administrator, EWT, UEM**)
- 10 A system will be planned and implemented for running the walking tours, including booking, itineraries, guiding (**Tourism Officer, with advice from EWT and UEM**)
- 11 The revenue collection system will be improved, with attention to security and prompt customer service (**Reserve Administrator, Tourism Officer, Accountant**)
- 12 Monitoring systems will be established and implemented for:
 - monitoring impacts of tourism, with feedback mechanism for management (**Reserve Administrator, Tourism Officer, Biologist with technical inputs from UEM**)
 - monitoring of visitor use of Reserve, including collection and analysis of tourism statistics (**Tourism Officer**)
 - monitoring of visitor satisfaction (**Tourism Officer**)

15 EDUCATION AND INFORMATION

15.1 Issues

This plan involves many concepts not hitherto applied in the Reserve, for example ecotourism in its true sense, community participation and benefits, revenue retention, tourism concessions, marine and riverine extensions to the Reserve, development of the Futi Corridor, and controlled burning programme. Awareness promotion will be required for many different stakeholder audiences in order to gain their cooperation in plan implementation.

15.2 Objective

To promote understanding and awareness of the Reserve, issues affecting it and the local communities, and possible future solutions

15.3 Strategy and actions

Strategy

Most of the awareness promotion required for this plan will be integrated with actions under other sections of this plan to ensure that accurate and appropriate messages are channelled directly to the target audiences. However, a few actions remain which are not covered in other sections.

Key target audiences and messages are:

- **local communities:** concepts of shared management, community benefits, development of associations, acceptance of restrictions on certain activities and promotion of control mechanisms; development of new economic and subsistence activities (covered under section 12).
- **commercial resource users from outside the area:** new control measures, including those likely to result from reserve extension.
- **government and political decision makers at local, provincial and national levels:** concepts and strategies of plan, enlisting their cooperation in their implementation.
- **impacting sectors, both government and private** including tourism industry, agricultural sector, fisheries sector, mining sector, forestry sector, water sector: direct and indirect impacts which their activities may have on the Reserve and its biodiversity, in order to promote mitigating measures (covered in section 16).
- **tourism concessionaires:** detailed understanding and acceptance of conservation strategies of Reserve, in order to promote their full cooperation (covered in section 14).
- **tourists:** understanding of values of the reserve and conservation issues, to enhance their experience and enlist their collaboration in minimising their impacts (covered in section 14).

- **Reserve staff:** detailed understanding and acceptance of conservation and management strategies for the Reserve, in order to promote their full collaboration (covered in section 17).
- **school children:** appreciation of the various values of the reserve and its biodiversity in order to promote environmental awareness in these decision-makers of tomorrow (school children in general), and enforce the environmental messages to their parents (children in local communities).

Actions

- 1 When new terms are drawn up for resource use in the Reserve and extension, this information will be communicated to users from outside the immediate area (**Reserve Administration, LTFCRA Regional Administrator, CMBMP team**)
- 2 Management strategies and detailed actions will be explained and discussed with local, provincial and national government and political decision makers as appropriate, in order to gain their understanding and cooperation (**Reserve Administrator, TFCA Project, Head of Wildlife Department, Director of DNFFB**)
- 3 Concepts of conservation will be taught to school children living near the Reserve, including ways in which they and their families can benefit from and work with the Reserve (**Community Liaison Officer, Biologist**)

16 REGIONAL INFLUENCES

16.1 Issues

Regional influences are outlined in more detail in Volume 2, Chapter 2.

16.1.1 Opportunities

Opportunities arising from regional influences include:

- **biodiversity:** location in a globally important biodiversity region, and current favourable political climate for cooperation with neighbouring countries in management of shared biodiversity and natural resources. Relatively healthy state of ecosystems in adjacent areas within Mozambique. The MSR lies within the Lubombo LTFCA, which as a regional conservation initiative greatly enhances the inherent ecological value of the MSR. Conservation proposals and private sector interests from some quarters which would ensure its conservation (e.g. LTFCA and CMBMP Projects, requests for private game reserves)
- **tourism:** high potential for nature tourism and ecotourism in the reserve and in the region, due to the proximity to Maputo, South Africa, Swaziland, and regional developments such as LSDI and the Maputo Corridor; which could ensure financial support for the Reserve in the future
- **sustainable development:** it is an expressed concern of the Mozambique government that development occur in a responsible and sustainable manner, as demonstrated in the recent district land-use planning which tries to ensure that land uses and developments in the district are compatible with Reserve management objectives

16.1.2 Constraints

Actual or potential constraints arising from regional influences include:

- **upgrading of main road:** pressures resulting from upgrading of the road from Bela Vista to Ponta do Ouro, including increased illegal activities and increased conflict due to possible increase of settlement in the Futi Corridor
- **access to Machangulo:** if the Reserve is used as a major access route this could have large impacts, including localised vegetation degradation, illegal activities, and aesthetic values (Volume 2, Chapter 10). Options for water taxis and a shallow-draught ferry from Maputo and Catembe should be encouraged.
- **proposed port at Ponta Dobela:** a port has been proposed at Ponta Dobela, incorporating a 20,000 ha. development area (port, industry, residential), as well as an application from the developers for the eastern third of the MSR. This is the most serious threat ever to face the MSR, and could fatally compromise its ecological integrity as well as the objectives and activities of the LTFCA and the LSDI.

- **electrification of Machangulo and Inhaca:** a proposal exists to route an extension to the national grid through the reserve above ground, which could have various impacts (Volume 2, Chapter 10).
- **Salamanga quarry and limestone factory:** environmental impacts on the Maputo River are possible
- **other industrial developments:** if other industrial developments occur in the future, for example on the west bank of the Maputo River or further upstream, there could be impacts for the Reserve
- **water extraction and quality of Maputo River:** increased upstream extraction of water and manipulation of flows of the Maputo River in the future could have severe impacts on the estuary of the Maputo River, its mangroves and fauna, and potential for tourism. There is a large water shortage in this region of Southern Africa, and it is certain that further demands will be made on it, both within Mozambique and upstream in Swaziland and South Africa. There may also be impacts on water quality, for example from industrial developments and from runoff in commercial agriculture areas
- **impacts on the Futi River:** upstream developments including changes in land use and water extraction, both inside Mozambique and in South Africa, could have impacts on the Futi valley, its delta, and the communities and wildlife dependent on it. The Futi Corridor aims to conserve the Futi within Mozambique but the country has no control over upstream use
- **unsustainable tourism pressures:** if a high demand develops for the Reserve as a result of its strategic location and attractions, there is a risk that ecological carrying capacity will be exceeded and degradation may result. Positive actions would be needed, for example to control tourist numbers and activities in sensitive areas, and steer visitors to other areas (e.g. Futi Corridor, Machangulo, and other parts of the coast). There are currently (March 2000) at least five illegal tourist holiday structures within the Reserve, two of which are commercial diving operations based in South Africa.
- **livestock:** if livestock numbers increase to high levels in nearby areas there is a risk that in drought years there will be pressure to graze inside the Reserve

16.2 Objective

To participate actively in the planning of local and regional developments impacting on biodiversity and communities to ensure that development is appropriate and compatible with the Reserve and Corridor

16.3 Strategy and actions

Strategy

Active participation will be promoted in the planning and decision/making processes for activities which will enhance the conservation of the Reserve and Futi Corridor, and those which could impact negatively on them. This includes developments in many different sectors to ensure that adequate consideration is given to conservation and community aspects, and also covers mitigating measures to minimise adverse impacts. Some areas of

participation are indicated below in the actions, though this list will change rapidly as new initiatives occur.

Collaboration will also be sought with other projects in the region which have relevance to the reserve and Futi Corridor, to promote exchange of experiences and other forms of mutual benefit. This includes conservation, community and tourism projects.

In cases where communities living inside the Reserve are encouraged to undertake certain activities outside the Reserve (e.g. livestock husbandry), adequate land and other facilities must be ensured for them.

Consideration will be given to seeking Ramsar status for the wetlands of the Reserve, Machangulo and the vigilance area. The MSR together with the coastline from Inhaca to Ponto do Ouro has, in collaboration with national and international conservation organisations, been identified by DNFFB as an area for which World Heritage Status will be sought in order to strengthen national and international recognition of the importance of these areas (Volume 2, Chapter 2).

Actions

- 1 Participate actively in planning/decision making/ensuring mitigation measures for:
 - any follow-on from the district land use plan, including more detailed local planning (Reserve Administrator, Community Liaison Officer, Regional TFCA Project)
 - Ponta do Ouro-Xai Xai tourism masterplan and any follow-on (Reserve Administrator, TFCA Project and Regional Coordinator)
 - Spatial Development Initiative between Mozambique, Swaziland and South Africa (TFCA Project and Regional Coordinator)
 - Maputo Corridor (TFCA Project and Regional Coordinator)
 - SADC initiatives for international agreements on river management, specifically for the Maputo River and possibly Futi (TFCA Project)
 - regional project planned with Swaziland and South Africa for the integrated management of the Maputo River basin (LTFCA Regional Administrator)
 - local initiatives for the implementation of the new Land Law once gazetted (LTFCA Regional Administrator, Community Liaison Officer)
 - environmental impact assessments of any proposed developments which would have impacts on the Reserve or Corridor (various)

- 2 Collaborate with other projects and developments including:
 - Licuati Forest community biomass project (**LTFCA Regional Administrator and Community Liaison Officer**)
 - private game reserve developments adjacent or nearby to the Reserve or Futi Corridor (**Reserve Administrator**)
 - other tourism developments (**Tourism Officer**)

- 3 Collaborate with KwaZulu authorities for joint management of shared biodiversity resources, and to benefit from their experience, through the LTFCA and CMBMP Projects (**TFCA Project, LTFCA Regional Administrator, Reserve Administrator, CMBMP team**)
- 4 Ensure that needs of communities resident in the Reserve for keeping cattle etc. outside the Reserve are met (**Reserve Administrator, Community Liaison Officer, LTFCA Regional Administrator**)
- 5 Consult with MICOA over the possibility of gaining Ramsar status for the wetlands and continue with current plans to apply for World Heritage Site status for the Reserve and adjoining areas (**DNFFB/SPFFB**)

17 INSTITUTIONAL, LOGISTICAL AND LEGAL ASPECTS

17.1 Issues

17.1.1 Institutional aspects

The Reserve management capacity is limited generally by both numbers and level of personnel. Training is required for existing staff. Other limiting factors include transport, equipment and operational funds.

Reserve management is currently supported by DNFFB. The respective roles of DNFFB and SPFFB, and degree of autonomy of the Reserve, are issues that are being clarified under the TFCA Project.

Consultation with and involvement of other stakeholders in Reserve management, especially the local communities, has been limited. Considerable community ill-will developed during the stagnant period of the Blanchard-Sodetur concession, and it is probable that NGOs such as Helvetas and IUCN will be key players in continuing to assist MSR management to work with local communities. It is also imperative that private sector involvement (in ecotourism) in the MSR progresses according to the objectives of the management plan.

17.1.2 Infrastructure

Much of the Reserve infrastructure is in a rundown state, including parts of the main camp, outposts (see Table 9.1), roads, bridges, culverts and boundary fence. This severely limits the effectiveness of Reserve management, capacity for tourism, and recognition of Reserve boundaries by local communities.

17.1.3 Legislation

The proposed extension of Reserve limits is covered in section 7.

Levels of tourist charges and revenue collection need to be legalised. Ideally the Reserve should be able to set its own fee structure within general DNFFB guidelines, rather than being pegged to national levels. The quality of experience, availability of facilities and access to markets is so variable between protected areas that the flexibility of individual pricing is important.

The current legislation does not cover the following factors of relevance to the Reserve:

- a category of protected area which enables biodiversity conservation through both protection and sustainable use, with community involvement in resource and Reserve management, with some communities resident inside the Reserve
- community access rights to sacred sites

Reserve regulations should be finalised and legalised to enable their enforcement.

17.2 Objectives

To promote an appropriate institutional and legal framework to guide and undertake the management of the Reserve, involving the principal stakeholders

17.3 Strategy and actions

17.3.1 Institutional framework and personnel

Strategy

A Management Board will be established to guide the management of the Reserve, composed of government, communities, private sector and NGOs. Within the Reserve Administration, sections have been created for: law enforcement and control; conservation and maintenance; tourism; community relations and research, but none of these have the human or practical capacity to be currently effective. Community institutions are covered above.

1 Management Board

The Board already functions informally with a skeleton membership comprising DNFFB, SPFFB and NGOs.

The management board will comprise:

- Provincial Director of Agriculture (Chairman)
- DNFFB representative
- SPFFB representative
- Reserve Administrator
- representatives of the local communities
- NGOs involved in reserve management or community work in the area of the MSR (Helvetas, FNP)
- private sector operator(s) with concessions in the Reserve or who are otherwise substantially supporting the Reserve

Draft terms of reference for the Board are:

- to supervise and control the management and development of the Reserve
- to commission the updating of the Reserve Management Plan, either every five years or on a rolling planning basis, and approve it
- to approve the annual workplans and budgets prepared by the Reserve Administrator
- to supervise the tendering process for tourism concessions in collaboration with DNFFB
- to collaborate with DNFFB in the development of revenue retention mechanisms
- to supervise the development and running of the financial system
- to collaborate with DNFFB in the preparation of the new Forest and Wildlife Acts.

The Board will meet a minimum of four times each calendar year, and more often if required.

2 Reserve Administration

The Reserve will have a central Administration under which will fall the following sections:

- Conservation and Maintenance Section
- Law Enforcement and Animal Control Section
- Community Relations Section
- Tourism Section
- Research Section

Objectives and responsibilities of the Administration are outlined below.

Objective:

To plan, coordinate, direct, supervise and monitor Reserve management to ensure conservation of the Reserve's biodiversity and integration of the local communities in management, and to collaborate in the development and management of the Futi Corridor

Responsibilities:

- prepare annual workplans and budgets for approval by the Board, and participate in management plan revision
- implement the management plan and annual workplan
- control and account for the Reserve's budget to the Board
- direct, supervise and coordinate the work of the five administrative sections
- supervise the control of the reserve's vehicles and equipment
- collaborate closely with the Regional Coordinator of the TFCA Project and Futi Corridor Coordinator, and support the management of the Futi Corridor
- collaborate and foster good working relationships with tourism concessionaires
- promote working relations with district and provincial government, political parties, private sector, local communities (through the Communities Section), NGOs and projects operating in the vicinity
- assume ultimate responsibility for all legal matters concerning the Reserve, including prosecutions and boundary alterations
- produce three-monthly reports for the Board summarising development and management achievements including summaries and analysis of section reports; conservation status and trends; progress with community participation and tourism.

2.1 Conservation and Maintenance Section

Objective:

To provide logistical support to Reserve management to enable the other sections to function properly, and to undertake routine conservation work

Responsibilities:

- implement construction and maintenance of buildings and access roads in the Reserve
- undertake routine maintenance of vehicles and other machinery in the Reserve
- assume responsibility for the care and control of equipment in the Reserve
- assume responsibility for care and control of the store
- support the controlled burning programme through lighting and attendance at intended fires, and fighting of wild fires which threaten installations or sensitive vegetation types
- undertake habitat rehabilitation work as appropriate
- provide logistical support to the animal reintroduction programme as appropriate
- if electric fencing is erected, assume responsibility for its maintenance
- submit monthly reports to the Reserve Administration

2.2 Law Enforcement and Animal Control Section

Objective:

To support the conservation of the reserve's biodiversity by preventing unacceptable and unsustainable use of natural resources and undesirable fires, and protecting people, crops and livestock through control of problem animals

Responsibilities:

- undertake law enforcement to prevent illegal activities inside and in the vicinity of the Reserve, including the Futi Corridor
- ensure the protection of people, crops and livestock within and in the vicinity of the Reserve
- control fires which are considered undesirable
- ensure visitor security (protection against wild animals and people)
- collect data on animals, vegetation, fires and human activity for management purposes
- provide logistical support to the posts and ensure regular supplies to them
- produce monthly reports to the Reserve Administration

2.3 Community Section

Objective:

To promote enhanced collaboration between communities and Reserve through community participation in Reserve management, resolution of conflicts and promotion of sustainable use of resources by communities

Responsibilities:

- promote dialogue with the communities in and adjacent to the Reserve
- through participatory methods, gain a detailed understanding of the needs, conflicts and pressures facing communities
- negotiate co-management agreements with target communities, including community benefits and restrictions on community activities
- participate in the application and allocation of Community Development Fund and Special Fund benefits
- refine the reserve zoning in collaboration with communities, to accommodate their basic needs and also take in to account conservation aspects
- promote community collaboration in Reserve management, including resource use and burning programme
- submit monthly reports to the reserve Administrator and Futi Corridor Coordinator

This section will comprise personnel who will undertake community work in both Corridor and Reserve. They will in no way be responsible for any law enforcement, since it is impossible to combine the roles of regulation and facilitation. They should, however, liaise closely with the law enforcement team to ensure compatibility in the messages they are giving to the communities, and their interactions with them. The Community Liaison Officer will head this work.

2.4 Tourism Section

Objective:

To promote the development and appropriate management of tourism in the Reserve, in accordance with the tourism objectives

Responsibilities:

- supervise tourism developments and management in the Reserve and ensure mitigation of negative impacts
- liaise with tourist operators and ensure good collaboration between Reserve management and operators
- provide interpretation and information for visitors, including recruitment and training of guides

- supervise and monitor tourism revenue collection
- develop an appropriate system of collecting, analysing and presenting tourism statistics
- produce monthly reports to the Reserve Administrator on tourist statistics, revenues, developments, problems etc.
- provide inputs to annual workplans and revision of the management plan

2.5 Research Section

Objective:

To undertake research, monitoring and evaluation with direct relevance to promoting improved conservation, management and appropriate use of the Reserve's biodiversity, and inclusion of the communities in management programmes

Responsibilities:

- undertake biodiversity and hydrological inventories
- develop a data base for the Reserve
- monitor trends in biodiversity and hydrology
- undertake other research as indicated in the management plan
- make management recommendations for vegetation, habitat management, animal population management and other aspects as relevant
- monitor impacts of communities, tourism and management interventions on the natural systems
- provide technical inputs to the annual work plans and the revision of the management plan
- prepare six-monthly reports for submission to the Reserve Administrator

3 Staff requirements

The future staffing requirements are shown on Table 17.3.1

Table 17.3.1 Staffing (current and future)

Section	Current staff	Future requirement	Required recruitment
Administration	1 Administrator 1 Accountant	1 Administrator 1 Accountant 1 Secretary	1 Secretary
Law Enforcement and Animal Control	43 Guards ⁴	1 Chief of Section ⁵ 43 Guards ⁶	11 Guards
Conservation and Maintenance	3 Basic-level Technicians	1 Chief of Section 3 Basic-level Technicians ⁷ 10 Labourers ⁴	1 Chief of Section
Community	2 Medium-level Community Officers	1 Community Liaison Officer ⁸ 2 Medium-level Community Officers ⁸	1 Community Liaison Officer
Tourism		1 Medium-level Tourism Officer	1 Medium-level Tourism Officer
Research	1 Biologist ⁹	1 Biologist 1 Assistant	1 Assistant

4 Staff training

A full training programme will be drawn up once staff are recruited and their capabilities, qualifications and previous experience are known.

4.1 Law enforcement

A 6 month training session was held in collaboration with KZNNCS, involving the following aspects:

- firearms handling (police)

⁴ 10 are old and should move to maintenance duties

⁵ through promotion of one of the guards

⁶ 11 new guards should be recruited to replace the 10 old ones and the one to be promoted. They should be fit, young and motivated, and should have at least 4th class (old system) or 6th class (new system) so that they can write reports. Some of the 43 should have driving licences.

⁷ These people will collect revenues and receive tourists at the main camp. They must therefore speak some English and be competent and trustworthy to collect revenues.

⁸ the Community Officers must speak the local language and preferably have experience in community work through NGOs; they will be recruited through Helvetas in the Futi Corridor and will work in the corridor and the reserve, in close collaboration with reserve staff

⁹ currently being recruited

- drill (police)
- law enforcement strategy and procedures (police, Reserve Administration and KZNNCS)
- problem animal control (Reserve Administration and KZNNCS)
- wildlife and forest legislation (Serviço Nacional de Fiscalização - SNF)
- reporting (Reserve Administration, KZNNCS)
- communications (Reserve Administration, KZNNCS)
- first aid (Ministry of Health or Medicos Sem Fronteiras)
- communication skills (Reserve Administration, KZNNCS)
- community aspects (Reserve Administration/Futi Corridor Coordinator/Community Department, DNFFB)
- brief outline of biodiversity and ecology of the Reserve (Reserve Biologist, DNFFB Head of Protected Areas)
- boat handling and maintenance, swimming, lifesaving (for guards who will work in the Reserve's marine extensions) (CMBMP team)

Courses were attended by all reserve and SPFFB staff involved in law enforcement, whatever their category and previous training.

4.2 Biodiversity and ecological management

On the job training will be provided for the Biologist, Administrator and Head of Conservation and Maintenance Section in aspects such as:

- practical fire management and monitoring
- biodiversity inventory

4.3 Training in community aspects

This could include:

- study tours to other community programmes in Mozambique and Southern Africa
- PRA training for Reserve and Futi Corridor personnel if needed

4.4 Tourism

This could include:

- training of local community guides in communication skills, ecology and first aid
- training of Reserve Tourism Officer as required (possibilities are study tours to other ecotourism developments, and training in environmental impact mitigation, monitoring and practical tourism management)

- English language training for guides and Tourism Officer.

5. Relationship with TFCA Project, NGOs and other agencies

Under the TFCA Project, the Regional Coordinator is also the Provincial Director of Forestry and Wildlife. The Lubombo TFCA technical committee has been formed with representation from KZNNCS, the Swaziland National Trust Commission (SNTC), and DNFFB.

It is likely that the Reserve Administrator will become responsible for management of the Futi Corridor, including law enforcement and management of flora and fauna. The Community Liaison Officer will be responsible for community aspects in the Corridor and Reserve.

In all these agreements and institutional arrangements it is essential that coordination and integration is emphasised, to ensure optimum use of available support and building of long-term capacity for the Reserve and Corridor. All the institutions concerned should be involved throughout this process.

Actions

- 1 Formally establish the MSR Management Board formally with legal recognition, after consultation with stakeholders (**Director of DNFFB and Minister of Agriculture and Rural Development**)
- 2 Develop the full five sections within the Reserve Administration, including recruitment of new staff (**Reserve Administrator, LTFCA/SPFFB**)
- 3 Draw up a realistic staff and community training programme using existing courses, short custom-built courses, workshops, on-the-job training and study tours (**Reserve Administrator and LTFCA/SPFFB**)
- 4 Implement staff training programme (**Reserve Administrator and LTFCA/SPFFB to supervise and organise**)
- 5 Finalise institutional arrangements for the CMBMP Project (**CMBMP team**)

17.3.2 Infrastructure, transport and equipment

Strategy

1. Reserve infrastructure

Reserve infrastructure will continue to be developed, rehabilitated, upgraded and maintained. Maintenance responsibilities are covered in section 17.3.1. Rehabilitation required includes:

- guard posts (see section 9)
- roads (following study of realignment and identification of sections for upgrading, see section 10).
- bridges and culverts inside the Reserve
- main camp installations (see below).

2. Main camp

A detailed plan for the development of the main camp will be drawn up, to make best use of existing installations, cater for required expansion and ensure that future developments are harmonised and integrated. Guidelines developed in Fiebig & Siteo (in prep.) should be followed.

In principle, the social services serving local communities (school, health post) will remain in the short term so that people see direct benefits from Reserve, but in long term they will move outside the Reserve boundary nearer to the communities, keeping the camp for management. It is recommended that careful consideration is given to use of the old shop building. A shop might be better located on the other side of the Futi with the communities; the building might be used as a community cooperative to sell handicrafts to tourists.

Consideration must be given to location of tourism facilities including information and interpretation facilities and toilets. In principle these should be adjacent and not inside the current camp, with a separate entrance, to maintain privacy for management and staff quarters. The old training school buildings will be used for community training, environmental education, workshops and occasional training of Reserve personnel. If possible they should be screened from the staff housing.

3. Equipment

An inventory of existing equipment as at 1997 is presented in Volume 2, Chapter 13.

Actions

- 1 Prepare a proposal for main camp development (**Reserve Administrator with assistance from UEM and FNP**)
- 2 Undertake the rehabilitation and development of the main camp (**Reserve Administrator, Head of Conservation and Maintenance Section**)
- 3 Undertake road and bridge upgrading/rehabilitation (**contract, under supervision of Reserve Administrator**)
- 4 Undertake rehabilitation of posts (**Head of Conservation and Maintenance Section**)

Routine maintenance, control of equipment and vehicles etc. is covered in section 17.3.1.

17.3.3 Boundary demarcation

Strategy

Terrestrial boundaries will be re-demarcated with beacons and other appropriate means (e.g. the fence on north-western boundary). The old fenceline will be identified by guards who worked in the Reserve at that time. Where appropriate discussions will be held with communities to confirm the location of the boundary.

Actions

- 1 Identify the line of the boundary on the ground and record the coordinates accurately (**Reserve Administrator, Serviços Provinciais de Geografia e Cadastro**)
- 2 Discuss the limits with local communities (**Community Liaison Officer**)
- 3 Demarcate the boundary and document it (**Serviços Provinciais de Geografia e Cadastro**)

17.3.4 Waste management

Strategy

Guidelines outlined in Fiebig & Siteo should be followed. In principle the reserve should continue to sort refuse, disposing of it by:

- composting biodegradable wastes
- recycling/reusing other wastes where possible
- disposing of the remainder in the most appropriate and environmentally friendly manner, outside the Reserve

This applies to both management and tourism operations.

It is likely that the main camp will continue to use pit latrines for some time. These must be located away from the well and the Futi. When the piped water system is rehabilitated correctly sited septic tanks must be installed.

17.3.6 Legislation

Strategy

1. Protected area category

The wildlife legislation currently under revision must include an appropriate category of protected area for the Reserve, probably in the form of a Biosphere Reserve, with provision for the following:

- conservation and consumptive use of natural resources
- rights of communities to reside there, cultivate non-critical areas, use resources and have access to sacred sites
- ownership of restocked animals and their progeny (e.g. by communities)
- tourism concessions

- visitor fee structure, including the right for the Board to set its own fees within general DNFFB guidelines
- licensing of fishing within the Reserve.

2. Reserve regulations

The Reserve requires a set up up-to-date regulations. Suggested regulations are:

- no off-road driving
- no driving on beach
- no tourist use of roads not open to visitors
- no driving at night unless on authorised night safaris
- no angling outside zones designated for this purpose
- no collection of plants or animals (including corals, molluscs etc.) by people other than local communities, unless under licence in areas zoned for this purpose
- no firearms within the Reserve unless for management purposes
- no disturbance or feeding of wild animals, or damage to plants except for subsistence purposes by local communities
- no collection of firewood inside the Reserve except by and for local communities
- all rubbish to be removed from the Reserve for appropriate disposal elsewhere by both visitors, tourism operators and reserve management
- all tourism developments to follow the guidelines laid out for protected areas (Fiebig & Siteo)
- no domestic animals allowed into the Reserve
- lighting of intentional or accidental fires by visitors is prohibited except for campfires in designated campsites; special conditions for local communities will be worked out
- entrance and exit times for visitors: from ... h to ... h in summer
from ... h to ... h in winter

The Maputo Special Reserve is in no way responsible for any loss, damage, injury or loss of life through whatever means to visitors or their property including vehicles.

Actions

- 1 Participate actively in the legislation revision to ensure the Reserve's needs are catered for (**Chief of Wildlife Department, DNFFB Lawyer, TFCA Project**)
- 2 Finalise and gazette Reserve regulations (**Chief of Wildlife Department, DNFFB Lawyer**)

18 RESEARCH, MONITORING AND EVALUATION

18.1 Issues

Tello (1973) documented a large amount of information about the Reserve, its biodiversity, management, socio-economic situation, uses of natural resources, boundaries and threats. Since then a few studies have been made, notably by UEM, but there remain large gaps in existing knowledge about the current status of the Reserve's biodiversity, ecological trends and community issues. Marine aspects are particularly poorly understood, apart from the work done by the Oceanographic Research Institute in 1996 and some work on fisheries, and subsequent work between MICOA and UEM. There is no sound, comprehensive baseline data on which monitoring can be based.

A new collaborative study between UEM, members of KZNNCS and the University of Pretoria started in the MSR and proposed Futi Corridor in 1999, funded by the Peace Parks Foundation. It focuses on the population dynamics, distribution and movements of the elephant population in the MSR and proposed Futi Corridor, and incorporated a community element. Preliminary aerial surveys have been conducted, and several elephants have been fitted with GPS collars.

18.2 Objectives

To promote research which will contribute to a better understanding of the Reserve's biodiversity, ecological functioning, socio-economic situation and sustainable use of natural resources, develop a baseline for monitoring, and enable recommendations for improved management, resolution of conflicts and appropriate development

To monitor and evaluate biodiversity trends, tourism and its development, community aspects and the effectiveness of management interventions, and provide feedback to management

18.3 Strategy and actions

18.3.1 Research

Strategy

Priority will be given to research with direct application to Reserve management, including inventory work since there are still many gaps in basic knowledge about the Reserve. Some research in the Reserve may form part of larger research programmes covering wider areas (e.g. LTFCA, or coastal zone). All management-oriented research to be implemented under this plan has already been described as an integral part of management under previous sections.

Networking should be promoted with UEM, KZNNCS and other institutions to share research results and avoid duplication.

Requests to undertake other research (i.e. without direct relevance to Reserve management priorities) by other institutions will also be considered. If they are self-funded and inputs are not required from reserve management or Research Section they will generally be approved.

All research undertaken in the Reserve must be done with the approval and knowledge of the Management Board, Biologist and Administrator. All results and reports must be presented in two copies, for the Reserve library and DNFFB.

Actions

- 1 Undertake research programme as outlined in other sections (**overall responsibility for coordination: Reserve Biologist and Management Board**)
- 2 Develop a data base for monitoring of biodiversity, physical environment, community aspects, natural resource use, tourism and management interventions, to be located in the main camp with backup elsewhere (**Reserve Biologist in collaboration with DNFFB Fisheries Biologist and Head of Protected Areas, in consultation with Biology Department of UEM**)
- 3 Develop a network of contacts for other research (**Reserve Biologist in collaboration with DNFFB Fisheries Biologist and Head of Protected Areas**)
- 4 Develop a library for the Reserve in the main camp (**Reserve Biologist**)

18.3.2 Monitoring and evaluation

Baseline data will be collected and monitoring systems established to monitor priority aspects of vegetation, fires, hydrology, fauna, demography, use of natural resources, tourism, and management interventions. These have already been specified in sections above. Trends will be evaluated and feedback provided to modify management interventions where necessary.

19 FINANCING OF RESERVE MANAGEMENT

19.1 Current situation

The Reserve is currently being financed by the Mozambican Government.

19.2 Longer term situation

In the long term the Reserve cannot continue to rely on donor projects and NGOs for financial support, as this is not sustainable. The Reserve has a high potential for tourism and in the long term could become self-supporting. DNFFB's long-term aim is to gain some form of financial self-sufficiency, in order to ensure sustainable management of forestry and wildlife resources and protected areas. Details of this have not yet been worked out, but protected areas would be expected to be self-financing where feasible, and if possible contribute to the functioning of DNFFB and the SPFFB in light of their central and provincial support to the reserve. DNFFB is also committed to sharing benefits with communities. In addition there is the issue of whether those protected areas with high revenue generating potential should subsidise those which are never likely to be self-financing, but which have high biodiversity values and/or perform important ecological services.

At present however, there are no adequate formal mechanisms available to enable revenue retention and reinvestment in management. DNFFB is currently working on ways to develop these.

19.3 Financial analysis

Detailed results of the financial and economic analysis are presented in Volume 2, Chapter 14; the budget is shown in Table 19.1. A summary is presented below.

Capital investment costs for Reserve management (excluding tourism concessionaire's costs)	US\$522,000
Total annual recurrent costs for Reserve management	US\$275,620
Projected annual revenue for year 5 ¹⁰	US\$601,000
Net revenues after management costs covered	US\$325,380

The above figures are projections, but they do give an indication of the likely scale of costs and revenues. The Reserve is financially viable in the long term, with opportunities for revenue-sharing with communities and benefits for DNFFB, SPFFB and local rural development through the district.

¹⁰ assuming that Membene and Chemucane are also developed for tourism.

Allowing a safe margin for contingencies, the following allocations are suggested:

Reserve management	60%	USD360,600 (includes contingencies)
National Directorate	5%	USD 30,050
Provincial Services	5%	USD 30,050
District Administration	5%	USD 30,050
Local communities	25%	USD150,250
Total	100%	USD 601,000

Benefits to central government will accrue from tourism taxes paid by concessionaires in the Reserve.

Allocation of 25% of the estimated annual income to the projected 1500-2000 households in and adjacent to the Reserve provides an annual income of approximately \$75-100 per household.

There might be some need for further adjustment to these figures to take into account operational costs and community benefits for the rest of the Futi Corridor outside the immediate vicinity of the reserve. It is not possible to do this at present as potential revenues from the Corridor (e.g. through tourism) have not been estimated.

Table 19.1: Maputo Special Reserve Development and Recurrent Budget, 1997-2001

	Units	Cost/unit	Year 1	Year 2	Year 3	Year 4	Year 5	Total	Source	Swiss	EIA	EWT	MER	CZM
INVESTMENT COSTS														
Infrastructure														
Rehabilitate main camp	1	20,000	20,000					20,000	EIA		20,000			
Bridge across Futi	1	5,000	5,000					5,000	EIA		5,000			
Post construction	3	500	1,500					1,500	Swiss	1,500				
Road realignment/upgrading	1	80,000	80,000					80,000	Other					
Wells	8	500	4,000					4,000	Swiss	4,000				
Rehabilitation of camp sites	2	500	1,000					1,000	EIA		1,000			
Fence	1	30,000	30,000					30,000	Other					
Water points	1	20,000	20,000					20,000	Other	20,000				
Demarcation	1	20,000	20,000					20,000	Swiss					
Nature trail development	1	5,000	5,000					5,000	Swiss	5,000				
Interpretation centre	1	10,000	10,000					10,000	Swiss	10,000				
Total			196,500	0	0	0	0	196,500		40,500	26,000	0	0	0
Vehicles														
Vehicles (S/W)	1	30,000	30,000					30,000	EIA		30,000			
Vehicles (P/U)	2	30,000	60,000					60,000	EIA		90,000			
Tractor	1	50,000	50,000					50,000	exists					
Boats (RIB)	2	4,000	8,000					8,000	CZM					8,000
Beach buggies	2	8,000	16,000					16,000	CZM					16,000
Motorbikes	4	4,000	16,000					16,000	Swiss	16,000				
Total			180,000	0	0	0	0	180,000		16,000	120,000	0	0	24,000
Equipment														
Generator	1	15,000	15,000					15,000	EIA		15,000			
Computer and printer	1	4,000	4,000					4,000	EIA		4,000			

Gas freezer	1	400	400					400	Swiss	400				
Water pump	1	3,000	3,000					3,000	Swiss	3,000				
Radio equipment	1	9,000	9,000					9,000	Swiss	9,000				
Vehicle radio	1	2,000	2,000					2,000	Swiss	2,000				
Portable radios	10	500	5,000					5,000	Swiss	5,000				
Batteries	10	100	1,000					1,000	Swiss	1,000				
Equipment for main camp	1	10,000	10,000					10,000	Swiss	10,000				
Equipment for workshop	1	10,000	10,000					10,000	EIA		10,000			
Equipment for posts	13	500	6,500					6,500	Swiss	6,500				
Binoculars	20	200	4,000					4,000	Swiss	4,000				
Sign posts	1	2,500	2,500					2,500	MER				2,500	
GPS	2	500	1,000					1,000	Swiss	1,000				
Total			73,400	0	0	0	0	73,400		41,900	29,000	0	2,500	0
Training														
Law enforcement course	1	2,500	2500					2,500	EWT				2,500	
CASS course	3	5,000	15000					15,000	Swiss	15,000				
Tourism officer training	1	2,000	2000					2,000	Swiss	2,000				
Total			19500	0	0	0	0	19,500		17,000	0	2,500	0	0
Studies														
Access study	1	3,600	3,600					3,600	Swiss	3,600				
Biodiversity inventory	1	15,000	15,000					15,000	Swiss	15,000				
Vegetation map	1	500	500					500	Swiss	500				
Futi study	1	10,000	10,000					10,000	Swiss	10,000				
Aerial survey (mams/comms)	1	3,000	3,000					3,000	Swiss	3,000				
Turtle research	1	0	6,000					0	CZM					0
Bird census	1	0	0					0	EWT			0		
Monitoring fishing impacts	1	1,000	1,000					1,000	CZM					1,000
Fence feasibility	1	2,500	2,500					2,500	Swiss	2,500				
Archaeological survey and pres'n	1	2,000	2,000					2,000	Swiss	2,000				

Plan for main camp	1	2,000	2,000					2,000	Swiss	2,000				
Marine research	1	0	0					6,000	CZM				6,000	
Mangrove inventory	1	5,000	5,000					5,000	CZM				5,000	
Water survey	1	2,000	2,000					2,000	Swiss	2,000				
Total			52,600	0	0	0	0	52,600		40,600	0	0	0	12,000
TOTAL INVESTMENT COSTS			522,000	0	0	0	0	522,000		156,000	175,000	2,500	2,500	36,000
RECURRENT EXPENDITURE														
Salaries														
Administrator	12	400	4800	4800	4800	4800	4800	24,000	Swiss/MER	14,400			9600	
Accountant	12	100	1200	1200	1200	1200	1200	6,000	Swiss/MER	3,600			2400	
Secretary	12	80	960	960	960	960	960	4,800	Swiss/MER	2,880			1920	
Section chiefs	24	50	1200	1200	1200	1200	1200	6,000	Swiss/MER	3,600			2400	
Guards	516	40	20640	20640	20640	20640	20640	103,200	Swiss/MER	61,920			41280	
Basic-level technicians	36	60	2160	2160	2160	2160	2160	10,800	Swiss/MER	6,480			4320	
Labourers	120	30	3600	3600	3600	3600	3600	18,000	Swiss/MER	10,800			7200	
Medium-level community officers	24	100	2400	2400	2400	2400	2400	12,000	Swiss/MER	7,200			4800	
Medium-level tourism officer	12	100	1200	1200	1200	1200	1200	6,000	Swiss/MER	3,600			2400	
Biologist	12	300	3600	3600	3600	3600	3600	18,000	Swiss/MER	10,800			7200	
Assistant	12	100	1200	1200	1200	1200	1200	6,000	Swiss/MER	3,600			2400	
Total			42960	42960	42960	42960	42960	214,800		128,880	0	0	85,920	0
Equipment														
Uniforms	86	100	8600	8600	8600	8600	8600	43,000	Swiss/MER	25,800			17200	
Camping equipment	29	150	4350	4350	4350	4350	4350	21,750	Swiss/MER	13,050			8700	
Total			12950	12950	12950	12950	12950	64,750		38,850	0	0	25,900	0
Training														
Guard study tours	1	2,000	2000	2000	2000	2000	2000	10,000	EWT			10,000		
Total			2000	2000	2000	2000	2000	10,000		10,000	0	10,000	0	0

Operating Costs														
Vehicle running costs	36	600	21600	21600	21600	21600	21600	108,000	Swiss/MER	64,800		43200		
Boat running costs	24	1,500	36000	36000	36000	36000	36000	180,000	CZM				180,000	
Beach buggy running costs	24	500	12000	12000	12000	12000	12000	60,000	CZM				60,000	
Tractor running costs	12	300	3600	3600	3600	3600	3600	18,000	Swiss/MER	10,800		7200		
Motorbike running costs	48	500	24000	24000	24000	24000	24000	120,000	Swiss/MER	72,000		48000		
Road maintenance	1	5,000	5000	5000	5000	5000	5000	25,000	Swiss/MER	15,000		10000		
Crop protection equipment	1	1,000	1000	1000	1000	1000	1000	5,000	Swiss/MER	3,000		2000		
Miscellaneous operating costs	12	500	6000	6000	6000	6000	6000	30,000	MER			30,000		
Total			109200	109200	109200	109200	109200	546,000		165,600	0	0	140,400	240,000
TOTAL RECURRENT EXPENDITURE			167110	167110	167110	167110	167110	835,550		343,330	0	10,000	252,220	240,000
TOTAL			689,110	167,110	167,110	167,110	167,110	1,357,550		499,330	175,000	12,500	254,720	276,000
Swiss								499,330						
EIA								175,000						
EWT								12,500						
MER								254,720						
CZM								276,000						
Other								180,000						

Actions

- 1 Develop legally accepted mechanisms for revenue retention for reinvestment in Reserve management and revenue sharing with communities (**Director of DNFFB and Chief of Economics Department, DNFFB**)
- 2 Develop institutional management capacity and logistical arrangements for implementation of these mechanisms (**Director of DNFFB, TFCA Project, Reserve Administrator, Reserve Accountant**)
- 3 Develop systems for revenue sharing with local communities (**Community Liaison Officer**)

20 PLAN PERIOD, ALTERATIONS AND REVISION

This plan will run for five years. At the end of each year the Administrator will prepare an annual work plan for the following year. This will be done in collaboration with the Community Liaison Officer.

Consideration might be given to expanding this plan to incorporate the Futi Corridor, rather than preparing a separate plan. This is particularly relevant since the reserve will provide considerable support to Futi Corridor management, and the Community staff from the Corridor will work within the Reserve.

Under the current system the plan should be revised in the fifth year. DNFFB might like to consider the option of having a rolling plan, whereby the plan is slightly revised each year. This has the advantage of greater flexibility and avoids the major endeavour of revising the plan in the fifth year. It does involve a slightly greater commitment each year, however, during the annual planning.