Table of contents

Tables

Figures

List of Abbreviations

ACP	Africa, Caribbean and Pacific
ANE	Administração Nacional de Estradas (National Roads Administration)
APE	Administração Provincial de Estradas (Provincial Road Administration)
ARA	Administração Regional de Águas (Regional Water Administration)
ARPAC	Arquivo do Patrimonio Cultural (Arquives for Cultural Patrimony)
CAP	Country Assistance Plan
CAS	Country Assistance Strategy
CCF	Country Co-operation Framework
CDS	Centro para o Desenvolvimento Sustentavel (Center for Sustainable Development)
CIMT	Change Impact Monitoring Table
CNCS	Conselho Nacional de Combate ao SIDA (National Council Against AIDS)
DFID	Department for International Development (UK)
DIP	Departamento de Inspecçao Pesqueira (Department of Fish Inspection)
DNA	Direcção Nacional de Águas (National Directorate of Water)
DNAC	Direcção Nacional para as Areas de Conservaçao (National Directorate for Conservation Areas)
DNAP	Direção Nacional da Administração Pesqueira (National Directorate of Fisheries Administration)
DNHA	Direcção Nacional de Hidráulica Agricola (National Directorate of Agricultural Hydraulics)
DNFFB	Direcção Nacional de Florestas e Fauna Bravia (National Directorate of Forestry and Wildlife)
DNTF	Direção Nacional de Terras e Florestas (National Directorate of Lands and Forests)
DPOPH	Direcção Provincial de Obras Públicas e Habitação (Provincial Directorate of Public Works and Housing)
EC	European Commission
EDM	Electricidade de Moçambique (Electricity of Mozambique)
EIA	Environmental Impact Assessment
EFA	Environmental Flow Assessment
EU	European Union
FAO	Food and Agriculture Organization of the UN
GDP	Gross Domestic Product
GOM	Government of Mozambique
HIV/AIDS	Human Immuno Deficiency Virus / Acquired Immune Deficiency Syndrome

ICZM	Integrated Coastal Zone Management
IDPPE	Instituto par o Desenvolvimento Pesqueiro de Pequuena Escala (Institute of Small-Scale Fisheries Development)
IIED	International Institute for Environment and Development
IIP	Instituto de Investigação Pesqueira (Institute of Fisheries Research)
IUCN	World Conservation Union
MADER	Ministério da Agricultura e Desenvolvimento Rural (Ministry of Agriculture and Rural Development)
MA	Ministério da Agricultura (Ministry of Agriculture)
MCE	Maputaland Centre of Endemism
MDG	Millennium Development Goals
MCS	Monitoring Control and Surveillance
MINED	Ministerio de Educaçao (Ministry of Education)
MICOA	Ministério da Coordenação Para Acção Ambiental (Ministry for Environmental Coordination)
MIREME	Ministerio dos Recursos Minerais e Energia (Ministry of Mineral Resources and Energy)
MISAU	Ministério da Saúde (Ministry of Health)
MCRN	Maneio Comunitário Dos Recursos Naturais (Community Based Natural Resources Management)
MOPH and Housing)	Ministério das Obras Publicas e Habitação (Ministry of Public Works
MPF	Ministério do Plano e Finanças (Ministry of Planning and Finance)
MPD	Ministério da Planificação e Desenvolvimento (Ministry of Planning and Development)
MF	Ministério das Finanças (Ministry of Finance)
MTC and Communications)	Ministério dos Transportes e Comunicaçõe̊s (Ministry of Transport
NBSAP	National Biodiversity Strategy and Action Plan
NEMP	National Environmental Management Programme
NGO	Non-Government Organisation
NIMD	Netherlands Institute for Multiparty Democracy
NIZA	Netherlands Institute for Southern Africa
NPUM	Netherlands Management Cooperation Programme
NRM	Natural Resources Management
PARPA	Programa do Governo Para a Redução da Pobreza Absoluta (GOM's Programme for Reduction of Poverty)
ROCS	Roads and Coastal Shipping
SADC	Southern African Development Community
SEA	Strategic Environmental Assessment
SPFFB	Serviços Provinciais de Florestas e Fauna Bravia (Provincial services for Forestry and Wildlife)

SPTD	Strategic Plan for Tourism Development
TFCA	Transfrontier Conservation Area
TPIS	Tourism Policy and Implementation Strategy
UEM	Universidade Eduardo Mondlane (Eduardo Mondlane University)
UNDP	United Nations Development Programme
UNECA	United Nations Economic Commission for Africa
UNEP	United Nations Environmental Programme
USAID	United States Agency for International Development

CHAPTER 1: Executive Summary

STATE OF THE ENVIRONMENT

Trends in the physical and biological environments

Climate and regional setting

Mozambique is located on the south-eastern coast of Africa. It is mostly low lying (only 13% has an elevation above 1000 meters) and has an extensive coastline (2 700 km). The climate ranges from subtropical in the south to tropical in the centre and north. July (winter) temperatures average 21°C at Pemba in the north and 18°C at Maputo in the south. January (summer) temperatures average about 27°C along the coast but are lower in upland areas (21°C). Rainfall is highly seasonal (most rain falls between October and April each year) and varies regionally, being higher in the north (1 000-1 800 mm per annum) than the south (400-1 000 mm per annum). A decreasing trend in rainfall has been observed in East Africa region as a whole over the last four decades, while the occurrence of droughts has been steadily increasing. High variability in rainfall associated with tropical cyclones and the El Nino/La Nina phenomenon compound this problem, resulting in extreme floods and droughts from time to time. Further reductions in streamflow can be anticipated in Mozambique in the future associated with global climate change, with rainfall projected to decline by 5-10% and evaporation to increase by 9-13% by 2075.

Freshwater resources

Thirty-nine major rivers drain into to the Indian Ocean along the Mozambique coastline. The most important of these from south to north are the Maputo, Umbeluzi, Nkomati (in Maputo Province), the Limpopo (in Gaza Province), Save (in Inhambane Province), the Buzi, Pungoe (in Sofala Province), Zambezi, Licungo, Ligonha, Lurio (in Nampula Province), and the Messalo and Rovuma (in Cabo Delgado Province). The majority of these rivers have a torrential regime with high flows during the rainy season (January to April) and low flows for the remainder of the year. Thus, while Mozambique has abundant surface water resources (216 km^3/year), much of this is available for short periods of the year only, and is concentrated in a limited number of river basin areas (e.g. the Zambezi river accounts for almost 50% of the total flow). Also of importance is the fact that 50% of the available freshwater comes as cross border flow. Abstraction by neighbouring countries, while not a major issue yet, is likely to become highly significant in the future.

Natural Vegetation and Wildlife

Savanna woodland is the main vegetation in Mozambique, comprising two major types - miombo and mopane woodlands. Miombo is the most extensive and covers much of Niassa, Cabo Delgado, Nampula, Zambezia, Sofala, Manica and Inhambane Provinces, while Mopane woodland occurs in the Limpopo-Save area and in the mid-Zambezi Valley. Other important vegetation types include Acacia woodland, dune forest, sub-littoral woodland, lowland palm

savanna, vegetation on alluviums in the Zambezia Delta and the lower Limpopo and Incomati valleys, and mangroves. Natural vegetated areas in Mozambique are exploited for grazing, wildlife management, fuel and building materials. Southern Africa's savannas are generally considered extremely fragile ecosystems and are highly prone to overexploitation, as they arise from a combination of low and often unreliable rainfall patterns, generally high temperatures and fire regime, and a distinct often prolonged dry season. Cycles of drought and relatively good rainfall years encourage periods of 'boom' in which the increased carrying capacity of the savannas becomes gradually more fully exploited, and then 'bust' during the drought years when the carrying capacity is drastically reduced.

Mozambique has rich diversity of wildlife. Diversity of large mammals is very high but few species are endemic to the country. Populations of large mammal species are severely depressed though due to uncontrolled exploitation of wildlife during the civil war (1981-1992).

Areas of Outstanding Ecosystem, Biological and/or Scenic value

A number of areas of outstanding ecosystem, biological and/or scenic value have been identified in Mozambique and are considered to warrant special attention. These include the Gorongosa Mountain - Rift Valley Complex, The Cheringoma Plateau, Zambezi Delta Grasslands and Swamps, The Great Inselberg Archipelago, The Chimanimani Massif, The Maputaland Centre of Endemism (MCE), Coastal Barrier Lakes, and the Pebane Evergreen Coastal Forests. It has been is recommended that these areas be treated with particular care when considering impacts of development.

Agriculture

Agriculture is the main activity of the Mozambican population. Approximately 84% of the economically active population in Mozambique works in agriculture, which contributes about 40% of the Gross Domestic Product. Exploitation of agricultural resources is way below their potential though, with only 4.9 million ha (12%) of the estimated 36 million ha of cultivatable land area in Mozambique actually under cultivation. Most of this (90%) is devoted to food crops, of which short fallow shifting cultivation is the most common activity. The most common crop cultivated by subsistence farmers include roots and tubers (mostly cassava); cereals (mostly maize); and pulses (mostly beans), while commercial farmers focus on sugarcane, cotton, cashew nuts and tobacco. Livestock production is also very modest with a total national herd of cattle of about 1.5 million units, with goats and pigs accounting for a further 750 000 units. Growth in agriculture has been slow over the last decade, having increased by only 0.9% per year since 1997, while livestock farming is growing at a slightly faster rate (8%). There is some evidence of land degradation as a result of over-utilisation at present, but this is expected to increase dramatically in grassland areas in certain provinces in the future (e.g. Manica and Tete), especially in the event of a prolonged drought.

Forestry and forest resources

Productive forests in Mozambique occupy an area of about 20 million hectares or 20% of the national territory. Wood resources are used by commercial and artisanal logging operations and as energy source by the rural and urban populations. It is estimated that Mozambique forests have the capacity to support about 500,000 m^3/year of sustainable logging, but logging operations only account for only around 127,000 m^3/year at present (down 15% from a decade ago). This is partly a function of strict export policies but also a function of the low potential sustainable harvest per hectare (only 0.025 m^3 per annum). Wood consumption for fuel is considerably greater than that accounted for by logging, estimated to amount to approximately 31,278,000 m^3 per annum. Fuel wood consumption in Mozambique is in fact reported to be the highest in the SADC region, and is the most important source of domestic energy in the country (accounting for 85% of total household energy requirements). This is though to be a function of poor access to other forms of energy and high levels of poverty. It is a major issue of concern from a conservation perspective

Marine and coastal environments

Mozambique has the third longest coastline in Africa, characterized by a diversity of habitats including sandy beaches, coral reefs, estuarine systems, bays, mangroves, seagrass beds, and numerous offshore islands. The coastline can broadly be split into three regions: a coral coast in the north (north of Pebane), a swamp coast in the central region (Pebane to Bazaruto Island) and a parabolic dune coast in the south (south Bazaruto Island). The continental shelf encompasses a total area of 68 300 km^2 and varies from very narrow to very broad, the broadest point (140 km) lying opposite the town of Beira. Tidal range is amongst the highest in Africa (up to 6.3 m). The coastline is large unspoilt and has tremendous tourism potential.

Marine fisheries

The marine fisheries sector in Mozambique is very important, providing employment for between 75 000-80 000 people while an estimated 480 000 people are economically dependent on this sector. Collectively, fisheries produce catches of 100 000 and 120 000 tones per year, and contribute about 30-40% of the total export earnings for the country. Three principal categories of marine fisheries are recognised in Mozambique: artisanal, semi-industrial and industrial. Industrial fisheries are focussed mostly on shallow water shrimp (the most important fishery in the country), deep-water shrimp (gamba), tuna, lobster and demersal fish, while semi-industrial fisheries focus on shrimp, fish, and a variety of invertebrates such as squid and crab. Artisanal fishers target a range of resources including fish, shrimp, crabs, and molluscs. A small recreational fishery also exists, focusing mostly of linefish in the southern part of the country.

Inland fisheries

Inland fisheries are focused on the large lakes (Niassa, Cahora Bassa, Amaramba, Chiúte, and Chilwe) and major river systems in the country (Zambeze, Limpopo and Pungue/Buzi River Basins). Lake fisheries include both a semi-industrial and artisanal fishing sectors, while the riverine fisheries include only an artisanal component. The lake fisheries have been well

studied and most seem to be operating at or near their maximum sustainable limits, and yield about 25-30 000 tonnes of fish per annum. Catches have been relatively stable for the last decade at least. Much less is known about the riverine fisheries but yields for the Zambezi are estimated to be comparable to that from Lake Cahora Bassa (15 000 tonnes per annum), but are much lower for the other river systems (e.g. Limpopo: 200-650 tonnes per annum). Development of dams on the major river systems in the country pose a significant threat to productivity of the riverine fisheries.

Threats and issues in sustainable use of natural resources

Intensity of use of agricultural resources

In spite of abundance of arable land in Mozambique and the fact that over 90% of the cultivated area is under food crops, high level of food insecurity are prevalent in certain parts of the country. The primary reason for this is the inefficient use of available resources – only 12% of the available arable land is utilised at present and primary type of agriculture is shifting (slash and burn) subsistence agriculture. Proposed strategies for promoting the intensification of agriculture and hence increasing food security for the country are controversial. Expansion of large scale commercial agriculture is the most logical way to increase production but is contentious owing ill feelings to wards such enterprises which stem from the country's colonial history. Expanding the area under irrigation for both small and commercial farming could make an important contribution to agricultural growth. Irrigation potential is reported to be high especially in the central and northern parts of the country and expansion thereof is considered to be economically viable. Some effort is being applied in this respect but needs to be greatly expanded.

Impacts of mining on the environment

Mozambique has favourable geology for exploration and mining activities, but has yet to capitalize on this potential. This sector is still currently dominated by small scale and manual operations, whose contribution to the economy remains small (0.4% of GDP). This sector has been prioritised for development by the GOM and is expanding rapidly, however. Environmental impacts of mining are not a major concern at present owing to the low level of development but are likely to become more of an issue in the future as mining activity intensifies. Issues of concern relating to mining activity in Mozambique include inefficient use of mineral resources, conflict with other land uses (e.g. agriculture, tourism), land disturbance, erosion, encroachment on wilderness areas, visual impacts, pollution of water and soil resources, disturbance of wildlife, and occupational health and safety issues. Rapid development within this sector needs to be balanced against opportunity costs that may arise at a later stage within others sectors (particularly tourism).

Access to freshwater

Mozambique is not a water-poor country (surface water availability ranges between 5,560 m^3 per inhabitant per year considering only the runoff generated in the country or 12,000

m^3/inhabitant/year including the flows from upstream countries). However, the country faces a number of difficult challenges in supplying adequate freshwater for irrigation, and domestic and industrial uses. These include high variability of precipitation, substantial lack of water resources infrastructure, its geographic location as a downstream riparian of most of its major rivers, extremely low efficiency and rapid deterioration of existing systems, and serious equity issues as a large share of the poor has little or no access to water for their basic needs. Supplies of water for irrigation are woefully inadequate at present, while supplies to both urban and rural areas in Mozambique reportedly compares poorly with other countries at a similar level of development. Significant progress has however been made in improving access to clean water supplies in the urban and rural areas in particular. The fact that such a large proportion of Mozambique's freshwater supplies (>50%) originate from rain that falls in neighbouring countries remains an issue of concern for the future. Even with its water supply infrastructure fully developed, reduction of flow due to intensive use in the neighbouring countries is likely to limit delivery of water for domestic and agricultural use in Mozambique in the future. The central and southern part of the country is where the reduction in flow from hinterland is most critical at present - it is estimated that South Africa, Swaziland and Zimbabwe already abstract about 40% to 60% of their cross border flows.

Modification of freshwater flows

While Mozambique desperately needs to expand is water resources infrastructure, particularly that required for harvesting surface water (e.g. dams), care must be taken to ensure that this is done in a manner that does not unduly impact on other beneficiaries of the water, notably the environment and fisheries. Impacts of dam construction have been felt in Mozambique as much as anywhere else in the world, particularly those associated with the construction of the Cahora Bassa and Kariba Dams on the Zambezi River. Notable impacts of these dams in Mozambique include loss of biodiversity, coastal erosion, declines in the marine shrimp fishery, loss of freshwater fisheries, resettlement of people, and loss agricultural productivity. Internationally accepted and applied techniques are available for minimising impacts of dams on river systems and should be applied to all new water resource developments in the country.

Unsustainable use of forest resources

Deforestation is considered to be a significant problem in Mozambique, as it damages the environment, the economy, and the welfare of Mozambicans. The primary driving forces of deforestation include potential for profit through logging and timber exportation, necessity of more crop cultivation plots for an increasing population, the use of fire to clear land for agriculture and for hunting, and the use of firewood as a primary source of energy. While commercial timber production is less than 25% of the legally permitted 500,000 m^3/year, many believe that this is not sustainable. Of much greater significance though, are the impacts of fuel wood collection and unsustainable agricultural practices (slash and burn agriculture). Wood consumption for fuel in Mozambique is estimated to account for nearly 250 times that consumed by logging operations. Fuel wood is the most important source of domestic energy in the country (accounting for 85% of total household energy requirements),

and is reported to be the highest in the SADC region Even in the larger urban areas such Beira, where electricity and gas are available, a significant number of inhabitants (50 percent) still use charcoal for cooking. Impacts of slash and burn agriculture are also considered to account for a significant albeit less well quantified loss of woodland resources. Almost entire forests in Mozambique are reportedly burnt at least once a year as a result of these practices. Environmental impacts of deforestation are far reaching and include among other, loss of agricultural soil through soil erosion, desertification (i.e. loss of soil fertility), increased surface water runoff and reduced infiltration which in turn exacerbates the effects of flooding, coastal erosion (mostly from loss of mangroves), and sedimentation.

Exploitation of living marine resources

Exploitation of living marine resources by the industrial fishery sector in Mozambique appear to be sustainable at present, with little variation in total landed catches reported over the last decade. However, catches by the semi-industrial and artisanal fisheries are thought to exceed sustainable limits in many areas with the result that certain fish stocks exploited by the sectors are severely depleted. Key threats to sustainability of fisheries in Mozambique are reported to include fishing by unlicensed operators, encroachment by indusial fishing vessels into inshore fishing grounds reserved for semi-industrial and artisanal fishers, deficiencies in recording and reporting of catches, difficulties in controlling the artisanal fisheries that are distributed along the entire coastal line and in the fresh waters lakes and rivers, and a shortage of human resources and infrastructure for implementation of fisheries laws and regulations.

Pollution and waste disposal

Waste disposal is not a major issue in Mozambique at this stage due to the low level of development in the country. However, is likely to become increasingly important in the future due to the rapid economic growth that is taking place in the country. Three primary sources of pollution include agriculture (sedimentation, and pesticide and fertiliser runoffs), industrial activities (discharge of untreated waste containing heavy metals, hydrocarbons, etc.) and sewage and domestic waste (most of which is discharged without treatment directly to the rivers and sea). Solid waste is also a major problem in the larger cities in Mozambique, as infrastructure and resources are inadequate to cope with the volumes produced and current rates of growth, and many dumping sites are located in close proximity to residential areas.

Transportation

Transportation infrastructure is poorly developed in Mozambique, and is rated as one of the least developed in southern Africa. It is considered to be a major impediment to overall economic development and to the reduction of poverty. However, considerable progress has been made over the last decade in rehabilitating existing roads, to the extent that environmental impacts associated with road construction are becoming an important issue. Roads have a number of important biophysical and socio-economic impacts that have not always been adequately addressed to date. Indirect impacts (e.g. illegal exploitation of forests and wildlife resulting from improved access to an area, the increased use of local forests and

wildlife caused by in-migration of people; and the increased use of local forests and wildlife caused by the existing population increasing production because of better access to markets) are generally considered to be much more significant than direct impacts (e.g. loss of flora and fauna habitat caused by clearing for the road construction and construction of borrow pits). The major challenge is not to allow negative biophysical and socio-economic impacts to bar the development of the transport infrastructure in Mozambique but rather to ensure that negative impacts are effectively mitigated and positive impacts enhanced as far as possible.

Tourism

Tourism started from a comparatively low base in Mozambique, but is currently experiencing rapid growth, having increased by 10-15 % per annum in the period 1995 and 2001. It is now listed as the third largest sector for investment in the country. While the GOM has embraced the potential of tourism and is working actively to promote further growth, an area that possibly requires greater focus is ensuring adequate protection for key natural assets (wildlife, beaches, coral reefs, etc.) on which the tourism industry depends. It is important to ensure that these assets are not degraded through irresponsible or uncontrolled growth in the tourism and other sectors (mining, fishing, agriculture, etc.).

ENVIRONMENTAL POLICY, AND LEGISLATIVE AND INSTITUTIONAL FRAMEWORKS

In terms of the Mozambican law control over natural resource use is exercised through key sectoral legislation (fisheries, agriculture, forestry and water laws), while environmental impacts of from other sources (e.g. from the transportation and energy sectors) is controlled though legislation developed by the Ministry of Environmental Coordination (MICOA). Mining is an exception here, in that it has its own suite of regulations governing environmental management. Government's policy on the environment is one geared through the promotion of sustainable development in such a way that the use of natural resources fulfils the basic needs of the people and development of the nation in equilibrium with economic growth, technology development, environmental protection and social equity.

Land and agriculture

Land policy and land-tenure in Mozambique is possibly the most controversial issue in the context of its legislative and policy framework. Land policy has a strong socialist-leaning (a backlash against colonial past), is widely believed to be constraining development, and does not encourage sustainable land-use practices. All land is state owned and the right to use land has three levels: customary right; occupancy in good faith where land has been in use for a certain purpose for more than 10 years and, formal authorisation, through the defined application regulations. While this system is very effective in entrenching and protecting traditional land use rights of subsistence farmers, and was very important in political terms for dealing with issues arising from the country's colonial history, disruptions caused by the civil war, and the unsuccessful post-independence attempts to redistribute land, it has a number of

pitfalls which have a bearing on economic development and environmental management. Principal among these is the fact that leased land has no inherent value and land holders have no incentive to protect or conserve the land, the land tenure system is a expensive in terms of human resources to administer and is open to abuse by corrupt officials, and acquisition of land for development is difficult due to lack of transparency in the allocation procedures and owing to the fact that there is technically no incentive for occupiers of land to relinquish their rights to the land (the costs of leasing land is nominal, is rarely collected and does not apply to traditional land use). The net result of this is that land is being degraded at a much faster rate than would otherwise happen in a freehold system where it would loose value as it becomes degraded; economic development is being hampered, particularly the expansion of commercial agriculture; speculation in land is rife (individuals acquire land not for the purpose of developing it but rather for profiting from the sale of the "infrastructure" on the land at a later stage); and opportunities for corrupt officials to enrich themselves through allocation of land are abundant.

Fisheries

Marine and inland fisheries in Mozambique are governed in terms of the Fisheries Law (1990) and the Marine Fisheries General Regulations (2003), and fall under the jurisdiction of the Ministry of Fisheries and its various directorates and affiliated institutions. Three main areas of activity are recognised in terms of the regulations promulgated under these laws: subsistence, artisanal, and semi-industrial. Participation in any of these sectors requires a licence issued by the national or provincial authorities. While the legislative system is considered comprehensive in most respects, enforcement is woefully inadequate particularly for the semi-industrial and artisanal sectors where control over effort and use of illegal fishing methods is poor. Participation on the artisanal sector is largely open access and operates largely without any form of control.

Forestry

Commercial exploitation of timber and other forest resources in Mozambique are governed by the Forest and Wildlife Act of 1999, administered by the Ministry of Agriculture. There are a number of important deficiencies in the existing legislation and in the implementation thereof that need to be addressed to ensure future sustainable use of forestry resources. Of particular importance is the fact that management plans for timber harvest and timber inventories required for concession areas required in terms of the law are not prepared and no sanction is applied, and collection of tax revenue is poor.

Water

Water resources management in Mozambique is under the jurisdiction of the Water Law promulgated in 1991, and is administered by the Ministry of Public Works and Housing. In general, the institutional and legal framework is considered to be coherent and has been designed to implement an approach to managing the water sector that is consistent with experience and good practice in many middle and high income countries. A strong focus on

decentralisation is being applied with the aim of devolving water management issues to various water management areas in the country (termed Aras). The approach is good but has been slow to take off with only one water management areas, Ara Sul currently functional.

Mining

Potential environmental impacts associated with mining are dealt with separately from those from other activities, by specific provisions in the Mining Law (Lei no. 14/2002). While the legislative provisions within the mining law are good and include a number of important instruments for managing environmental impacts these are not always consistent with those stipulated in the Environmental Law (Lei no 20/97) and hence are potentially problematic in respect of consistency of application. Potential conflicts of interest also exist as the agency responsible for promotion of mining and protection of the environmental from negative effects of mining are the same (Ministry of Mineral and Energy).

Environmental Management

MICOA (The Ministry for Coordination of the Environment) is the agency responsible for coordinating environmental management issues in Mozambique. Comprehensive legislation has been promulgated for managing environmental impacts in Mozambique but there are some problems with the implementation thereof principally relating to lack of cooperation and coordination between ministries, limited human resources and institutional capacity for implementation, and lack of clarity and overlap of environmental management roles and responsibilities.

Protected areas

A variety of different types of protected areas exist in Mozambique each with different level of protection applied to the environment within their borders. In total, there are seven National Parks, five Game Reserves, twelve Controlled Hunting Areas, two Vigilance Areas, and sixteen Forest Reserves. Most of the parks and reserves were established by the Portuguese authorities in 1955. Since this time a number of new national parks have been declared but the primary focus especially in recent years has been on establishing Transfrontier Conservation Areas (TFCAs) through the establishment of links with conservation areas in neighbouring countries (South Africa and Zimbabwe). TFCAs, in terms of Mozambique legislation are considered large, defined areas which include both core Protected Areas (PAS) and multiple-use ("interstitial") areas where the primary management objective is to promote environmentally sustainable development compatible with the TFCA's conservation goals. Under the existing legislation MITUR (Ministry of Tourism) through DNAC (National Drectorate for Conservation Areas) have the mandate to co-ordinate all conservation efforts of Parks, Game Reserves and Hunting Areas, and all Forest Reserves were under the jurisdiction of MADER (now MA) through DNFFB (now DNTF). This is a point of certain concern as a duplication of functions certainly exists between the two ministries, where one (MA) will dedicate efforts in the conservation of forests and the other will emphasise the (sustainable) use of natural resources to produce income revenue. A new

national conservation policy is being discussed, and it is expected that this ambiguity over protection jurisdiction will be resolved. There is a strong focus on the inclusion of local communities and other stakeholders (as is the case with all protected areas in the country), and sustainable use of the natural resources by communities, particularly through sustainable tourism, as required by Mozambique's Biodiversity Strategy and Action Plan (NBSAP). On the whole it is believed that natural use by communities living within the protected areas does not pose a significant threat to biodiversity, except possibly in the more arid areas of the country where small pockets of fertile wetlands or river banks have become foci for resource use and settlement. However, the presence of people living in the parks is preventing park authorities from allowing free movement of animals across the borders from the established parks in the neighbouring countries. Regarding the Red Data Lists (RDLs) an adequate legal framework is still needed, however Mozambique has a progressive legal framework that might be used to conserve species listed as threatened.

International Commitments

As a member of the international community, Mozambique ratified most of the major international conventions of importance including the Convention on Biological Diversity, the Convention Against Desertification, the Basil Convention, the Bamako Convention, United Nations Convention on the Law of the Sea, Convention on the International Trade in Endangered Species of Wild Flora and Fauna, United Nations Framework Convention on Climate Change, as well as most of the regionally important conventions and protocols (e.g. is a member of SADC, has signed the Nairobi Convention, and Protocol on Shared watercourse Systems in the SADC).

EU AND OTHER DONOR COOPERATION WITH MOZAMBIQUE

Mozambique receives substantial contributions of donor aid each year, amounting to a total of $6.3 billion in the period 2000 to 2004, amounting to some 25% of Gross National Income. Principal donor organisations active in Mozambique include the European Union, World Bank, Danida, DFID, UNDP, Sweden, The Netherlands and USAID. Details on the funding priorities for each of the major donors are provided in the main report. As the leading donor organisation in Mozambique, the European Union should seek to set a leading role in terms of ensuring assistance provided to the country does not only yield short term benefits that come at the expense of longer term sustainable development.

CHAPTER 2: State of the Environment

2.1. Trends in the physical and biological environments

2.1.1 Climate and regional setting

The Republic of Mozambique is located on the south-eastern coast of Africa, bounded by Tanzania to the north; by the Mozambique Channel (Indian Ocean) in the east; on the south and southwest by South Africa and Swaziland; and in the west by Zimbabwe, Zambia, and Malawi. The country has a coastline of over 2 700 km and is generally low-lying, with only thirteen percent of the country having an elevation above 1000 meters. The land ascends in a westward direction from the coast through a coastal lowland region that is narrow in the north but fairly broad in the south (44% of the total land area), through a sub-plateau zone to an extensive low-lying plateau of moderate height, and finally up to a narrow higher lying area on the western border. The climate ranges from subtropical in the south to tropical in the centre and north. July (winter) temperatures average 21°C at Pemba in the north and 18°C at Maputo in the south. January (summer) temperatures average about 27°C along the coast but are lower in upland areas (21°C). Most of the country receives above 400 mm of rainfall per annum, the rainy season extending from October to April. Rainfall in the coastal lowlands in the northern half of the country is generally between 1 000 and 1 400 mm, but is much less in the south where it drops rapidly from 1 000 mm near the sea to 400 mm or less on the boundary with Zimbabwe (Figure 1). The rainfall in the intermediate altitude zone is usually between 800 and 1 000 mm in the north and slightly higher in the south. In the mountainous areas (e.g. Mount Binga in Zambezia Province) rainfall may reach or exceed 1 800 mm per annum.

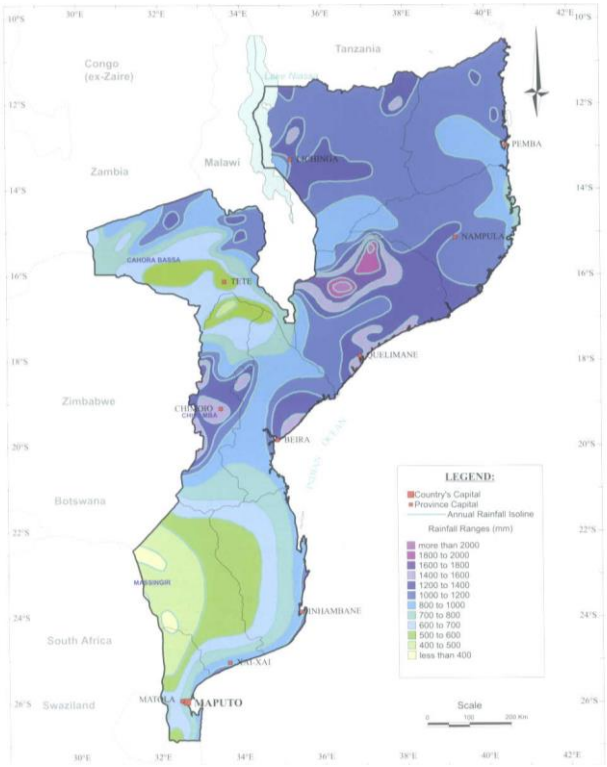

Figure 1. Mean annual rainfall in Mozambique (mm/year). Source: Water Resources in Mozambique, Synopsis 1999, Ministry of Public Works and Housing, DNA.

Rainfall records from the early 1900s to mid 1990s indicate that rainfall in the East Africa region has decreased since 1968 and has been fluctuating around a lower mean level (UNEP, 1997). The occurrence of droughts in the area has also been steadily increasing. In the later half of the century (between 1988 and 1992) over 15 events affected the region, compared to fewer than five such events between 1963 and 1967 (**Figure 2**, Conley, 1996). Tropical cyclones and the El Nino/La Nina phenomenon compound the variability resulting in extreme floods and droughts such as the floods of 2000 in the South and 2001 in the Centre of Mozambique.

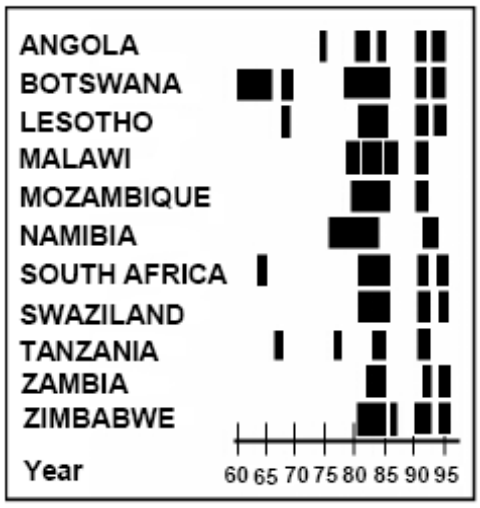

Figure 2. Recent droughts in the SADC region (from Conley, 1996).

Projected impacts of climate change for Mozambique are that the average temperatures will increase by 1.8-3.1°C by 2075, that rainfall will decline by 5-10%, and potential evaporation will increase by 9-13% (Government of Mozambique 1999, Hulme 1996, Ragab & Prudhomme 2002). Severe reductions in streamflow in Mozambique can be expected as a consequence of this (Arnell 1999, Government of Mozambique 1999).

2.1.2 Freshwater resources

A total of thirty-nine major rivers drain into to the Indian Ocean along Mozambique's 2,700 km coastline (**Figure 3**). The salient features of the main rivers, from north to south, are described below.

In the north the Rovuma River, with a catchment of 155 400 km^2 is the third largest river in Mozambique and forms the border with Tanzania. The Messalo, Montepuez, Megaruma, Lurio, Mecuburi and Monapo Rivers discharge along the northern coast in Cabo Delgado and Nampula Provinces. These rivers have seasonal flows and low sediment loads. Consequently, marine turbidity is low along this stretch of coastline and extensive coral formations occur in the coastal waters.

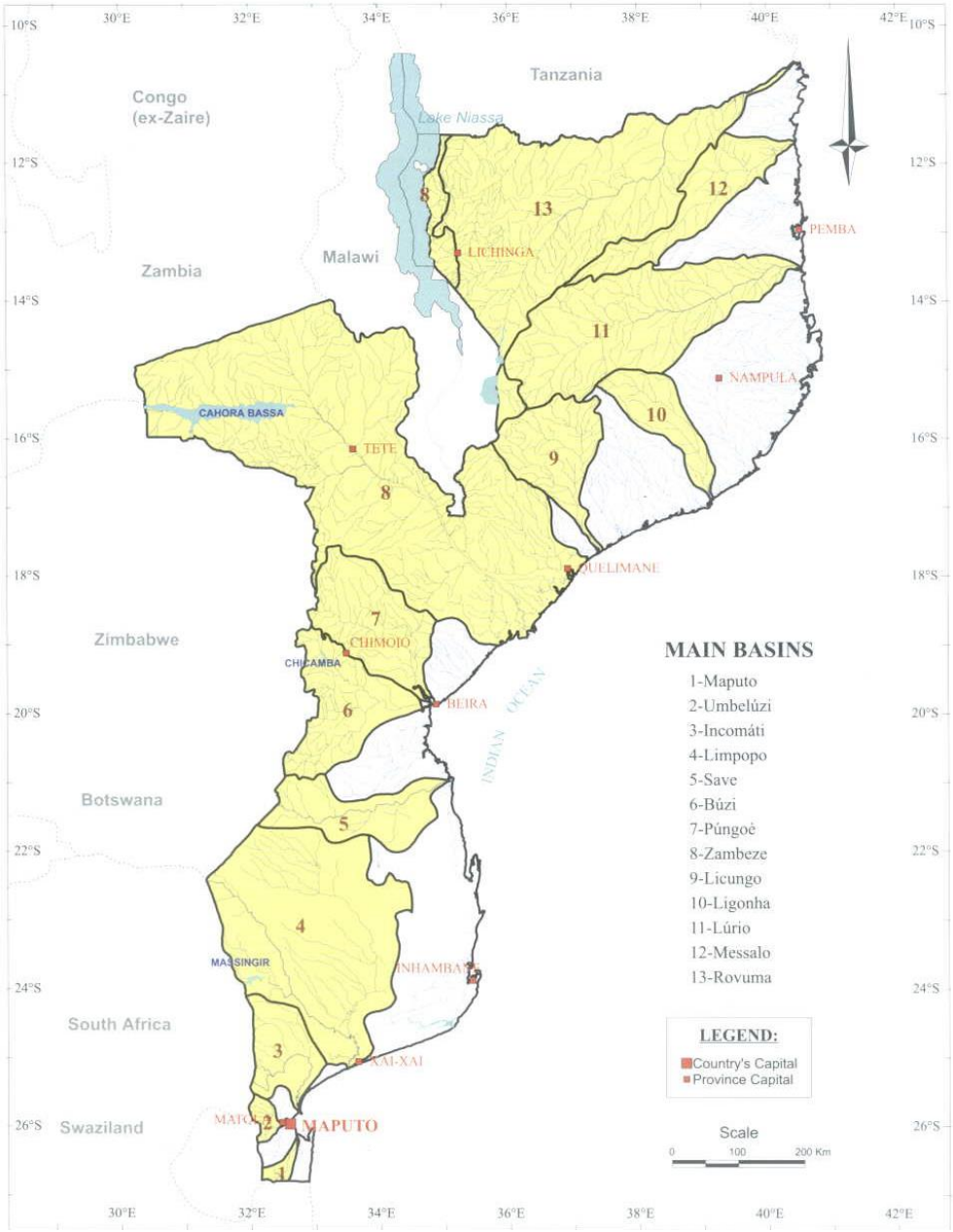

Figure 3. Major river basins in Mozambique. Source: Water Resources in Mozambique, Synopsis 1999, Ministry of Public Works and Housing, DNA.

The most important river in Mozambique is the Zambezi. The Zambezi River enters Mozambique at Zumbo where it immediately swells into the impoundment of Lake Cahora Bassa. For much of its course between Tete and the delta, the bed of the Zambezi River is between one and five kilometers wide. At Chupanga the Zambezi River begins to spread over a vast triangular expanse known as the Zambezi Delta which covers an area of about 18 000 km^2. The most important tributary of the Zambezi River is the Shire River, which drains Lake Malawi via the Rift Valley. The huge dual impoundments of Kariba and Cahora Bassa are believed to have affected the downstream flooding regime and the ecology of the Zambezi Delta.

The Pungue River rises in Zimbabwe and discharges into the Indian Ocean south of Beira, collecting numerous tributaries en route. The most important tributary is the Urema River which flows southwards through the Gorongosa National Park. The Pungue River forms the southern boundary of the National Park. The Buzi River also rises in Zimbabwe and receives several major tributaries in the upper catchment, most notably the Lucite and Revue Rivers. It shares a common estuary with the Pungue River south of Beira. The Gorongosa River (not to be confused with Gorongosa National Park) drains 13 150 km^2 of lowland area, flowing through swampy lands for 100 km to the muddy coast south of Beira.

The Save River forms the common boundary between Sofala and Inhambane Provinces. The Save River is impounded in Zimbabwe and now has only a seasonal flow pattern. There is little surface water in most of the interior of Inhambane Province.

The southern portion of the Province is drained by the Inharrime River system via Lake Poelela. The Limpopo River, in southern Mozambique, is the country's second largest river. Flows in the Limpopo River are extremely variable and it is often dry over long sections of river bed during the winter months. The floodplain of the Limpopo River is narrow between the South African border and Macarretane, just above Chokwe.. At Macarretane the river flow is checked by a barrage which controls the flood waters to some extent. From Macarretane the floodplain widens as the river approaches its confluence with the Changane River near Chibuto. Thereafter it meanders over a broad swampy floodplain towards the coast where it discharges to sea through a narrow break in the dunes.

The major rivers of Maputo Province are 1) the Maputo River, with a catchment area of 29 800 km^2, flowing from Natal in South Africa; 2) the Umbeluzi River with a catchment of 5 622 km^2, flowing into Mozambique from Swaziland; and 3) the Incomati River which drains some 45 875 km^2 and enters from South Africa. These rivers all discharge into Maputo Bay. There are multiple impoundments in the upper reaches of the Incomati River in South Africa and has now become a seasonal river in Mozambique. The Umbeluzi River is impounded near Boane (the Pequenos Libombos Dam which was filled in 1989) and now floods irregularly in the lower reaches.

The majority of the rivers described above have a torrential regime with high flows during the rainy season (January to April) and low flows for the remainder of the year. Of the 104 main rivers in Mozambique, 50 have catchments smaller than 1,000 km^2, 40 are between 1,000 and 10,000 km^2, 12 between 10,000 and 1000,000 km^2 and two basins (Zambezi and Rovuma) have catchment areas in excess of 1,000,000 km^2. Of the 11 major river basins 7 are shared with other countries.

Under a regional perspective Mozambique has abundant surface water resources (216 km^3/year). However, more than 50% of the water resource comes as cross border flow (116 km^3/year) with the remainder being generated within the country. Mozambique thus has little control over its supply of freshwater. The Zambezi River represents almost 50% of the water

resource available (106 km^3/year) of which 88 km^3 comes from outside Mozambique. During nine months of the year, minimum monthly flows in most of the rivers south of the Save River, are on average 1-2% of the annual run-off. Furthermore, all major rivers in the southern part of the country (Maputo, Umbeluzi, Incomati, Limpopo and Save) originate in neighbouring countries. Significant water abstractions upstream in these river systems reduces the availability of water to Mozambique and increases the regional water vulnerability. Of the combined natural flow of 11 km^3/year only 5 or 6 km^3 are expected to remain in 20 years time if the existing increases in demand for water are accounted for. This situation becomes worse if less rainfall occurs in the region, as is forecasted by regional climate models.

2.1.3 Natural Vegetation

The main vegetation type in Mozambique, based on structure, is savanna woodland. It covers approximately 70% of Mozambique's land area and can broadly be divided into two types: miombo and mopane woodlands. Miombo is the most extensive and covers much of Niassa, Cabo Delgado, Nampula, Zambezia, Sofala, Manica and Inhambane Provinces. There are several different types of miombo determined by variations in rainfall and soils. The second most extensive woodland is mopane woodland occurring in the Limpopo-Save area and in the mid-Zambezi Valley. Other important vegetation types in Mozambique include Acacia woodland (found in the southern and central parts of the country), dune forest (which occurs on high dunes along the coast between the southern border and Bazaruto Island), a sub-littoral woodland (found inland from the dune forest in the sub-littoral zone between Ponto do Ouro and Macia), lowland palm savanna (in coastal areas in Nampula, Sofala, and Inhambane Province), vegetation on alluviums in the Zambezia Delta and the lower Limpopo and Nkomati valleys, and mangroves which are well developed in the northern and central sectors of the coast and less so along the southern sector.

Southern Africa's savannas are generally considered extremely fragile ecosystems, as they arise from a combination of low and often unreliable rainfall patterns, generally high temperatures and fire regime, and a distinct often prolonged dry season. In addition, the cycles of drought and relatively good rainfall years encourage periods of 'boom' in which the increased carrying capacity of the savannas becomes gradually more fully exploited, and then 'bust' during the drought years when the carrying capacity is drastically reduced. Natural vegetated areas in Mozambique are exploited for grazing, wildlife management, fuel and building materials. The conservation status of Mozambique's flora is not well known, but a preliminary estimate indicates that, of the 5,500 plant species recorded for the country, some 247 plant species in 67 families may be of conservation concern (SMEC International 2001).

2.1.4 Wildlife

Mozambique has rich diversity of wildlife. Mammal fauna is particularly rich with 211 terrestrial mammal and 11 marine mammals species recorded. Only one mammal species is considered endemic to Mozambique - a white-bellied red squirrel confined to Namuli Mountain. However, there are several endemic sub-species of mammal including the blue Niassa Wildebeest, a sub-species of Burchell's Zebra and Johnson's Impala, all of which occur in the Niassa Reserve. Although the mammal species diversity is high, the populations of these species, especially the larger mammals, have been significantly reduced both inside and outside of protected areas, due to lack of enforcement during the armed conflict (1981 - 1992). Gorongosa National Park and Marromeu Reserve suffered massive declines in large mammal populations such as elephant, buffalo and waterbuck. Niassa Reserve in northern Mozambique was less affected by the armed conflict, and is the only protected area that still supports significant populations of large mammals such as elephants, buffalo, sable antelope, greater kudu and leopards. At a national level, several large mammal species are believed to be extinct or on the verge of extinction. These include the black and white rhino, giraffe, roan antelope, tsessebe, the mountain reedbuck and the African wild dog.

Approximately 900 bird species have been recorded for southern Africa, of which 581 have been recorded in Mozambique. There are a number of near endemic and restricted range species, mostly associated with isolated montane habitats such as Gorongosa, Chimanimani, Chiperone and Namuli Mountains. The freshwater and marine wetlands of Mozambique are important sites for migratory and resident aquatic bird species. One of the most important wetland sites in Mozambique is the Zambezi Delta where over 50 species of aquatic birds have been recorded. The Delta supports numerous vulnerable and threatened bird species of global concern. The conservation status of the birds of Mozambique is under consideration, but a preliminary estimate indicates that at least 24 bird species are of conservation concern.

One hundred and sixty reptile species (including marine turtles) have been recorded in Mozambique, but their conservation status is largely unknown. Three endemic reptiles have been recorded, including the flat rock lizard (Chimanimani Mountains) and a new snake and gecko species (Pebane coastal forests). One snake species, the African Rock Python is believed to endangered and is protected by law. All five species of Indian Ocean sea turtles nest on beaches along the Mozambique coast. These are the Loggerhead Turtle, the Leatherback, the Green Turtle, the Hawksbill Turtle, and the Olive Ridley Turtle. All species are protected in Mozambique.

The amphibia of Mozambique are not well documented. The Natural History Museum has records of only 39 species. However, thirty-five amphibian species have been recorded for the Chimanimani Massif alone, of which at least two are endemic. Similarly, Mozambique's freshwater fish fauna is poorly known. Only fish species in the major river systems such as the Zambezi, Limpopo, Pungue and Incomati Rivers have been documented. The lower Zambezi has by far the greatest fish biodiversity. The conservation status of fish species in Mozambique is not known.

2.1.5 Areas of Outstanding Ecosystem, Biological and/or Scenic value

A number of areas of outstanding ecosystem, biological and/or scenic value have been identified in Mozambique and are considered to warrant special attention (SMEC International 2001):

(i) Gorongosa Mountain - Rift Valley Complex

This area encompasses the isolated massif of Gorongosa Mountain and the southern-most section of the African Rift Valley. The mountain supports montane forests and heath grasslands on its summits. Several endemic and near-endemic plants and animals occur within the mountain's habitats. The Rift Valley in Mozambique is a floodplain ecosystem comprising a variety of wetland habitats. The diversity of habitats in the Rift Valley makes it one of the finest wildlife grazing ecosystems in Africa. The southern portion of the Rift Valley is protected within the Gorongosa National Park.

(ii) The Cheringoma Plateau

The Cheringoma Plateau comprises tropical forests containing a mixture of local endemics with Equatorial and southern African flora. The forest on the Plateau contains several commercially important hardwood species.

(iii) Zambezi Delta Grasslands and Swamps

The Zambezi Delta covers an area of about 18,000 km^2. The Delta is of great socio-economic and cultural value. Marromeu Buffalo Reserve is located on the southern portion of the Delta. In addition to buffalo, elephants, water buck and reedbuck are found in the Delta although their numbers have been much reduced by hunting. The Zambezi Delta represents an important wetland for resident and migratory bird species. Wetland scientists believe that the Zambezi Delta qualifies as a Wetland of International Importance under the Ramsar Convention.

(iv) The Great Inselberg Archipelago

This series of habitats occurs south of the Lurio River occupying a rectangular area approximately 500km by 160km. This Inselberg archipelago presents a remarkable landscape of tall granite core remnants in a savanna plain. Several of the montane areas have high biodiversity moist forests.

(v) The Chimanimani Massif

The Chimanimani Massif although relatively small in area is characterized by an exceptionally high diversity of habitats and species. The Massif supports a rich endemic flora, while endemic fauna include two frogs and one reptile. Large mammals are well represented in the area and include buffalo, eland and sable. Over 160 bird species have been recorded for the Chimanimani Massif some which are considered endemic to the Afro-montane regions of

eastern Africa. There are well preserved rock paintings throughout the area depicting much of the local and lowland big game of the region.

(vi) The Maputaland Centre of Endemism (MCE)

The MCE (26,734 km^2) is defined as that part of southern Mozambique and north-eastern Natal (South Africa). It is bounded in the north by the Inkomati-Limpopo River, in the west by the western foothills of the Libombos, in the south by the St. Lucia estuary and in the east by the Indian Ocean. It contains extensive wetland areas. The MCE flora comprises 2,000 to 3,000 species of which at least 168 species/infraspecific taxa are endemic/near-endemic to the Centre. Of the more than 472 species of birds in the MC, 47 subspecies are endemic/near-endemic.

(vii) Coastal Barrier Lakes

A characteristic feature of the Ponta do Ouro to Bazaruto coast is the extensive system of coastal lakes which occur behind the dunes. The coastal lakes provide habitat for many bird species. Besides their importance biologically these coastal systems have a high scenic value. A proposal has been developed to declare the Maputaland wetlands (between Ponta do Ouro and Inhaca island) a Natural World Heritage Site.

(viii) Pebane Evergreen Coastal Forests

The Evergreen Coastal Forests in northern coastal Zambezia Province are of high biological importance. A new (and possibly endemic) tree species was discovered in these forests in 1998. A rich and diverse reptile fauna occurs in the coastal forests of Pebane. In 1998 two new reptile species were discovered; a new snake and a new dwarf day gecko. The two new reptile species are, at present, endemic to the area.

2.1.6 Agriculture

The total land area of Mozambique, excluding rivers and inland waters, is estimates to be about 784,000 km^2. About 360,000 km^2 (36 million ha) of this is considered to be cultivable. However, the actual area cultivated for arable and permanent crops was estimated to be only 4.9 million ha (INE/MADER: 1999-2000 Agricultural Census). Most of this (90%) is listed as being under food crops. Other estimates of the total area of area of land under cultivation in Mozambique suggest that only 1 million ha of the total is under permanent cultivation, but that a further 10 million ha is used for short fallow shifting cultivation (at least one-third being cropped each year) and 9.1 million ha for long fallow shifting cultivation (FAO Land Census 2005). The total area cultivated for food crops is estimated to have increased by only 0.9% per year from the period 1997/8 to 2003/4, and is even reported to have declined in some provinces (Maputo and Inhambane). Food production systems are extensive with low productivity. On an average year these systems can supply the country with basic foodstuffs,

however, the diet would be insufficiently diversified and a significant degree of food insecurity would still occur at the household level (PARPA, 2001).

Agriculture is the main activity of the Mozambican population. Approximately, 84% of the economically active population in Mozambique works in agriculture, which contributes about 40% of the Gross Domestic Product. Pressure on cultivable land in Mozambique is considered to be relatively low though, to the abundance of arable land and the low overall population density. The ratio of cultivated land to cultivable land for the whole country as a whole, is estimated to be only 12%, but varies considerably between provinces. Cropping rates are reported to be highest in Gaza (cropping rate = 72%), but is very much lower in Niassa and Tete (3 and 7% respectively). The cropping rates mirror to some extent the ratio between cultivable land and total land area which is only 5% in Gaza but 65% in Niassa. Cropping rates for land devoted to shifting agriculture are also reported to be modest - 17% on average, which is equivalent to a rotation period of about 1 year in 6. Cabo Delgado province is reported to have the highest cropping rate for shifting agriculture in Mozambique, with a rotation period of about 1 year in 4.

Small-holder agriculture is mainly a subsistence activity that involves a large part of the population and is done on fields with the area ranging from 0,06 to over 3 hectares. The area under food products are distributed in the following way[1]: roots and tubers (73,8%, mostly cassava); cereals (22,7%, mostly maize); pulses (2,2%, mostly beans) and meat (1,2%). Daily calories come primarily[2] from roots and tubers (40%); cereals (38%); pulses (3%); vegetables and fruits (2%); sugars (2%), and milk eggs and animal products (1%). The most important commercial and cash crops are sugarcane, cotton, cashew nuts and tobacco. Farmers closer to urban centres or irrigated perimeters, depend on horticulture as an important source of income (sweet potato, tomato, onion, carrots, lettuce and cabbage).

Reported estimates of the total stock of domestic livestock differ dramatically both over time and for different species. The total stock of cattle was estimated to be in the region of 1.4 million units in 1975. This declined dramatically during the war (estimates vary considerably to how much it declined by), but is now believed to be in the range of 1.5 million units. Goats and pigs are estimated to contribute a further 750 000 units to the total. The rate of growth of the national cattle heard is estimated to be around 13.8% in the period 1994 to 2000, but has slowed to 8.2% for the period 1997-2000. Assuming that this slowdown continues, (Hughes 2005) estimates that the total number of livestock units will increase by a further 50% by 2010. Following from this, it is estimated that the amount of land required for grazing will increase from 85 000 km^2 in 2003 (19,000 sq km in mixed farming and 66,000 km^2 in range grazing) to a total of nearly 122 000 in 2010 (32,000 sq km in mixed farming and 90,000 km^2 in range grazing respectively). There is some evidence of land degradation as a result of over-

[1] FAO Land and Water Development Division (2005; World Resources Institute (2003)

[2] FAO GIEWS (1997)

utilisation at present, but this is expected to increase dramatically in grassland areas in certain provinces in the future (e.g. Manica and Tete), especially in the event of a prolonged drought.

Livestock does not provide a large contribution to the economy but provides vital supplementary nutrition amounting to 5 kg of meat consumed annually per person. The most commonly raised animals are chicken, ducks and goats. Cattle are only raised by 7% of the farmers. Wild animal products and bush meat are also important sources of food.

2.1.7 Forestry and forest resources

Productive forests in Mozambique occupy an area of about 20 million hectares or 20% of the national territory, with a further 8.8 million hectares (11 percent of total area) contained in national parks and reserve areas. Wood resources are used by commercial and artisanal logging operations and as energy source by the rural and urban populations. In terms of timber production for logging purposes, forests of Mozambique are reported to have the potential to produce 500,000 m^3/year of sustainable logging. However, much of the forest area is comprised of low-increment forestland with low density of commercial species. The net result of this is that the potential sustainable harvest per hectare is only around 0.025 m^3 per annum. A consequence of this, and a recent ban on the export of first-class species round wood (i.e. unprocessed logs), national total wood output is currently only around 127,000 m^3/year today (about 25% of the estimated sustainable potential). Overall production of timber has also declined by about 15% since 1998, principally because of the ban on export of first-class roundwood, which has always accounted for a very large proportion of the total output (Table 1). Round wood accounts for approximately 73% of this (93,000 m^3), sawn wood for 24% (30,000 m^3), and posts, plywood and veneer for the rest (3%). Most of this wood production comes from forest concession areas in Sofala, Zambézia, and Cabo Delgado provinces. Only a small proportion of the wood production is exported, and altogether generates a value of only US$ 30 million annually.

Table 1. National wood production (m^3) in Mozambique - 1998-2003. Source: Relatório Estatístico Anual, Direção National de Florestas e Fauna Bravia.

Wood type	Unit	1998	1999	2000	2001	2002	2003
Roundwood	m^3	119 761	61 482	84 750	91 215	130 290	93 216
Sawnwood	m^3	28 180	15 323	19 392	29 600	29 428	29 928
Parquet	m^2	16 394	6 446	9 269	3 937	3 715	2 920
Plywood	m^3	662	661	764	664	720	82
Veneer	m^3	2 792	992	826	913	1 130	15
Posts	m^3	8 570	3 219	1 028	-	5 006	3 570

Wood consumption for fuel in Mozambique is estimated to amount to approximately 31,278,000 m^3 per annum (Broadhead et al. 2001), nearly 250 times that consumed by logging operations. Fuel wood consumption in Mozambique is reported to be the highest in the SADC region, and is the most important source of domestic energy in the country

(accounting for 85% of total household energy requirements) owing to the poor access to other forms of energy and high levels of poverty. Miombo, mopane and acacia woodlands are the major sources of energy in all the major cities including Maputo, Beira, Nampula, Quelimane, Chimoio, Tete, Xai-Xai and Chókwè, with firewood and charcoal as the principal products. Even in the larger urban areas such Beira, where electricity and gas are available, a significant number of inhabitants (50%) use charcoal for cooking (Serra and Zolho, 2003). Forests around main urban centers of Maputo, Beira, and Nampula are reported to have been severely degraded by firewood harvesting (Milington and Townsend, 1989, Cuco, 1996).

Recent studies on the forestry sector in Mozambique (Fath, 2002; Chitará, 2003; Bila & Salmi, 2003 and Sitoe Bila & Macqueen, 2003) have shown that despite law requirements, logging in the country has been carried out with minimal reforestation effort and poor ecologically-oriented management practices. As a result of this, many believe that in spite of the low production statistics, current rates of logging are not sustainable in the long term.

2.1.8 Marine and coastal environments

The Republic of Mozambique has the third longest coastline in Africa, being approximately 2 770 km in length, and is characterised by a wide diversity of habitats including sandy beaches, coral reefs, estuarine systems, bays, mangroves and seagrass beds. These diverse marine ecosystems support important fishery resources and provide habitat for many endangered and protected species like turtles and dugongs.

The coastline can be broadly categorised into three regions (Rodrigues *et al.* 2000, ICZM 1996):

1. The northern coast extending 770 km from the Rovuma River in the north to Pebane. This is essentially a **coral coast** with an almost continuous fringing reef;
2. The central coast from Pebane to Bazaruto Island, approximately 950 km, is classified as a **swamp coast** with linear to arched beaches, swamps and estuaries. The sea along this coast is shallow with high wave impact, which causes much turbidity close to the shore. Twenty-four rivers flow into the ocean in this region, discharging their high mineral loads (ilmenite and rutile) onto the beaches, resulting in black, sandy beaches.
3. The southern coast, stretching 850 km from Bazaruto Island southwards to Ponta do Ouro and beyond to Kwa-Zulu Natal, is classified as **parabolic dune coast** dominated by parabolic dunes with north-oriented capes (very high vegetated dunes, up to 120m, with equally steep sides, having a slight incline towards the north at the tip) and barrier lakes. There are a few patchy rocky reefs with scattered corals in this region.

The continental shelf encompasses a total area of 68 300 km^2 and varies from very narrow to very broad. The widest point is 140 km in width and lies opposite the city of Beira, causing one of the highest tidal ranges along the entire African coast (6.3 m) to occur here (ICZM 1996). The rest of Mozambique has a tidal range of 3-4 m.

There are several small island distributed along the length of coastline, many of which have been severed and isolated from northward oriented peninsulas by strong wind and sea action. The two largest island groups are that of Inhaca Island and the Bazaruto Archipelago. Inhaca Island is located 35 km from the capital city Maputo at the end of the Machangulo Peninsular, which separates Maputo Bay from the Indian Ocean. With an area of 42 km^2 it is the southern most island along the east coast of Africa. The Bazaruto Archipelago is comprised of five islands, located 20 km off the coast of Inhambane Province, together encompassing approximately 600 km^2. These islands are composed of beach rock and sand dunes and incorporate a wide range of marine habitats that support the largest population of the endangered dugong (*Dugung dugon*) in Eastern Africa and many species of turtles, dolphins and whales (Moffat & Kyewalyanga 1998). The Bazaruto National Park is the only marine national park in Mozambique and covers an area of 1400 km^2, making it the largest marine national park in the Indian Ocean. The Bazaruto Archipelago is a popular tourist destination and hosts several hotels and lodges, however the resident islanders benefit little from tourism, with the majority of the hired staff being from the mainland (ICZM 1996).

2.1.9 Marine fisheries

The marine fisheries sector in Mozambique is very important, providing employment for between 75 000-80 000 people while an estimated 480 000 people are economically dependent on this sector. Collectively, fisheries produce catches of 100 000 and 120 000 tones per year, and contribute about 30-40% of the total export earnings for the country. The marine fisheries of Mozambique can be classified into two categories: Coastal and Offshore fisheries. Coastal fisheries target mostly shallow-water demersal and pelagic species, while the offshore fishery targets primarily tuna and tuna-like species. Most of the offshore fishing is conducted by foreign licensed vessels. In terms of the Mozambique fisheries regulations (Regulamento da Pesca Maritime 1997) three principal categories of fishers are recognised: artisanal, semi-industrial and industrial. These are defined in terms of the law as follows:

Artisanal fishery: A locally based fishery providing fish for local consumption, the excess of which may be sold. Fishing may be performed with or without the use of a boat, which may not exceed 10 m in length. The boat may be propelled using paddles, sails, and/or outboard or small inboard engines. Use must be made of traditional fishing techniques, but ice may occasionally be used for the preservation of the catch. This sector accounts for 33% of the total registered catch (Fishing Industry Handbook 2002), although it is the poorest managed fishery and landing data reported are considered to be incomplete (ICZM 1996). The registered catch for the artisanal sector is estimated to be as little as 30% of the actual catch landed (Fishing Industry Handbook 2002).

Semi-industrial fishery: A fishery performed in the coastal zone using boats not greater than 20 m total length. Engines may be used to propel the boats and either ice or onboard

refrigerators may be used to preserve the catch. Mechanical means may also be used for the fishing operation itself. This sector accounts for 20% of the registered catch (Fishing Industry Handbook 2002).

Industrial fishery: A fishery performed within or outside of Mozambican territorial waters using boats greater than 20 m in length. Boats are propelled by engines and make use of mechanical means for fishing and onboard freezers for the preservation of the catch, enabling them to remain at sea for extended periods of time. This is the largest sector of the fishing industry of Mozambique and accounts for up to 47% of the total catch landed (Fishing Industry Handbook 2002).

Marine fish resources are concentrated in two areas where the continental shelf forms wide, shallow banks; the Sofala Banks in the centre of the coastline and Maputo Bay in the southern region of the country (Hoguane *et al.* 2002). It is in these areas of the coastline that the majority of industrial and semi-industrial fishing activity occurs. Artisanal fishers are distributed all along the coastline in small concentrations.

Industrial Fisheries

The industrial fishing sector in Mozambique is made up of several components, which target a variety of different resources. The most important of these include shallow-water shrimp, tuna, deep-water shrimp (gamba), lobster and demersal fish. The shrimp fishery is a trawl-based fishery making use of trawl nets modified to suit the vessel and terrain over which the trawl is conducted. The vessels all have blast freezers onboard and are able to remain out at sea for extended periods of time. The primary fishing grounds of the shallow water shrimp fishery are on the Sofala Bank, offshore of Beira.

Deep water shrimp, locally known as ‘gamba’, are targeted by several industrial fishing companies. Vessels targeting this resource, generally fish south of the Save River mouth, concentrating their efforts in Maputo Bay. Deep-water spiny lobster and deep-water crab, are caught by the industrial fishery using trawl and traps. The main focal area lies between the southern border of Sofala Banks and Bazaruto Island in waters between 200 and 400 m in depth.

Semi-Industrial Fisheries

The semi-industrial fishery is very active in three areas off the coast of Mozambique 1) Sofala Bay, 2) between Sofala and Chiloane (Save River area) and 3) Maputo Bay where they catch fish, shrimp and other invertebrates such as squid and crab. Although it is not the majority product by volume, shrimp forms the primary target of this fishery because of its high value. Most of the shrimp (95%) is exported while the bulk of the fish and squid caught are sold locally. The semi-industrial vessels are small (by law they are not allowed to exceed 20 m in length) and most carry ice as the only means of preserving their catch. The hold capacity of these vessels is small, and they are forced to return to port regularly (usually very five days)

to discharge their catch and take on fresh ice. These vessels cannot afford to travel for long distances and operate mostly within the confines of Sofala Bay, Maputo Bay and the nearby surrounding waters having their vessels based at the closest port. Most fishing is undertaken in shallow water within 15 miles of the shore, as most semi-industrial boats do not have the capacity to fish in deep water.

Artisanal Fisheries

In accordance with the definition of artisanal fishers, the vessels that are used for this fishery are mostly canoes, flat bottom boats or "chata", and keeled boats or "launcha". Most of the canoes are propelled by means of paddles or sail, while the chata and launcha are propelled mostly by means of sail and/or outboard. The principal means of artisanal fishing is by using beach-seine nets operated from the shore or on emergent sand banks. Surface gill nets and hand lines, which are deployed in the estuaries or the sea, up to 2-3 miles offshore, are also frequently used by artisanal fishers. Artisanal fishers generally utilise whatever means they can for fishing and crab cages, subsurface gill nets, traps and other make-shift nets and fishing lines are known to be used. Some of the fishers (minority) do not have vessels at all and harvest crabs, clams, molluscs and anything else they can access at low tide from the shore areas. Most of the catch taken by artisanal fishers is either retained for their own consumption or sold on the beach or at landing sites. Around the larger urban centres, most of the fish and prawns are taken up by fish buyers, who either dry it or resell to the public and semi-industrial or industrial fishing companies. In the outlying areas, most of the artisanal catch is dried and transported to the larger cities or to the interior of the country, where it provides an important source of protein for the people living here.

Other Fishing activities

There are a large component of fishermen (primarily South Africans) who conduct recreational line fishing from beaches, rocks and ski boats in the southern regions of Mozambique. There is very little control over these fishing activities and there have been reports of large quantities of reef and line fish being exported to South Africa without Mozambique consent (ICZM 1996).

2.1.10 Inland fisheries

Inland fishing areas of Mozambique can broadly be divided in two groups: lake fisheries centred on Lakes Niassa, Cahora Bassa, Amaramba, Chiúte, and Chilwe (the first two being the most important), and riverine fisheries of which the Zambeze, Limpopo and Pungwe/Busi River Basins are the most important. Barnes *et al*. (2002) provide a comprehensive description of the current status of inland fisheries in these water bodies. The following description thereof draws heavily on this report and is supplemented by information collected by the project team from interviews with key individuals in Mozambique.

Lakes Niassa and Cahora Bassa are quite different both in their physical make up, their fish fauna and the fisheries they support. Lake Niassa, in the western arm of the East African Great Rift Valley, is the 6th largest lake in the world covering some 30 000 km^2. About 20% (6,400 km^2) of the lake, with a shoreline of about 250 km, belongs to Mozambique (Vanden Bossche & Bernacsek, 1990). The Mozambican shoreline is mostly rocky (44%) and sandy (43%) and the bottom falls steeply to the 100 metre depth contour which, on average, is only 1.2 km wide and occupies a total of only some 300 km^2 (Bernacsek *et al*., 1983). Lake Niassa has the most diverse fish fauna of any lake in the world, boasting over 800 fish species, most of which are endemic. The fishery in the Mozambican sector of the lake is exclusively artisanal and near-shore. At least 95% of fishing boats are dugout canoes and are unlikely to venture farther than 1 km from the shore. The fishery is strongly seasonal, with about 90% of the catch taken in the rainy season. Fishers in Mozambique focus on three groups of these fish. Demersal (bottom dwelling) fish species constitute the most diverse group of fish in the lake. They are targeted by bottom-set gill nets, beach seines, chilimilas (purse seines), longlines and hand lines. Fishing effort in this sector is low on the Mozambique side of the lake and stocks are probably reasonably healthy. Pelagic (surface dwelling species) species tend to be concentrated along the shoreline of the lake and are caught by chilimilas and longlines. Potamodromous, comprising both demersal and pelagic fish species, are caught, mostly with traps, when they congregate in river mouths prior to their spawning runs up river in the rainy season. Historically, these species have been a major constituent of the Lake Niassa catches, but stocks in Malawi have collapsed completed due either to overfishing or river degradation (or both), while those in Mozambique have declined precipitously. Trade in ornamental (aquarium) fish is an important activity on the Malawian side of the lake, where it provides employment for some 200 people, but seems to be less important in Mozambique. No formal fishery management systems are established on the Mozambican section of the lake, and the fishery is to a large extent an open access one, except in the riverine and river mouth areas which are considered community property and access is controlled. Total annual catch of fish on the Lake is estimated to be in the range of 9-10 000 tons per annum and seems to have been static for the last 10 years at least. The total potential sustainable annual yield of the Mozambican section of Lake Niassa is estimated to be not much higher than the annual catch (12,000 tonnes), and thus the fishery as a whole, is probably sustainable. However, potadromous species may be overexploited.

Cahora Bassa is a large body of dammed water, with a surface area of 2,665 km^2. It is one of Africa's largest reservoirs. Lakes Amaramba, Chiúte, and Chilwe are smaller and shallower than Lake Niassa or Cohora Bassa, and are situated on the Malawian border with Lake Niassa. The Cahora Bassa fishery is comprised of two sectors - artisanal fishers who exploit mostly riverine fish species and a semi-industrial fishery focussed on kapenta. Artisanal fisheries operate from dugout canoes and use mostly gill nets, while the semi-industrial fisheries operate mostly off small boats using seine nets. There are an estimated 150 "kapenta" rigs operating on lake Cohora Bassa, and they catch approximately 15,000 tonnes of fresh fish per annum. Artisanal fishers are estimated to land about 7,000 tons of fish per

annum. The total potential sustainable annual yield for Lake Cahora Bassa is estimated to be much higher than Lake Niassa, at about 19,000 tonnes, of which 15,000 tonnes comprises offshore species (mostly "kapenta") and 4000 tonnes inshore (mostly demersal) species. Both the artisanal and semi-industrial fisheries are fishing at the maximum sustainable limits of their respective fisheries and seem to have been static for some time.

Much less is known about the fisheries of inland water bodies away from the two large lakes. Turpie *et al*. (1999) studied the artisanal floodplain fishery in the lower Shire valley in Tete Province and the artisanal fishery in the Zambezi Delta area. Fishers in the lower Shire valley use mostly gill nets, reed wall traps, and to a lesser extent cast nets, seine nets and spears, to catch an estimated 1,800 tonnes of fish per annum. Artisanal fishers in the Zambezi Delta use mostly gill nets and hand lines together with small numbers of circle traps and seine nets catching an estimated 15,000 tonnes of fish per annum. By comparison, artisanal fishers in the Limpopo basin reported catching about 650 tonnes of fish in 1999 using mostly gill nets. Catches dropped dramatically in 2000, down to about 200 tonnes, due to flood induced equipment losses (Barnes *et al*. 2002).

2.2. Threats and issues in sustainable use of natural resources

2.2.1 Intensity of use of agricultural resources

In spite of abundance of arable land in Mozambique and the fact that over 90% of the cultivated area is under food crops, high level of food insecurity are prevalent in certain parts of the country. Part of the reason for this is that only a small proportion of the cultivatable land (only 12 %) is currently being utilized for crop production, of which 75% is estimated to be used for shifting (slash and burn) subsistence agriculture (Hughes 2005). Extensive livestock grazing is also common amongst subsistence farmers, but is also relatively unproductive and wasteful of land resources. Proposed strategies for promoting the intensification of agriculture and hence increasing food security for the country are controversial. Simple economics suggest that the focus should be on expanding the more capital-intensive forms of land use which are aimed at production for the market rather than for subsistence use. However, expansion of commercial farming operations is very contentious. This stems partially from a history of large farms and plantations during the colonial period and also from a desire to avoid the problems that characterise patterns of land ownership in many other countries in Southern Africa. Such concerns are reinforced by anecdotal evidence regarding local elites acquiring large holdings of land - sometimes in partnership with foreign investors - that is barely developed or is used for extensive ranching of cattle and game (Hughes 2005). Large and small scale farms (those with more than 50 ha under cultivation) account for a very small proportion of the total area under cultivation in Mozambique (<2%), while those greater than 5% account for a little less than 12%. Expansion of large and medium scale farms should not really be an issue of concern, and need not take place at the expense of small-scale farmers. Although small-scale farming is

generally concentrated in areas with either or both the best access to infrastructure and the best quality soils, there are significant areas with good soil quality that are not farmed because they are either unattractive to small scale farmers and/or difficult to access. This problem could easily be alleviated through improvements in infrastructure, particularly roads (more on this later). Expansion of medium and large scale commercial operations would if anything provide benefits to small scale farmers through the adaptation of new technologies, the development of physical and market infrastructure, and by expanding the labour market. It is noteworthy therefore that the GOM has established as one of its development goals for 2006-2009, the promotion and development of a strong and dynamic commercial agricultural sector.

One way of increasing agricultural intensity and efficiency is through irrigation. The amount of irrigation potential in Mozambique is listed as being about 2.7 million ha (7.5% of cultivable area). However, irrigation schemes in Mozambique cover only 120,000 ha of which only 41,000 ha are operational (<1% of the total). The ratio of irrigated area to cultivated land area in Mozambique is very much lower than other SADC countries, which suggests that there is considerable opportunity for expansion in this respect (Table 2). Expanding the area under irrigation for both small and commercial farming could make an important contribution to agricultural growth and to reduce rural poverty. Vaz (2005) estimated that if Mozambique were to increase the proportion of irrigated land to 4% of the total cultivated area (in other words putting it on par with Zimbabwe), it should be possible to obtain an average value-added of US$ 2,000 per ha – equivalent to an additional US$ 600 million per year to agricultural value-added. This compares very favourably to the total value-added in agriculture in 2002 of US$ 790 million.

Table 2. Land use irrigation in southern Africa. Source: CIA Fact book 2004, WB World Development Indicators 2004

Country	Land area (000 km^2)	Cultivated Area (000 km^2)	% of land cultivated	Irrigated Area (km^2)	Irrigated area as % of cultivated area
ambique	799	42.5	5.3	400	0.9
Zimbabwe	390	32.8	8.4	1,170	4.0
Angola	1,247	30.8	2.4	750	2.5
Kenya	583	41.0	7.0	670	1.6
South Africa	1,220	148.0	12.1	13,500	9.1

It is important to note though, that potential for irrigation varies across the country and cannot be seen as the optimal solution in all areas. Much of the potential irrigable land is located in the Zambezi basin (more than 1.3 million ha). South of Save River, possibilities for irrigated agriculture are severely constrained by the low storage infrastructure and high evapo-transpiration rates (in most cases above average rainfall).

2.2.2 Impacts of mining on the environment

Mozambique has favourable geology for exploration and mining activities, but has yet to capitalize on this potential. This sector is still mostly composed of small scale and manual operations, whose contribution to the economy remains small (0.4% of GDP). Steady increases in the value of mineral production (**Figure 4**) and in the number of mining licence applications over the last 10 years suggests that this sector is expanding (Figure 5). Industrial production is modest at present, and apart from tantalite, is limited to building materials: stone crushing, limestone, clay, ornamental rocks, among others. However, there are a number of important industrial mining projects under development or consideration including heavy mineral, base metal (copper, zinc, nickel), coal, and oil and gas projects. In particular, two major heavy mineral mining projects are scheduled to begin this year (2006): the Moma project, sponsored by Kenmare, and the Limpopo Corridor Sands project, promoted by BHP/Billiton. The Moma project is focussed on the production of ilmenite, zircon, and rutile while the Corrisdor Sands project will focus on the production of titanium slag. Rehabilitation of the Moatize coal field is also expected to take place in the near future.

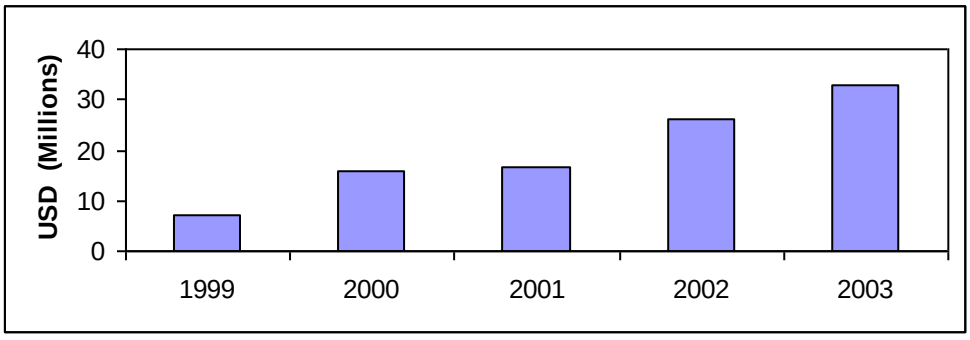

Figure 4. Mineral production in Mozambique, 1999-2003. Data from the Direção National de Minas

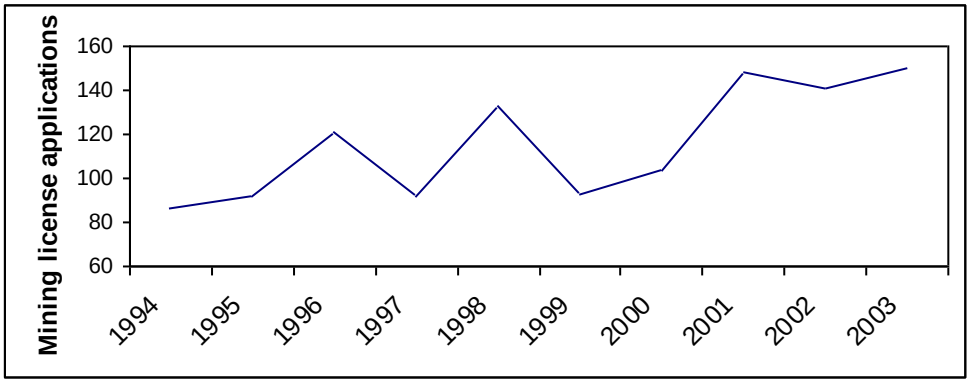

Figure 5. Mining license applications (reconnaissance, exploration and mining) received by the Direção National de Minas.

The mining industry of Mozambique is not yet very well developed, so the related environmental matters are not as serious and extensive as in some of the big mining countries. However, problems do certainly exist and there will also be potential environmental impacts associated with any new mining operation starting up. The Swedish Geological AB &

Impacto (2003) visited and conducted brief audits on 22 different mining sites in Mozambique. The following is a brief summary of the issues identified in their report and those identified by the team during interviews with other key informants.
The nature and extent of impacts associated with mining varies through the progression of the mining operation, from prospecting and exploration, through resource exploitation and closure (Table 3). Environmental impacts during prospecting and exploration are generally of low magnitude but are often widespread. Typical environmental impacts associated with this phase of mining include construction of access roads in sometimes sensitive terrain, clearing of vegetation and contamination associated with the establishment of camps (e.g. spillages of oil and other chemicals). Environmental impacts of exploration work in Mozambique to date have been small, due in part to low levels of exploration. Prospecting for heavy mineral sand deposits have been reported as being of concern in some areas, particularly the pits from which material has been removed for beneficiation tests. Issues identified during the resource exploitation phase include inefficient use of natural resources (an accusation often levelled at artisanal and small scale miners but one which is very difficult to prove), impacts on landscape and morphology resulting from the movement of large amounts of ore and overburden, overexploitation and/or contamination of surface and ground water resources, impacts on wildlife and natural vegetation

One of the most significant impacts associated with medium to large-scale mining is the loss of productive land and/or assets for small-scale farmers. The Land Law, with which mining activities must be compliant, allows for the revocation of land in the public interest (e.g. for mining3) but requires that this be subject to the prior payment of a just indemnification and/or compensation. However, it does not provide any guidelines on issues related to compensation, in terms of the principles, forms, eligibility, valuation, adequacy, procedures, timing and responsibilities. Agreements for compensation are generally dealt with on a case by case basis and are not always fair to the original landowners. Generally though, the principles of fairness and good practice are applied to compensation and resettlement. For example, it is usually accepted that replacement land is provided which is equal to or superior to the land foregone in terms of size, quality and location advantages. Compensation has also usually been paid on the basis of the full replacement cost of lost or displaced assets and has usually covered associated costs, such as transfers, transport, supervision and others (Swedish Geological AB & Impacto 2003). Nonetheless, while conflicts over land use have been dealt with fairly easily in the past by compensating the affected persons (mostly farmers) this issue is becoming increasing difficult to mange in the face of large scale mining of heavy mineral deposits in the coastal zone which may affect future use options in affected areas. Extensive erosion and silting of rivers is reportedly associated with small scale mining in some areas. Mining operations often require larger quantities of water for mineral extraction and

[3] In terms of the Mining Law (Lei no 14/2002) land use for mining operations shall have priority over other land uses when economic and social benefits related to these operations are greater

processing, much of which is contaminated with silt, heavy metals, and process chemicals (including acid, arsenic, cyanide and mercury) during the mining process. Large scale mining operations generally recycle much of their process water and at least make some attempt to decontaminate it before releasing it back into the environment. Small-scale mining operations, however, are more wasteful in their use of water and seldom have the resources or technology to decontaminate their process water. The major air pollutants related to mining and smelting activities are particulate matters and gases. Dusting from open pits or beneficiation plants occur at many of the Mozambican mining sites, however at a moderate level only. At present, there are only a few valid mining concessions that fall within protected areas, and no mineral exploitation is going on in those that do. However, impacts to wildlife and natural vegetation outside of these areas is reported to be a problem. As prospecting and mining activities expand in Mozambique conflict with conservation is inevitable and will have to be managed carefully. The heavy mineral sand deposits in Mozambique (like similar deposits in other countries) exhibit a high gamma radiation originating from thorium (mainly) and uranium and can exposes workers to unacceptably high levels of radiation unless appropriate precautions are taken. Tailings dam failures are usually considered to be one of the main accident risks in conventional mining. One or two major dam failures at mines are usually reported every year in the world. Occupational health and safety encompasses such issues as the exposition of workers to toxic chemicals and materials; dust and fugitive emissions within a plant; heat, noise and vibration; and unsafe work practices and conditions. It is of some concern in Mozambique, that hearing protectors, dust masks, and hard hats are used only occasionally in the large commercial mines while such issues are virtually unheard of in the small-scale and artisanal mining operations. It reflects mostly a lack of discipline and awareness amongst workers on the mines.

Table 3. Range of impacts caused by mining activities in Mozambiqe (after Swedish Geological AB & Impacto, 2003).

Stage of mining	Impact/issue	Source
Prospecting and Exploration	• Land disturbance • Erosion • Encroachment on wilderness areas	• Construction of access roads • Drilling activities • Trenching and sampling

Stage of mining	Impact/issue	Source
Mining	Inefficient use of natural resources including incomplete recovery of ore reserves in mine or deposit, poor recovery of metals/minerals in the beneficiation process, wastefulness regarding consumption of water and energy	The use of unsuitable mining methods Inferior beneficiation methods and/or poor optimization of processes Slack management and work routines
	Impacts on landscape and morphology including visual and aesthetic effects from changes in land form, competition with other forms of land use, destruction of natural habitat, land subsidence, soil erosion; changes in river regime due to siltation and flow modifications, abandoned equipment, plants, buildings, excavations	Excavation of open pit mines Establishment of industrial areas for ore dressing Areas of tailings and waste Underground mining Road construction Inadequate rehabilitation after closure
	Overexploitation and/or contamination of groundwater and surface water resources	Excessive use of or demand for process water, Discharge of contaminated water from tailings dams or directly from ore processing plants, Acid mine drainage from mines and from tailings, contamination by reagents used in mineral processing
	Air pollution	Dust pollution from dry tailings deposits, SO2 emissions from smelters, Emissions of lead, arsenic and other substances with smelter gases, Release of methane from coal mines
	Soil pollution	Transport of metals and other substances related to mining operations by air, water or vehicles
	Impacts to flora and fauna including destruction of natural habitat in and adjacent to the mining, disturbance of wildlife, loss of forests, and impacts on aquatic life, flora and micro fauna	Radiation of contamination from mining operations Deforestation related to operations or the activity of intruding settlers
	Effects of noise and vibration on human health and the environment, and infrastructure	Blasting Operation of crushers, vehicles and other heavy equipment
	Radioactivity	Radiation from natural sources Exploited of uranium and thorium ores
	Environmental emergencies including catastrophic failures of tailings dams, collapse of underground workings and accidental spillage of toxic substances	Deficient design or management of tailings or other waste disposal structures Use of unsafe exploitation methods Inadequate facilities for storage and transport of toxics

Stage of mining	Impact/issue	Source
	Occupational health and safety including intoxication by inhalation (cyanide, mercury, other toxic material), or from polluted water, silicosis, gamma radiation and radon, exposure to heat, noise, vibration, physical injuries due to accidents and the spread of HIV/AIDS	Fugitive emissions within the plant Handling of chemicals, residues and products Explosives handling Lack of adequate equipment, sound routines and satisfactory safety control Unsanitary living conditions Social upheaval

2.2.3 Access to freshwater

The per capita surface water availability in Mozambique is estimated to be about 5,560 m^3 per inhabitant per year considering only the runoff generated in the country or 12,000 m^3/inhabitant/year including the flows from upstream countries. In comparison, the per capita water availability in Africa runs around 7,120 m3/inhabitant/year and the World number is 7,340 m^3/inhabitant/year. However, while Mozambique is not a water-poor country, it faces a number of difficult challenges related to the supply of freshwater for irrigation, and domestic and industrial uses (Vaz 2005, World Bank 2005): (*i*) the high variability of precipitation; (*ii*) substantial lack of water resources infrastructure; (*iii*) its geographic location as a downstream riparian of most of its major rivers; (*iv*) extremely low efficiency and rapid deterioration of existing systems; and (*v*) serious equity issues as a large share of the poor has little or no access to water for its basic needs.

Most of the rainfall in Mozambique falls during the rainy season which extends from November to March. Very little falls outside of this period. As a result most of the rivers in the country have a torrential regime, with high water levels during the wet season followed by relatively low flows or no flows at all during the drier part of the year. Rainfall is also highly variable from year to year, and drought frequency seems to be increasing in the region as a whole. There are only five large dams in Mozambique with sufficient storage capacity to have an impact on multi-year uses including flood control. Together, their useful capacity represents only 5 percent of the mean annual runoff of the country's rivers, excluding the Zambezi. Although agricultural potential is fairly high in Mozambique, much of this is not realized due to the lack of water available for irrigation. Less than 1% of land currently under cultivation is irrigated, a ratio that is significantly less than that for many neighboring countries. The lack of water resources infrastructure also severely constrains the supply of fresh water for domestic consumption in urban and rural areas.

Ground water is the primary source of water in rural areas and it is used to supply some of the major cities – Pemba, Tete, Quelimane, Xai-Xai and Chokwe. It is estimated that 14 million Mozambicans – or nearly 75% of the total population - rely on groundwater supply. Groundwater is abundant in some but not all areas of the country. South of the Save River,

Cenozoic sediments and Miocene carbonates predominate and form productive aquifers, and shallow boreholes (<50 m depth) yield good water supplies. However, in some areas in the extreme north and south of the country where crystalline basement rocks, volcanic formations and indurated sediments prevail, groundwater yields are low (<2 litre per second), and are not suitable even for domestic use.

The supply of water to urban areas in Mozambique compares poorly with other countries at a similar level of development. In terms of unaccounted for water (i.e. system losses), Mozambique had a median of 48 percent in the 5 biggest cities in 2004, exceeding the African average of 39 percent. Water supply failures in the cities are reported to occur 152 days in the year, the worst of nine African countries surveyed, which together averaged 56 days (World Bank 2005). Hours of service in the five biggest cities in Mozambique vary from 11 to 19 hours, while the average for developing countries is 20 hours per day, and the average for African cities was 17 hours per day in 1999-2001. Most of the population in the rural areas does not have access to regular water supplies and often obtain water directly from rivers and lakes or from shallow rudimentary wells. Access to clean water in rural areas in Mozambique, at 27 percent, is well behind compared with Africa's average of 46.5 percent.

Despite its still absolute low rates in terms of basic coverage to population in both urban and rural areas, the GoM has made some progress over the past few years. Mozambique has an advanced legal framework for water resources management; it has developed some interesting arrangements to promote private participation in the water supply and sanitation sector; and it is engaged in the development of a country water resources strategy. But the challenges are enormous and an accelerated pace of implementing the reform agenda will require political support, technical capacity, financial resources, and a ***highly selective*** focus on the most pressing needs, those for which well-designed and concrete programs can lead to the most beneficial outcomes. For example, access to clean water in rural areas is reported to have increased from 12 percent in 1996/7 to 27 percent in 2002, and in urban areas from 56 percent in 1996/7 to 64 percent in 2002/3. Success in improving domestic water supplies in Maputo city has been particularly impressive in recent years, thanks largely to the involvement of the private sector. After a private sector contractor commenced operations in Maputo city in 1999, supply improved from 9 to 13 hours, the number of functioning standpipes doubled, the collection ratio rose from 61 to 73 percent, and the number of household connections rose from 70,000 to 90,000.

The fact that such a large proportion of Mozambique's freshwater supplies (>50%) originate from rain that falls in neighbouring countries remains an issue of concern for the future. Even with its water supply infrastructure fully developed, reduction of flow due to intensive use in the neighbouring countries is likely to limit delivery of water for domestic and agricultural use in Mozambique. The central and southern part of the country is where the reduction in flow from hinterland is most critical at present. It is estimated that South Africa, Swaziland and Zimbabwe now abstract about 40% to 60% of the cross border flows. The Zambezi River

is used in the production of electricity both in Mozambique and Zimbabwe, and is used in intensive agriculture in many countries including Zambia, Zimbabwe and Mozambique. The Pungoé River is used for irrigation in the tobacco plantation in Zimbabwe and to supply water in the cities of Mutare, in Zimbabwe and of Beira, in Mozambique. The Elephants river (a tributary of Limpopo), is heavily utilised in South Africa, for cooling at the thermal power stations that serve Gauteng province. This sub-catchment covers most of the coal deposits that supply the thermal stations in South Africa. Apart from the dams constructed to supply the mining industry, power generation and agriculture, this river also serves as the main supplier of water to Gaborone, the capital city of Botswana. Incomati and Umbeluzi rivers are extensively used for irrigation in South Africa and in Swaziland, respectively.

2.2.4 Modification of freshwater flows

Freshwater covers only a very small proportion of the earth surface, but plays a very important role in the global environment. River systems are important natural corridors for the flows of energy, matter and species and provide large quantities of water, food and energy for direct human consumption, agriculture, fisheries, watering livestock, industry and energy production. Natural riverine ecosystems also perform a wide range of functions such as flood control and storm protection, yield products such as wildlife, fisheries and forest resources, and are of aesthetic and cultural importance to many millions of people. Modification in freshwater flows can very easily disrupt the delivery of these good and services to society. Anthropogenic interventions implicated in the disruption of freshwater flows includes dam construction, diversion of river flow, changes in natural vegetation, modification of landscape structures and profiles, amongst others. Construction of large dams is typically the main contributing factor responsible for modification of freshwater flow throughout the world.

Dams unquestionably provide profits and benefits for a wide range of beneficiaries, are sorely needed to address some of the major socio-economic problems in Mozambique. At the same, dams create their own problems due to the negative impacts they have on people and the environment. Dams are structures designed to store or divert water. They are intended to alter the natural distribution and timing of streamflows in order to meet human needs. As such, they also alter essential processes for natural ecosystems. Dams constitute obstacles for longitudinal exchanges along rivers. By altering the pattern of downstream flow (i.e. intensity, timing and frequency), they change sediment and nutrient regimes and alter water temperature and chemistry. Storage reservoirs flood terrestrial ecosystems, killing terrestrial plants and displacing animals.

Associated impacts of dam construction have been felt in Mozambique as much as any where else in the world, particularly those associated with the construction of the Cahora Bassa and Kariba Dams on the Zambezi River. A summary of impacts from the Cahora Bassa Dam are provided in Table 4.

Table 4. Adverse ecological and social effects of Cahora Bassa. (After Jerman & Peter 2005).

Downstream ecological effects	**The lack of seasonal variation in flow resulted in:** loss of many species (mangroves, birds, large mammals, fish, …) reductions in sediment loads and flows coastal erosion and transformation into a "canal" like system. transformation of vegetation: from a herbaceous to a woody floodplain; more drought and saline resistant species displaced flood tolerant and freshwater species substantial drop of groundwater table
Downstream social and economical effects	flood recession farming no longer possible loss of food sources and malnutrition shrimp fishery decline Culture obliteration: flooding of sacred shrines and burial etc.
Reservoir ecological effects	transformation of the river in a lacustrine system: invasion of alien species eutrophication growth of weed transformation of the upstream vegetation from a herbaceous floodplain to a woody savanna
Reservoir social effects	resettlement of 42'000 instead of initially claimed 25'000 people into strategic villages loss of fertile land -> malnutrition spreading of disease vectors

While it may not be possible to mitigate all of the negative effects of dams, it is possible to enable downstream river ecosystems to retain much of their natural integrity and productivity provided consideration is given to the amount, timing, and conditions under which water is released from a dam. Such considerations are usually a product of an environmental flow assessment (EFA) which constitutes an assessment of how much of the original flow regime of a river should continue to flow down it in order to maintain specified valued features of the river ecosystem (King *et al.* 1999). An EFA has two main areas of focus: 1) the different flow regimes that would maintain a river ecosystem at various levels of health (condition) and 2) the ways these different levels of river health will affect people. One of the major advantages of completing an EFA is that it ensures that the full costs of dam construction are internalised within the planning process for the dam. Costs in terms of soil erosion, land loss, loss of valued species, blooms of pest species, loss of fisheries, and much more have profound economic and social implications. As most of these consequences are far removed in space and time from the point of flow manipulation (the dam) that caused them, they are usually externalised in water-resource plans and costing. The level of such costs is now sufficiently high, however, for EFAs to be increasingly accepted world-wide as an essential tool for water-resource management. As such it is critical that any future water resource developments in Mozambique be subject to an EFA.

2.2.5 Unsustainable use of forest resources

Deforestation is a significant problem in Mozambique, as it damages the environment, the economy, and the welfare of Mozambicans. The primary driving forces of deforestation include: potential for profit through logging and timber exportation, necessity of more crop cultivation plots for an increasing population, the use of fire to clear land for agriculture and for hunting, and the use of firewood as a primary source of energy (Ghazvinian 2004).

The Forestry sector falls under the Ministry of Agriculture (MA). MA was recently created by presidential decree (13/2005) and a new organic structure was created and the former National Directorate of Forestry and Wildlife (DNFFB) was integrated in the National Directorate of Lands and Forestry (DNTF). Commercial forestry in Mozambique is governed by the 1999 Mozambique Forest and Wildlife Law (Lei 10/99 de Florestas e Fauna Bravia) and regulation promulgated hereunder. While the law is based on modern forest principles and instruments many believe that it does not provide for adequate protection of forest resources in Mozambique, principally because of inadequate management and enforcement of regulations (this is elaborated in section 3.3). Coupled with this, Mozambican forests are of low productivity and slow growth rate, and very little reforestation is practiced. Thus, even though current timber production (estimated to be around 127,000 m^3/year today) is barely 25% of the legally permitted 500, 000 m^3/year, many believe that this is not sustainable

In addition to timber harvesting, forest resources in Mozambique are also severely impacted through fuel wood collection and by unsustainable agricultural practices. Wood consumption for fuel in Mozambique is estimated to amount to approximately 31,278,000 m^3 per annum (Broadhead *et al*. 2001), nearly 250 times that consumed by logging operations. Fuel wood is the most important source of domestic energy in the country (accounting for 85% of total household energy requirements), and is reported to be the highest in the SADC region. Even in the larger urban areas such Beira, where electricity and gas are available, a significant number of inhabitants (50 percent) use charcoal for cooking (Serra and Zolho, 2003). As a result, forests around main urban centres of Maputo, Beira, and Nampula are reported to have been severely degraded by firewood harvesting (Milington and Townsend, 1989, Cuco, 1996).

The majority of subsistence farmers in Mozambique practice slash and burn agriculture, in which a plot of land is cleared for crop cultivation and is abandoned when it loses its fertility after a few planting seasons. Several years after abandonment, vegetation can grow again, allowing the land to regain fertility and be used for cultivation once more. Such practices are sustainable in small populations because cultivation plots can be given sufficient time to recover and become fertile again. With a growing population, however, greater areas are being deforested to provide enough cleared land for crop cultivation and this land is not given enough time to recover after use, making the practice extremely damaging to the environment. Fire also constitutes a powerful working tools for local communities for other practices. Aside from being used in agriculture - to clear lands before cultivation (described above); it is also used in hunting, to guide wild animals into pre-established traps and to smoke the meat;

in bee-keeping, to put bees to flight and extract the honey; in cattle breeding, to activate the leafing of pastures during the dry season. All these activities offer benefits for local communities in the short term, but because of the absence of discipline and controlled burning in the use of fire, large areas are devastated by fire during the dry season. Almost entire forests in Mozambique are burnt at least once a year as a result of these practices. As a result, the structure and composition of the forest communities are maintained in a sub-climax stage in many of these areas

Environmental impacts of deforestation are far reaching and include among other, loss of agricultural soil through soil erosion, desertification (i.e. loss of soil fertility), increased surface water runoff and reduced infiltration which in turn exacerbates the effects of flooding, coastal erosion (mostly from loss of mangroves), and sedimentation. As a poor country with a large proportion of the population dependent on agriculture for their livelihoods Mozambique can ill afford to allow current rates of deforestation to continue.

2.2.6 Exploitation of living marine resources

Exploitation of living marine resources by the industrial fishery sector in Mozambique appear to be sustainable at present, with little variation in total landed catches reported over the last eight years **Figure 6**). These fisheries are controlled mostly by limiting fishing effort (number of licences) and monitoring of landed catches. Vessels participating in these fisheries are required by nature to be based in the major ports in the country which makes controlling effort and monitoring catches a relatively easy task.

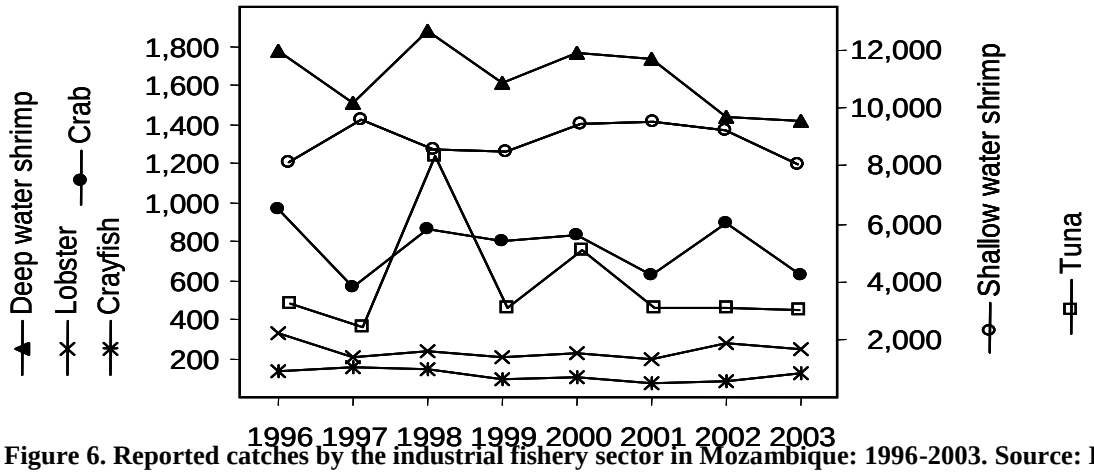

Figure 6. Reported catches by the industrial fishery sector in Mozambique: 1996-2003. Source: Direção National de Pescas

Participation in and catches by the semi-industrial and particularly the artisanal fisheries are much more difficult to monitor or control, and as a consequence few data are available on total landings or catch rates. From the few data that are available it appears that levels of exploitation are excessive in many areas (particularly around the major centres) and stocks are overexploited. Use of illegal fishing methods (such as dynamite, poison, and fine mesh nets) has also contributed to reductions in fish stocks by directly impacting on the stocks

(overexploitation) and by impacting on fish habitats (such as coral reefs and seagrass beds) (Hoguane *et al*. 2002).

The principal threats to future sustainability of fisheries in Mozambique are reported to include the following (Kelleher 2002, Government of Mozambique 2005):

a) Unlicensed fishing, in particular by foreign tuna and high sea vessels;

b) Encroachment on fishing grounds/zones reserved for semi-industrial and artisanal fisheries by industrial fishing vessels;

c) Encroachment onto shallow water shrimp fishing grounds/zones by unlicensed or unauthorized vessels;

d) Deficiencies in recording and reporting of catches in the official logbooks;

e) Difficulties in controlling the artisanal fisheries that are distributed along the entire coastal line and in the fresh waters lakes and rivers;

f) Difficulties in controlling recreational and sport fisheries and in protecting endangered species;

g) Legal framework for co-management of fisheries is incomplete;

h) Shortage of skilled human resources to undertake MCS activities.

2.2.7 Pollution and waste disposal

Waste disposal is not a major issue in Mozambique at this stage due to the low level of development in the country, but is likely to become increasingly important in the future due to the rapid economic growth that is taking place in the country. The three primary sources of pollution of Mozambique include agriculture, industrial activities, and sewage and domestic waste (Fernandes & Hauengue2003).

Agricultural activities within the coastal region and in the hinterland contribute to the pollution of the coastal, marine and associated freshwater environments through sedimentation, and through pesticide and fertiliser runoffs. Throughout the coastline of Mozambique, small-scale peasant farming is widely practised and contributes substantially to the livelihood of coastal communities. This type of farming involves mainly slash-and-burn methods, with farms divided into cultived, fallow and grazing subsystems. Poor land-use practices, which include deforestation of the coastal as well as in the hinterland areas, are the main contributors to sedimentation of the coastal and marine environments of Mozambique. This necessitates frequent dredging of the Maputo and Beira harbours. Recent surveys by the dredging company EMODRAGA show that between 1,200,000 m^3 and 2,500,000 m3 of sediments need to be dredged annually from the Maputo and Beira Ports respectively. Most of the agricultural activities take place along or close to the main river basins. Rivers are thus the main pathways through which agrochemicals enter the coastal and marine environments. Agricultural chemicals and fertilisers are reported to be widely used in the intensive farms in Incomati, Umbeluzi and Maputo Rivers valleys, particularly in the sugarcane plantations in the Umbeluzi River valley in Swaziland. Water samples collected from the mouths of the

Monapo, Pungoé Maputo and Incomati rivers have tested positive for various pesticide residues, including DDT, lindane and hexachlorobenzene (Fernandes & Hauengue2003).

Along the Mozambican coastline, industrial activities are mainly concentrated in the Maputo/Matola and Beira areas. Few industries treat their effluents, which are discharged directly into canals, rivers and coastal waters. Many of these contain toxic chemical and heavy metals. Analysis of water quality samples from rivers entering Maputo Bay have tested positive for the presence of heavy metals, particularly lead, in a number of localities. These include the Port of Maputo, the mouths of Matola and Maputo rivers and the Nacala Bay.

Maputo is the only city in Mozambique with central sewage systems. However, only 30% of the households in the city are connected to the system; the rest use septic tanks. The outskirts of Maputo, as well as other major cities and towns in the country, use pit latrines and septic tanks. The Maputo City sewage works is also very primitive and comprises a series of anaerobic and facultative tanks designed to treat only organic matter. As a consequence of this, faecal coliform levels are reported to be extremely high (4.6×10^5 bacteria counts/100 ml) in the canals leading from the sewage works to the Infulene river, and are also high in the river itself (more than 2400 bacteria counts/100 ml) (Fernandes & Hauengue 2003). Faecal coliform, faecal streptococci and *E.co*li have also been detected in Maputo Bay, in both marine waters and shellfish tissues, with levels being consistently higher in shellfish. The bacteria *Vibrio parahaemolyticus* and *Vibrio minicus* have been isolated from clams at the Incomati, Polana and Matola rivers respectively. These pathogens are known to cause severe gastro-intestinal infections in humans. Coliform levels in the Maputo Bay are reported to have been increasing over the years, and in some areas e.g. at the Miramar Point, it is no longer considered safe to swim. High levels of biological pollution have also been recorded at the Beira and Nacala Bays, although they are lower than those at Maputo Bay.

Solid waste is also a major problem in many cities in Mozambique. In many areas solid waste is simply managed by the residents themselves, usually by using open pits dug in their backyards and periodic burning of the wastes. It is also common in many cities in Mozambique to see accumulations of solid waste along the streets and around houses and markets. The Maputo municipality provides 21 waste containers at various sites, but these are emptied irregularly. Where municipal dumping sites exist, they are mostly old and lack any mechanisms established by standards and regulations for industrial waste disposal. Industrial and domestic waste, are in most cases, treated in the same way. This *per se* constitutes a high risk to the environment as well as human health (those working on removal and transport waste and those living in the vicinity of those sites). The methods of disposal are “open sky” and located in most cases in sites where no geological or groundwater assessments have been completed. Many dump sites are also located in close proximity to residential areas and as such also pose a health risk.

2.2.8 Transportation

Transportation infrastructure is poorly developed in Mozambique, and is rated as one of the least developed in southern Africa. It is considered to be a major impediment to overall economic development and to the reduction of poverty. The lack of a good transport network constrains virtually all forms of growth and development. For example, both small holder and commercial agriculture in Mozambique is concentrated in areas close to the major transport corridors, even to the extent that they show a preference for poorer land with good road access rather than good land with poor road access. The Mozambique road network consists of approximately 25,300 kilometers of classified roads, 10,000 kilometers of unclassified roads, and 1,000 kilometers of urban roads. Recognizing that improvement of transport infrastructure was a high priority, the Government of Mozambique initiated the Roads and Coastal Shipping (ROCS) Project in the late 1980's. This programme comprised three elements:

1. investing in the rehabilitation and maintenance of physical infrastructure;
2. reforming the policy and institutional environments; and
3. developing institutional, organisational and human resources capacity.

There have been two phases of the ROCS Project, referred to as ROCS I and 2. ROCS I concentrated on urgent road and shipping projects and initiated a long term institutional development program. ROCS 2 implemented road rehabilitation and maintenance projects, concentrating on the emergency opening of priority roads. Prior to the ROCS Project only three percent of the network was classified as in good condition while 44 percent was considered not passable. Towards the end of ROCS 2 (2000) these percentages had changed to 23 percent in good condition and only 9 percent not passable. A third phase of the ROCS project was proposed and initiated in 2001 and is now referred to as the ROADS3 project. This takes up where ROCS 2 left off and spans the period 2001-2010. The ROADS3 programme has four focal areas: institutional capacity, roads, bridges and funding. With the help of various donors, this programme is proceeding well and the share of good and fair road network had improved to 56% by 2003. The lower unit transport costs in real terms have led to significant increased traffic, evidenced by the growth in the vehicle fleet from 13,000 to about 200,000 vehicles over the last ten years. The net result is an increase in the basket of goods and services available in rural areas and urban. The number of bicycles, improved school and social services, increased market activities, better housing conditions along rehabilitated roads, use of health posts, and development of informal sectors are all evidence of the positive impact of roads improvement

However, there are still important challenges in the areas of transport and roads, among others we can highlight the road hinge of the north-south axis and the widening of and improvement of road systems in the rural areas. Also of particular concern is the long time periods between maintenance intervals (particularly for feeder roads) which is aggravated by climate shocks (floods and droughts) that affect the deterioration rate; the very limited number of contractors participating in bids; and the costs of building materials and/or their transport to sites where

they are required, which in turn contribute to a very high unit cost for road construction and maintenance in Mozambique.

Another issue that cannot be neglected is the impacts that road construction and maintenance has on the environment. These include both direct and indirect impacts and can broadly be separated into biophysical and socio-economic impacts. Biophysical impacts of road construction are generally all negative while socio-economic impacts are both positive and negative. Direct biophysical impacts are mostly confined to the direct loss of flora and fauna habitat caused by clearing for the road construction and construction of borrow pits, but can include problems associated with erosion and sedimentation, impacts on water quality due to sediment movement and poor management of waste waters from construction activity (sewage, workshop waste and run-off from work compounds), spills of chemicals or fuels, run-off from a road surface (particularly for high traffic volume roads) and erosion from the face of cuttings or large fills, noise and vibration related impacts, changes in air quality and visual impacts. Indirect impacts from road construction and maintenance are much more diverse and have further reaching impacts. Such effects include illegal exploitation of forests and wildlife resulting from improved access to an area, the increased use of local forests and wildlife caused by in-migration of people; and the increased use of local forests and wildlife caused by the existing population increasing production because of better access to markets. Direct socio-economic impacts of road construction and maintenance include loss of agricultural land, loss of buildings, population displacement, and loss or damage to archaeological or cultural resources. These direct effects are usually related to the loss of land required for the road construction. Indirect socio-economic impacts include improved access to services such as health and education, improved access to markets, in-migration of people to areas with the improved access, health effects associated with workers who temporarily move to an area during the construction and maintenance periods and also truck drivers and travelers who use the roads, increased competition for local resources (e.g. firewood, wildlife, food and water supplies) and services (e.g. health facilities).

The major challenge is not to allow negative biophysical and socio-economic impacts to bar the development of the transport infrastructure in Mozambique but rather to ensure that negative impacts are effectively mitigated and positive impacts enhanced as far as possible. A huge effort has been made to mainstream social issues like gender, health and HIV-AIDS, and environmental mitigation into roads projects and roads institutions in Mozambique is progressing well, but there is still considerable scope for improvement.

2.2.9 Tourism

Tourism is one of the fastest growing economic sectors worldwide. Global tourism arrivals reached 692 million in 2001, with a 5.5% annual increase forecast for the next decade. Southern Africa accounted for approximate 1.6% of the total in 2001 (10.7 million arrivals), with a projected annual increase of 7.8% over the next few years, reaching some 30.5 million

by 2020. Within the international tourism industry, all trends point to exclusive, nature-based and sustainable coastal tourism as being an important growth area in the coming decades. For example, sixty percent of South Africa's 6 million tourists (representing $2.5 billion in annual tourist revenues) already visit protected areas. Nature-based and coastal tourism are areas in which Mozambique has a comparative advantage, due to its natural endowments and to the relatively low extent of environmentally destructive mass tourism to date.

Although tourism in Mozambique started from a low base, it is currently experiencing rapid growth, increasing by 10-15 % per annum in the period 1995 and 2001. Tourism is now listed as the third largest sector for investment in the country. The Government of Mozambique has recognised the growing importance of the tourism sector for the national economy and poverty alleviation, and created a separate Ministry for tourism in 2001. In addition to the overall economic promise of tourism development, many of the areas with greatest tourism potential are located in some of the poorest provinces of the country, where agricultural potential is lowest, where opportunities for other types of income generation are limited and where conservation-based tourism is one of the few potential sources of growth. The GOM has stated in its tourism policy documents (Tourism Policy and Implementation Strategy 2003, and the Strategic Plan for Tourism Development in Mozambique 2004-2008) that it recognizes that Mozambique's comparative advantages lies in its relatively untouched/intact environment, and is strategically focusing on sustainable tourism that contributes to the conservation of natural areas. Mozambique is likely to benefit tremendously from its prime geographical location, particularly its proximity to the rapidly expanding local and international tourism market in South Africa, and the potential for highly marketable "bush and beach" circuits linking inland wildlife areas with the coast.

However, in order to fully capitalise on this growing tourism market and to ensure its sustainability into the future, the GOM must ensure adequate protection for its key natural assets (wildlife, beaches, coral reefs, etc.) and must not allow these assets to be degraded through irresponsible or uncontrolled growth in the tourism and other sectors (mining, fishing, agriculture, etc.). Constraints to tourism development in Mozambique include poor infrastructure (particularly the transport network) and difficulties in accessing many high potential areas, the lack of institutional capacity to plan and manage tourism development and integrate it with other development plans and priorities, a poor business climate and the absence of marketing and a creative approach to product development. Inasmuch as people have greater access to information than ever before (including websites that focus on Mozambique), the industry must be agile in recognizing travel trends and responding with products that differentiate them from other countries' offerings and, crucially, add value. It is increasingly recognized that tourism generates backward and forward linkages that must be approached broadly in the context o f a national framework and that the tourism sector alone cannot alone achieve these. The GOM must therefore follow a cross-sectoral approach in the management of its tourism industry, in which sustainable tourism is integrated into the country's overall policies and economic and physical planning processes. The GOM must

also recognise that the tourism industry has become increasingly competitive on a global scale, as more and more countries recognize its potential and must take measures to attract and encourage development. Without a comprehensive approach to address these constraints, Mozambique will be hard pressed to benefit significantly from the estimated $2 trillion global tourist receipts expected in 2020.

2.2.10 Threatened Species

The major cause of forest and wildlife degradation is considered to be wood resource depletion for fuelwood requirements. Other causes for loss of species are the slash and burn agriculture and traditional hunting practices involving the use of fire. The Red Data List for Mozambique (2002) although with its own weaknesses including identifying only threatened plant species, reports 161 taxa under some kind of threat, of which 122 are listed as Critically endangered, Endangered or Vulnerable, with one (*Suaeda* sp.) already extinct. Plants in the Genus Encefalartus of the Family Zamiaceae are also reported as requiring special attention, as some taxa in this genus are critically endangered. Also in need of a special protection status (but not in the Red data liot) is the tree species used for the production of "TIMBILA" (Mozambican traditional sound instrument) produced mainly in Inhambane and Gaza. Three other species (slow-growing *mwenje*, sneezewort tree) were recently reported by APAC as being critically endangered. Several large mammal species are believed to be extinct or on the verge of extinction. These include the black and white rhino, giraffe, roan antelope, tsessebe, the mountain reedbuck and the African wild dog. The conservation status of the birds of Mozambique is under consideration, but a preliminary estimate indicates that at least 24 bird species are of conservation concern. One snake species, the African Rock Python is believed to be endangered and is protected by law. In terms of sea turtles all known species in Mozambique coast are protected. The amphibia of Mozambique are not well documented. Similarly, Mozambique's freshwater fish fauna is poorly known.

2.3. Indicators of environmental and social conditions in Mozambique

A wide range of indicators of the state of the natural and social environment in Mozambique are available. A small selection of these have been identified as being of major relevance to this study and are reported on here. We have preferentially focused on those indicators for which a reasonable time series is available (10 years or more) for Mozambique and for a range of other countries in southern and sub-Saharan Africa. Figures for other countries are used to place the figures from Mozambique in perspective. Selected indicators are presented in Table 5 and are discussed in the text that follows the table.

Mozambique has the third largest population in southern Africa (out of nine surveyed countries), but only the fifth highest population density in the region. Population density (24.0 people km^{-2}) is also below average for sub-Saharan African (29.8 people 1000 km^{-2}). Overall population growth over the last three decades is modest (between 1.3-2.7%) and is below that for the region (2.7%) and sub-Saharan Africa as a whole (2.5-3.0%). A little over a third of the population lives in urban areas (35.6%), which is a little below average for the region (38.1%) but is on par with sub-Saharan Africa as a whole (36.2%). The rate of urbanisation is high though (average over the last 3 decades = 8.4%), higher than the regional average (6.1%) and well above that for sub-Saharan Africa as a whole (4.0%). Health and life expectancy indicators suggest that Mozambique is on par with other countries in the region and with sub-Saharan Africa as a whole. Life expectancy at birth is exactly on par with the regional average (41 years) but less than that for sub-Saharan Africa as a whole (46 years). Infant mortality per thousand births (101) is a little higher than the regional average (93) but is exactly on par with that for sub-Saharan Africa as a whole. Access to improved sanitation and safe water for Mozambican people is, however, poor relative to other countries in the region and in sub-Saharan Africa. Only 27% of the population in Mozambique have access to improved sanitation (relative to a regional average of 43%, and an average of 36% for sub-Saharan Africa) and only 42% have access to safe water (relative to a regional average of 70% and an average of 58% for sub-Saharan Africa). Numbers of people living with HIV/AIDS in Mozambique (12.2% of the population) is below the regional average (17.7) but above that for sub-Saharan Africa (7.5). Economic indicators suggest that Mozambique is lagging considerably behind other countries in the region and sub-Saharan Africa as a whole. Gross Domestic Product (GDP) for Mozambique (US$ 4,789 million) is well below the regional average (US$21,440 million) (which is admittedly strongly skewed by South Africa with a GDP of US$145,338 millions). Even if we take account of Mozambique's relatively small population, as indicated by GDP per capita figures, Mozambique's position remains poor (US$254.7) relative to other countries in southern Africa (average = US$1,214) and sub-Saharan Africa (US$520.7). Growth in GDP has been strong over the last 2 decades, 4.1% for the period 1985-94 and 8.2% for the period 1995-2003. This is well above the regional averages of 2.8 and 4.0% respectively, and that for the whole of sub-Saharan Africa: 1.7 and 3.3% respectively.

Table 5. Indicators of environmental and social conditions in Mozambique

Indicator	Mozambique	South Africa	Namibia	Angola	Botswana	Zimbabwe	Zambia	Malawi	Tanzania	Sub-Saharan Africa
Land area (000 km^2)[1]	784	1,221	823	1,247	567	387	743	94	884	23,626
Population size (millions)[1]	18.8	45.8	2.0	13.5	1.7	13.1	10.4	11.0	35.9	705.2
Population density (no. people km^{-2})[1]	24.0	37.5	2.4	10.8	3.0	33.9	14.0	117.0	40.6	29.8
Population growth[1]:	2.7	2.3	2.0	2.9		3.4	2.6	3.3	3.2	3.0
1985-94	1.3	2.3	4.0	2.7		3.1	3.5	2.7	3.2	2.8
1995-03	2.2	2.1	2.7	2.7		1.8	2.8	2.2	2.5	2.5
Urban population as % of total	35.6	59.2	32.4	36.2	50.3	37.5	40.3	15.9	35.4	36.2
Urban pop. Growth:	11.8	2.2	4.2	5.9	11.8	5.9	6.3	7.1	11.6	3.9
1985-94[1]	6.9	2.7	4.6	6.1	12.6	6.3	3.1	5.8	7.4	3.9
1995-03[1]	6.5	3.7	4.4	5.0	4.0	4.2	2.4	4.5	6.7	4.2
Life expectancy at birth (years)[1]	41	46	40	47	38	39	36	38	43	46
Infant mortality (per 1000 births)[1]	101	53	48	154	82	78	102	112	104	101
% adult population (15-49) with HIV/AIDS[1]	12.2	21.5	21.3	3.9	37.3	24.6	16.5	14.2	8.8	7.5
Access to improved sanitation facilities (% of pop)[1]	27	67	30	30	41	57	45	46	46	36
Access to safe water (% of population)[1]	42	87	80	50	95	83	55	67	73	58
Primary school enrolment[1]	103	106	105	101	103	94	82	140	84	95
Secondary school enrolment[1]	14	90	60	15	82	45	25	45	5	26
GDP (US$ millions)[1]	4,789	145,338	3,717	11,139	6,084	5,354	3,687	1,776	11,079	367,195
GDP per capita	254.7	3,173.3	1,858.5	825.1	3,578.8	408.7	354.5	161.5	308.6	520.7
GDP growth[1]:	-	2.4	-	-	11.6	3.0	0.2	3.2	-	2.1
1985-94	4.1	0.8	3.4	-1.2	8.9	3.3	0.9	2.2	2.6	1.7
1995-03	8.2	2.8	3.3	6.5	5.8	-1.6	2.7	3.1	4.8	3.3
Percent of labour force that is female[1]	49.0	43.4	41.7	46.2	44.4	44.0	43.0	48.7	48.9	42.3
Natural forest area (000 ha)	30,551	7,363	8,040	69,615	12,426	18,899	31,171	2,450	38,676	-
% Annual change in natural forest cover (1990-2000) [1]	-0.2	-0.3	-	-0.2	-0.9	-1.6	-2.4	-2.6	-	-

Indicator	Mozambique	South Africa	Namibia	Angola	Botswana	Zimbabwe	Zambia	Malawi	Tanzania	Sub-Saharan Africa
Total no. species and no. threatened (in brackets) [1]:	228 (14)	320 (42)	192 (15)	296 (19)	169 (6)	222 (11)	255 (11)	207 (8)	375 (42)	-
Mammals										
Birds	685 (16)	829 (28)	619 (11)	930 (15)	570 (7)	661 (10)	770 (11)	658 (11)	1,056 (33)	-
Higher plants	5,692 (36)	23,420 (45)	3,174(5)	5,185 (19)	2,151 (-)	-	- (8)	3,765 (13)	10,008 (235)	-
Reptiles	195 (5)	364 (19)	215 (3)	235 (4)	133 (-)	180 (-)	143 (-)	108 (-)	335 (5)	-
Amphibians	59 (-)	119 (9)	40 (1)	85 (-)	28 (-)	40 (-)	66 (-)	56 (-)	132 (-)	-
Freshwater fish	524 (4)	629 (29)	107 (3)	108 (-)	1 (-)	4 (-)	8 (-)	163 (-)	331 (17)	-
Protected areas1:	11	390	20	13	12	48	35	9	39	-
Total area (000 ha)	3,285	-	3,214	5,271	10,499	3,103	6,366	1,059	13,787	-
% of land area	4	-	3.9	4.2	18.1	7.9	8.4	8.9	14.6	-
Marine protected areas (no.)	6	22	4	4	n.a.	n.a.	n.a.	n.a.	8	

1. Source: World Bank (2005) African Development Indicators

Natural resource indicators suggest that Mozambique is well endowed with natural resources but that these are not all adequately protected or managed. Mozambique is well endowed with natural forests, containing the fourth highest amount of forest area in southern Africa (over 30 million ha). Rates of deforestation are modest at present, and amount to a reduction of only 0.2% over the period 1990-2000, which is a lot less than the regional average for this period (1.2%). Faunal and floral diversity across all major taxa (mammals, birds, higher plants, reptiles, amphibians, and fish) are high and in line with regional averages, while the numbers of threatended species in each group are mostly low. The total numbers of protected areas in Mozambique is well below the regional average (11 vs. 64) but total land area in protected areas is relatively better (3.3 million ha vs. 5.8 million. The percentage of land area within protected areas in Mozambique amounts to only 4.0% which is well below the 10% target recommended by the IUCN, and also well below the regional average of 8.8%. This suggests that terrestrial biodiversity is not adequately conserved in Mozambique at present and one can expect to see the numbers of threatened species in all major groups increasing in the future. There are fewer marine protected areas in Mozambique than most other coastal countries in southern Africa and it is likely that marine and coastal resources are also not adequately conserved.

CHAPTER3: Environmental Policy, and Legislative an Institutional Frameworks

3.1. Background to environmental policy and legislative and institutional frameworks

Since the adoption of a new Constitution in 1990 and the signing of the peace agreement in 1992, Mozambique has witnessed a period of rapid change in the policies and regulations governing the ownership and rights of use of a range of natural resources. The primary stated object of the Government of Mozambique is the reduction of absolute poverty in the country (PARPA I). As such, the Government's policy on the environment is one geared through the promotion of sustainable development in such a way that the use of natural resources fulfils the basic needs of the people and development of the nation in equilibrium with economic growth, technology development, environmental protection and social equity. The Constitution entrenches the concept that the state is the paramount owner of the natural resources occurring within its national territory. Land ownership, for example, is vested in the state and that no land may be sold, mortgaged, or otherwise encumbered or alienated. This has a very strong impact on natural resources management in the country and is expanded on below. The Constitution requires that the State develop and determine the conditions under which citizens and others may access natural resources for their use and enjoyment. Rights of use and enjoyment may be granted to individuals and collective persons by the State based on its social purpose, with priority to be given to direct users and producers.

Since adopting the constitution, the Government of Mozambique has produced and adopted a wide range of legal instruments that control the use of provide protection for natural resources in the country. Three key sector policies were approved in 1994 that govern natural resource use and provide protection for the environment in the country (Mendes *et al*. 1998):

- The Agrarian Policy. The stated aims within this policy were to develop agrarian activities to achieve food security for the country based on a sustainable use of the natural resources, while the strategy is to achieve this objective was: i) the involvement of the local communities in the management of natural resources to promote the sustainable use of natural resources and ii) expansion of production capacity both in terms of the extension of the cultivated area and an increase in yield;
- The Land Policy. The objective of this policy was to entrench the rights of the Mozambican population over the land and other natural resources, and to promote investment and a sustainable and equitable use of these resources. It was designed to creates conditions for the development and growth of local communities and promotion of investments by the commercial sector. Although the land belong to the State, the land policy stresses the recognition of the local community's rights, as well as their methods and approaches to agrarian management of land.
- The Environmental Policy. The primary purpose of the National Environment Policy, published in 1995 was to ensure an adequate quality of life to all citizens; to ensure environment and natural resource management in such a way that they maintain their

functional and productive capacity for the present and future generations; to ensure environmental considerations in the process of socio-economic planning; to promote the ecosystems and the fundamental ecological processes; and to integrate the global and regional efforts in the search for solutions to environmental problems. The primary stated objective of the National Policy of Environment was to secure sustainable development of the country, taking into account its specific conditions, through acceptable and realistic commitment between socio-economic progress and the protection of the environment. The National Policy was finally consecrated by two legislative instruments: (i) the National Environmental Management Programme (NEMP) finalised early 1996 and supported by the Framework Environmental Act (promulgated in 1997), and the EIA Regulations (Decree No. 76 of 1998); and (ii) the National Conservation Strategy within which an institutional and legal framework has been built concerning most relevant sectors and sub-sectors of the national development.

Thus, in terms of the Mozambican law control over natural resource use is exercised through key sectoral legislation (fisheries, agriculture, forestry and water laws), while environmental impacts of from other sources (e.g. from the transportation and energy sectors) is controlled though legislation developed under the National Environmental Programme (NEMP) which includes Framework Environmental Act (1997) and the EIA Regulations (1998). Mining is an exception here, in that it has its own suite of regulations governing environmental management (discussed in more detail later). A brief discourse on the policies, laws institutions responsible for regulating use of natural resources in each of the principal sectors is provided below together with a short summary of laws and regulations governing environmental management.

3.2. Land and agriculture

Land tenure in Mozambique is a very complex and controversial issue. Many of the problems are rooted in the colonial era, reinforced by the political instability and war that followed. Prior to independence subsistence farmers relied upon customary forms of land tenure with conflicts being adjudicated by traditional community or tribal elders, while commercial farmers, plantation owners, etc (almost all of them Portuguese) had long leases that were almost equivalent to freehold ownership. Immediately after independence, many of the commercial farms were abandoned when the Portuguese farmers left the country while others were expropriated by the government which had adopted a policy that all land was state owned as well as quasi-socialist economic system based on state enterprises and cooperatives. Abandoned commercial farms were reorganized into large state farms, while small farmers were expected to join cooperatives or communal villages. Results of this programme were not particularly successful as the state did not have the resources or capacity to maintain the infrastructure and operations of the state farms, while the subsistence farmers had limited incentives to produce and sell food crops and often resisted incorporation in cooperatives or communal villages. In the period that followed, civil war ensued, many of the state farms effectively collapsed and reverted to subsistence level agriculture, and there was a large scale

displacement of the population. After the end of the civil war, displaced families and others tried to return to their former lands which lead to conflict with those who have taken over their land. In addition, local and expatriate investors had taken advantage of the new found peace and stability, and were seeking to gain control over land that was claimed to be "unoccupied" or "abandoned" for the purpose of developing new businesses or in the expectation that improvements in infrastructure or economic prospects would induce others to acquire this land. At the same time, the recovery of economic activity encouraged some subsistence farmers to expand production to take advantage of better access to urban markets. As a result of these developments, conflict escalated between subsistence farmers wishing to assert their traditional land use rights and those who had submitted legal claims or acquired leases over the same land.

The GOM attempted to address these conflicts through the introduction of the 1997 Land Law, followed by the secondary legislation passed in 1998. This legislation was founded on a number of core principals:

- All land remains property of the state, but land leases can be granted for up to 50 years. Leases are renewable, inheritable and may be transferred (other than by inheritance) subject to prior administrative authorisation.
- Award of a lease is contingent on the presentation of a land use or development plan, and can be cancelled by administrative action if the lessor fails to comply with this land use plan.
- Investments in infrastructure and improvements on leased land can be bought and sold, but the actual land transfer is subject to administrative authorisation.
- Traditional land use rights are recognised and formalised through a system of community land management, implemented through co-titling of community lands.
- Existing users of land are protected provided that they can demonstrate regular, "good faith" occupation of the land, either through documentary or verbal evidence from members of the community

While this system of land management has been very effective in entrenching and protecting traditional land use rights of subsistence farmers, and was very important in political terms for dealing with issues arising from the country's colonial history, dislocation caused by the civil war, and the unsuccessful post-independence attempts to redistribute land, it has a number of pitfalls which have a bearing on economic development and environmental management. Of critical importance is the fact that there is no incentive for holders of land to protect or conserve the land as it has no inherent value (and hence cannot loose value through poor management), the land tenure system is a expensive in terms of human resources to administer and is open to abuse by corrupt officials (much more so that a free hold system were land is tradable) as it is necessary to ensure that holders of land are compliant with the land use or development plan on which basis they acquired the land, and acquisition of land for development is difficult as there is technically no incentive for occupiers of land to relinquish their rights to the land (the costs of leasing land is nominal, is rarely collected and

does not apply to traditional land use). The net result of this is that land is being degraded at a much faster rate than would otherwise happen in a freehold system where it would loose value as it becomes degraded, economic development is being hampered, particularly the expansion of commercial agriculture, speculation in land is rife (individuals acquire land not for the purpose of developing it but rather for profiting from the sale of the "infrastructure" on the land at a later stage), and opportunities for corrupt officials to enrich themselves through allocation of land are abundant.

3.3. Fisheries

Marine and inland fisheries in Mozambique are governed in terms of the Fisheries Law (1990) and the Marine Fisheries General Regulations (2003). Three main areas of activity are recognised in terms of the regulations promulgated under these laws: subsistence, artisanal, and semi-industrial. Participation in any of these sectors requires a licence issued by the national or provincial authorities. Most industrial fisheries are quota controlled while the controlled semi-industrial and artisanal fisheries are controlled through licences only, but the artisanal fishery is in effect open access. The most important industrial fishery, the shallow water shrimp fishery, is also controlled through a 3-month closed season. Fisheries Policy in Mozambique is proscribed in terms of the Fisheries Policy (Resolution No. 11/96) and Fisheries Master Plan which were approved by the council of Ministers in 1996 and 1994 respectively, as instruments to identify strategies, prioritise development initiatives, and to contribute to national development objectives of reducing absolute poverty, promoting economic growth and development, and consolidating national unity. Goals established in terms of these two policy documents include:

- Improving supplies of fish to internal markets by increasing catches and reducing post-harvest losses
- Increasing net foreign exchange earnings through exports, value-added processing, and improving the efficiency of the fishing fleet, and
- Improving the standards of living of fishing communities through increased employment and returns for artisanal fishers

Overall responsibility for administration of marine and inland fisheries in Mozambique rests with the Ministry of Fisheries. It is a relatively new institution having recently taken over administration of fisheries from the Ministry of Agriculture. A number of entities within, or subordinate to, the Ministry of Fisheries are responsible for the actual hands on fisheries management. The National Directorate of Fisheries Administration (DNAP) administers licences for all industrial and semi-industrial fishing vessels, and is responsible for prosecutions, implementing and monitoring access agreements, collecting and compiling basic catch and landing statistics, and for monitoring quotas. DNAP is represented at provincial level by the Provincial Directorates of Fisheries Administration (DPAPs). The Institute of Fisheries Research (IIP) provides scientific advice on fish stocks and management measures to DNAP. The Department of Fish Inspection (DIP) is responsible for certifying fish product quality and health and hygiene standards of the vessels and processing plants.

The Institute of Small-Scale Fisheries Development (IDDPE) is responsible for development of artisanal fisheries.

3.4. Forestry

Commercial exploitation of timber and other forest resources in Mozambique are governed by the Forest and Wildlife Act of 1999. Administration of the Act is the responsibility of Ministry of Agriculture and its National Directorate of Forestry and Wildlife (DNFFB). The Forest and Wildlife Act of 1999 was ostensibly promulgated to make the exploitation of these resources more sustainable while providing a more effective structure for the generation and distribution of related tax revenue. However, while provisions for protection of local communities are at least on paper quite strong, provisions for the protection of the resource and for improving the tax base are not. Up until the 1999 law was promulgated, up to 500 cubic meters of timber could legally be cut per year by anyone who paid a small fee to obtain what was called a simple license. Officially, these licenses could only be held by nationals, were good for one year and allowed that the timber be taken from large, ill-defined land areas. No management plan as such was required and abuses, including illegally obtained licenses, false licenses, over harvesting, and harvesting outside the permitted boundaries were apparently quite common (Reyes 2003). The new law retains the simple license system (including most of its shortcomings), adding to its requirements, however, that a management plan be approved and observed. The 1999 law also creates a new exploitation regime allowing for logging by way of a forest concession contract. According to the law, forest concession agreements can cover up to 100,000 hectares with no explicit annual harvest limit and can last for up to 50 years, and are available to any individual or group of individuals including Mozambican communities and foreign nationals. Concessions require implementation of an approved management plan that must be presented within 180 days from the granting of the concession. Furthermore, the law calls upon concessionaires to process the wood they harvest prior to export and it provides that concessionaires may process, under contract, the produce of simple license holders.

Concession contracts of up to 20,000 hectares and all simple licenses can be authorized at the level of Provincial Governor without the involvement of the national government. Those ranging in size from 20,000 to 100,000 hectares must be approved by the Ministry of Agriculture. The basis for granting a concession begins with a direct request presented to the provincial director of forestry by those who seek it. This should be followed by a number of steps including an estimated timber inventory, the community consultation process, and development a forest management plan. After the consultation a more detailed topographic representation of the area, its population and its timber should be forwarded along with plans for the operation of two sawmills. Analysis of these materials is done at the provincial level. Meanwhile, the proposal is made public in national newspapers. Depending on the size of the possible concession, authorization is granted or denied at the level of Provincial Governor or the Minister of Agriculture, as explained above. What actually takes place is less definitive.

For example the detailed timber inventories would call for a substantial expense for the would-be concessionaire prior to having any guarantee of a return. Thus, these inventories, by and large, have not been required. Similarly, forest management plans, crucial for sustainable logging, are seldom ever prepared. For example, Da Motta (2004) reports that only four management plans have been approved out of 45 concessions authorised in the period 2003-2004. Monitoring is very difficult to evaluate, but if the application of sanctions is anything to go by, indications are that this is improving. National penalties applied in 2003 amounted to roughly US$ 100,000, which contrasts sharply with the US$ 5,000 applied in 1999.

Regulations published subsequent to the Forest and Wildlife Act of 1999 create a licensing fee structure and divide Mozambique's 118 commercially valuable species of trees into five categories for purposes of taxation. Levels of taxation depend on species classification, and are levied based on the harvester's total volume of timber cut and are controlled by roadside checkpoints where government controllers track timber volumes by category, check licensing compliance and levy fines. The regulations also provide that 20% of the tax revenue derived from timber exploitation in inhabited areas be reinvested in affected communities. However, as yet there is no structure for distribution of this income.

3.5. Water

Water resources management in Mozambique is under the jurisdiction of the Water Law promulgated in 1991. The law dictates that water management stays with a Ministry responsible for water affairs (presently the Ministry of Public Works and Housing), with cross-sectoral coordination ensured by the National Water Council, a consulting body of the Government. Within the Ministry of Public Works and Housing, the National Directorate of Water (DNA) has the specific task of water management, with two main areas – Water Resources and Water Supply & Sanitation. Historically, the water sector has been managed within a highly centralized structure under the National Directorate of Water (DNA). However, following the publication of the National Water Policy in 1995, a process of decentralisation of authority has begun, where all but the major policy decisions have been devolved to five Regional Water Administrations (ARAs). These agencies are (or will in the future) be responsible for the operational management of water resources within their area of jurisdiction. They have the power to levy charges on bulk water abstraction and discharges to water bodies as the means of raising funds to finance their operations and investment spending. At present, two out of the planned five agencies - ARA-Sul (based in Maputo) and ARA-Centro (based in Beira) – are fully operational. One more – ARA-Zambezi (based in Tete) – is being established, with the support of the European Union. It is not clear when the remaining two agencies - ARA-Centre North (to be based in Nampula) and ARA-North (to be based in Pemba) – will be set up.

In the area of water supply and sanitation, the Water Policy adopted in 1995 started a process of legal and institutional change, whose most important result to date is the approval and implementation of the framework for delegated management, that created the set-up for the participation of the private sector in the management of the utilities. Under this framework, two new institutions were created

Activities in a number of other sectors impact on water issues and make coordination within this sector somewhat tricky. Of particular relevance are:

- Agriculture - particularly irrigation, managed by the National Directorate of Agricultural Hydraulics DNHA.
- Energy - particularly hydropower, where the Ministry of Mineral Resources and Energy MIREME, the electricity public company Electricity of Mozambique EDM and HCB, which manages the Cahora Bassa dam, are the major actors.
- Environment – responsible to consider the environmental impacts of water developments as well as co-manage pollution problems and ensure environmental requirements for rivers and lakes.
- Health – coordinating standards for drinking water and impacts of water supply and sanitation in public health

In general, the institutional and legal framework is considered to be coherent and has been designed to implement an approach to managing the water sector that is consistent with experience and good practice in many middle and high income countries (Vaz 2005). However, the key bottleneck is implementation rather than the overall policy framework. For example, ARA-Sul was established in 1993 and ARA-Centro in 1997, but only limited progress has been made in setting up equivalent institutional arrangements for the rest of the country. This is characteristic of the water sector in Mozambique – a multitude of studies and plans but little actual activity, especially outside the traditional regional centers, perhaps as a result of serious constraints on qualified human resources and of funds for investments and running costs.

3.6. Mining

Potential environmental impacts associated with mining are dealt with separately from those from other activities, by specific provisions in the Mining Law (Lei no. 14/2002). While the legislative provisions within the mining law are good and include a number of important instruments for managing environmental impacts (including provisions for environmental impact assessments, environmental management plans, environmental management programmes, environmental monitoring programme, mine closure programmes, emergency risk assessment and control programmes, and environmental audits) these are not always consistent with those stipulated in the Environmental Law (Lei no 20/97) and hence those adopted by MICOA. The plethora of different environmental instruments adopted by the

mining industry can also lead to uncertainties in questions of duty and responsibility and long drawn out handling periods due to the number of different experts required to evaluate each instrument. Unification of some of these different instruments under a broader EIA umbrella will simplify matters greatly and will ensure that issues such as rehabilitation have a greater influence on the design of an operation and the choice of mining methods, which is not always the case under the present system[4]. As mentioned previously, concerns have also been raised over the fact that there are no provisions in the legislation that regulate questions of compensation and resettlement associated with mining developments (even though good practice has prevailed to date). Another issue of concern is the fact that the mining legislation makes no provision for rehabilitation of old mining sites (so called environmental stocks), although on-going mining operations were given one year to adapt to the new regulations (this is a problem where it is not possible to unequivocally identify who the culprit was). There is also no mention the use of Performance Bonds (or similar) as a guarantee for rehabilitation of the mining site (progressively during the operation or after the closing-down). This has proven particularly valuable elsewhere, in the case of mining companies that have gone insolvent during the mining operations.

3.7. Environmental Management

MICOA (The Ministry for Coordination of the Environment) is the agency responsible for coordinating environmental management issues in Mozambique. It was created in 1994 from the National Environmental Council, a public institution composed of the Ministries of Agriculture and Fisheries; Industry, Commerce and Tourism; Transport and Communications; Public Works and Housing; Health; the National Institutes of Physical Planning, Rural Development; and the State Secretariat for Civil Aeronautics. Since its creation in 1994, MICOA developed the Framework Environmental Act (Act 20 of 1997) and the EIA regulations (Decree no 76 of 1998) which provide the basic framework for managing impacts of developments on the environment in Mozambique. In terms of the Act, licensing of any activities liable to cause significant environmental damage are required, the issuance of the environmental licence being contingent on the appropriate level of EIA being completed and accepted by MICOA. The Act also requires that all sectoral legislation in Mozambique be revised such that it is in conformity with the Act. EIA regulations prescribe the range of development projects that require an EIA, the process to be followed in conducting an EIA, and the content of an EIA report. While on paper these follow the internationally accepted process of screening, scoping, consultation, assessment of impacts, review and monitoring and evaluation, in practice there are numerous problems which limit the effectiveness of the process including

[4] Environmental Regulations for Mining Activities only require a closure plan to be drawn up 1 year after the start of mining operations

- Inconsistencies in substance and style of across ministries and departments regarding environmental management because roles responsibilities and modes of cooperation have not been properly defined;
- Limited human resources and institutional capacity especially at the provincial level (where much responsibility for environmental management has been relegated)
- Lack of clarity and overlap of environmental management roles and responsibilities among government sector;
- The absence of a culture of communication, information sharing, and cooperation between institutions;
- Planning, operational and human resource constraints in linking environmental monitoring activities mostly conducted at the provincial level to the national level;
- A shortage of technical expertise for evaluating environmental impacts in Mozambique and
- Absence of legislated environmental standards against which impacts can be measured.

Many of these problems are believed to stem in large part from the fact that MICOA is defined as a Ministry for Coordination and is not perceived as having a strong mandate to act. Another issue of concern is that while the EIA regulations define requirements for EIAs both at the project and programme level for public and private activities; in practice few Strategic Environmental Assessments covering the latter have been conducted. This is a serious concern as policies promoting aquaculture for example, can have very far reaching effects, way larger than an individual project might have. Deficiencies have also been reported in the requirements for public participation, which are not sufficient prescriptive and do not provide minimum performance standards. The EIA also regulations require that MICOA regularly inspect and control monitoring activities on a particularly project, but lack of human and material capacity within the Ministry means that this is seldom ever applied.

The new law for the environment was approved in 1997. It provides for the participation of local communities, amongst others, in the development of policy and laws for NRM, management of protected areas and policing environmental norms and regulations. Provisions in the law may reinforce the view that communities who live in areas later declared as protected areas should retain their rights, and use them later to negotiate some sort of active participation in the income generated on what is “still their land”, albeit now re-classified for specific conservation purposes (CTC, 2003). Under this law compensation can be sought by anybody who feels their rights have been prejudiced by any third party.

3.8. Planning and Decentralisation

Planning and decentralisation is perhaps the most important component in most natural resources legal and institutional framework. Two levels of planning are presently taking place simultaneously in Mozambique. The Macro-Planning and Micro-Planning. At national

level (macro) three instruments exist and were managed formerly (before 2005) by MPF and now by MPD. The main instruments are: 5-year GoM Programme; 3-year Public Investment Plan and the Economic and Social Plan. More recently one more instrument was also created in order to guarantee more ownership of the PES at central and provincial level - the sector wide approach (SWAp), that in certain sectors was very dynamic (agriculture – PROAGRI, health – PROSAUDE; education – FASE; housing and infrastructure Rocks 1, 2 and 3, and NWDP 1 and 2). Most of these tools worked at central and provincial level. At micro level, GoM has been promoting at the same time other planning approaches on a pilot basis in order to promote participation and decentralization to improve access of rural communities to basic services (e.g. UNCDF/PPFD in Nampula; PRODER in Gorongosa, PDHL in Guro, etc). At level of district the legal framework for planning is still lacking status.

MICOA and MPD developed a legal framework for physical and territorial planning while MICOA would strengthen the biophysical aspect and MPD the socio-economic. This process impacts the way NR will be managed creating the appropriate layer for investment and resource conservation. The economic perspective of development will link resource rights and use to economic value and the biophysical perspective will contribute in establishing a territorial zoning, linking resource rights and use to ecologic potential. MICOA produced a draft in 2002 but Legislation governing the different territorial planning tools only came in to effect in 2004 and its implementation is still in its infancy.

Another MICOA planning approach – Strategic Environmental Assessment (SEA), has been used by the Center for Sustainable Development (CDS-CZ). This is a combination of different tools (biophysical and social combined with policy) by which the desired result is an evaluation of potentially significant environmental effects of different development options. It is not clear however which one will be selected.

The 2004 planning legislation identifies three levels in territorial planning: national, regional and local, with an increase on the degree of geographical scale and time. Soil classification and qualification is one of the important tools used in these plans. Classification will determine its main purpose, while qualification indicates it potential. A methodology is being developed for regional planning, which has a very strong community participation component. It has 5 phases. IIAM has been made responsible for the pedology and hydrology component of the first phase of the physical planning methodology given above.

3.9. Protected areas

There are six categories of protected areas in Mozambique:

- *Parques Nacionais* (National Parks);
- *Reservas Especiais* (Game Reserves);
- *Reservas Parciais* (Partial Reserves);
- *Regimes de Vigilância* (Vigilance Areas);

- *Coutadas* (Controlled hunting and photographic safari); and
- *Reservas Florestais* (forest reserves).

In total, there are seven National Parks, five Game Reserves, twelve Controlled Hunting Areas, two Vigilance Areas, and sixteen Forest Reserves (**Figure 7**). Many of the parks and reserves were established by the Portuguese authorities in 1955. However, since then three new national parks, Limpopo National Park, Chimanimani National Park and Quirimbas National Park, were established in 2001-2002. Two of these (Limpopo and Chimanimani) have subsequently been converted into Transfrontier Conservation Areas (TFCAs) through the establishment of links with conservation areas in neighbouring countries (South Africa and Zimbabwe). Three more TFCAs are planned: the Niassa-Cabo Delgado TFCA (linking terrestrial and marine conservation areas with others in Tanzania and possibly Malawi), and the Zimoza TFCA (linking a community natural resource management area in northwest Mozambique with conservation areas in Zimbabwe and Zambia), and the Libombo TFCA (linking conservation areas in Mozambique and South Africa).

These TFCAs, as described in the country biodiversity and tourism strategies, are large, defined areas which include both core Protected Areas (PAS) and multiple-use ("interstitial") areas where the primary management objective is to promote environmentally sustainable development compatible with the TFCA's conservation goals. There is a strong focus on the inclusion of local communities and other stakeholders, and sustainable use of the natural resources by communities, particularly through sustainable tourism, as required by Mozambiques Biodiversity Strategy and Action Plan (NBSAP). Much of the richest and best preserved biodiversity and natural habitat in Mozambique (and southern Africa in general) is located in areas adjacent to national borders, in many cases contiguous with terrestrial and/or marine protected areas and well established nature tourism sites in the neighbouring countries. Preservation of habitats and ecological linkages, such as migration corridors and watercourses, on both sides of the borders provides a unique opportunity to protect large, intact ecosystems that span a wide range of altitudes and climatic zones. The TFCAs are very important both for wildlife conservation and tourism development in Mozambique as they include large areas of natural vegetation and represent important global biodiversity resources.

The different conservation areas (and indeed the different zones of the TFCAs) in Mozambique offer varying levels of protection to fauna and flora within their boundaries, as prescribed by the Forestry and Wildlife Law. National Parks (and the core protected areas of the TFCAs) offer total protection to all flora, fauna, landscapes, and geology within their boundaries. No hunting or livestock rearing, natural resource exploitation, land modification or alien species are permitted in these areas. Natural reserves provide total protection for certain specified plant and animal species and/or ecosystems, while other resources may be exploited within norms established by a management plan. Areas of historic and cultural value (communal use zones) are set aside for forests with religious interest, and sites of

historical and cultural use. Resource use in these areas is only permitted in accordance with customary practices and norms of communities. Multiple use zones (or buffer zones) are typically established around protected areas. Resource use in these areas is permitted in accordance with an established management plan.

As many of these TFCAs have only recently been established, a considerable number of people still live within the core protected areas. In total, an estimated 37,872 people are reported to live within the five established and proposed TFCAs, while an estimated 15,762 live within the buffer zones and 323, 375 live in the interstitial areas surrounding the parks. On the whole it is believed that natural use by communities living within the protected areas does not pose a significant threat to biodiversity, except possibly in the arid areas of the Limpopo TFCA where small pockets of fertile wetlands or river banks have become foci for resource use and settlement. However, the presence of people living in the parks is preventing park authorities from allowing free movement of animals across the borders from the established parks in the neighbouring countries.

The authority responsible for the administration of the Forest Reserves is the National Directorate of Lands and Forests former National Direction of Wildlife and Forestry (DNFFB) from the Ministry of Agriculture. All other conservation areas and concessions fall under the jurisdiction of Directorate of Conservation Areas (DNAC) of Ministry of Tourism, MITUR. The Niassa Reserve is managed by a private society, however, while the biological reserves of Inhaca and Portuguese Islands are managed by the Department of Biological Sciences from University Eduardo Mondlane).

Use of wildlife resources outside of the conservation areas is also controlled by legislation. For example, communities must have a hunting license to use wildlife resources for consumptive purposes. Such licenses are issued by local councils according to customary norms and practices. Non-consumptive use of wildlife and forestry resources are subject to certain controls such as requiring proof of technical capacity to harvest, transport and process the resources.

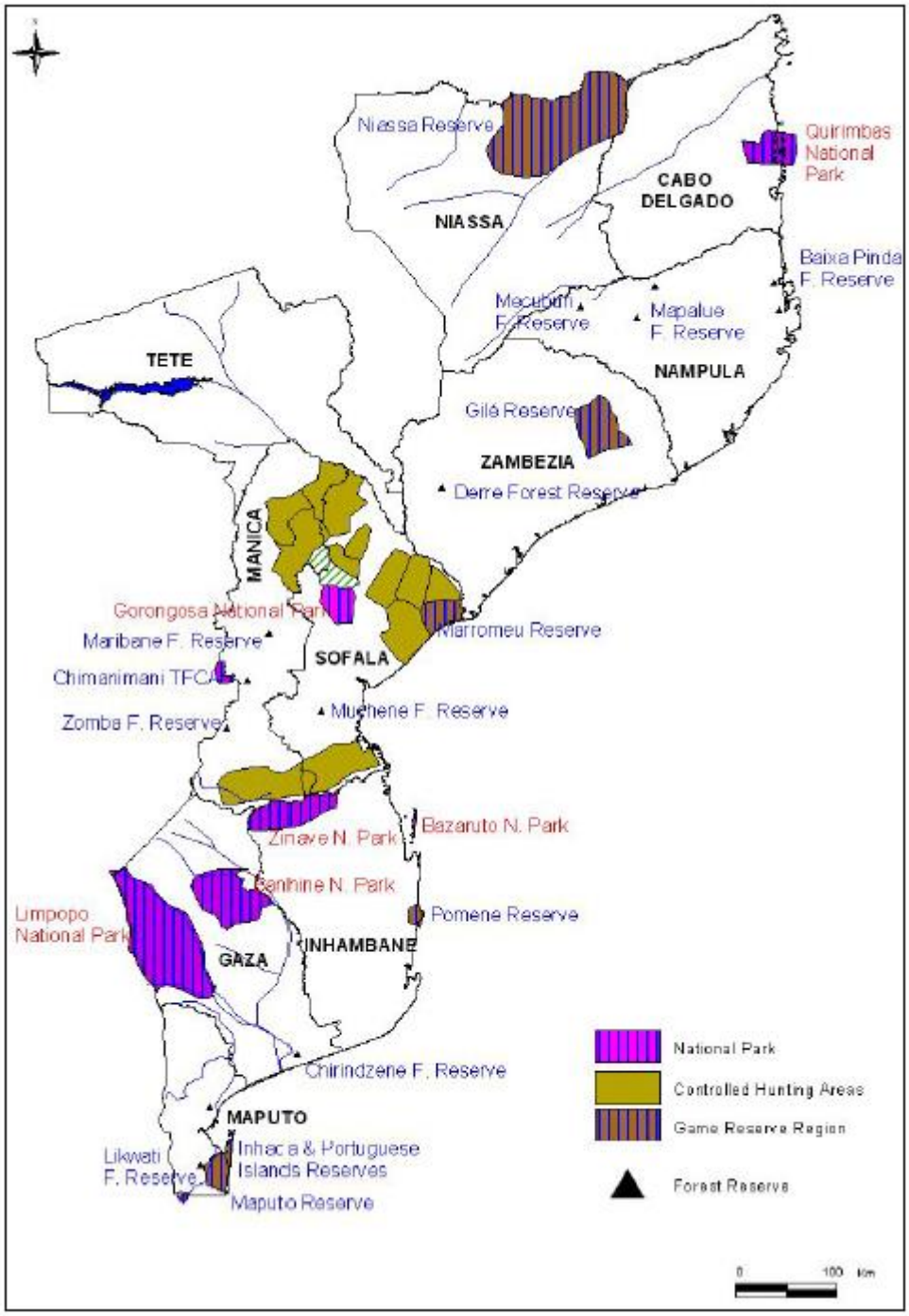

Figure 7. Protected areas in Mozambique. (Source: Swedish Geological AB & Impacto 2003)

3.10. International commitments

As a member of the international community, Mozambique ratified the following conventions:

- Vienna Convention for the Protection of the Ozone and the Montreal Convention on Ozone Destroying Substances (Mozambique Parliamentary Resolution No. 8/93)
- United Nations Basic Convention on Climatic Changes (Mozambique Parliamentary Resolution No. 1/94)
- United Nations Convention on Biological Diversity (Mozambique Parliamentary Resolution No. 2/94)
- United Nations Convention on the Right to the Sea (Mozambique Parliamentary Resolution No. 21/96, dated November 26 –, including the Agreement concerning the implementation of the Section X of this convention
- Basil Convention on the Control of Across-border Movement and Elimination of Dangerous Residues (Mozambique Parliamentary Resolution No. 18/96)
- Bamako Convention on the prohibition of Importing into Africa Dangerous Waste and Control over Cross-border Movement of Waste in Africa (Mozambique Parliamentary Resolution No. 19/96)
- United Nations Convention Against Desertification in countries severely affected by drought and Desertification (especially) in Africa (Mozambique Parliamentary Resolution No. 20/96)
- Cartagena Protocol on Bio-security (2001)
- Southern African Programme for Conservation of Biomass (ProBEC)
- Adherence to the International Hydrological Organization (Mozambique Parliamentary Resolution No. 20/94)
- Nairobi Convention for the Coastal and Marine Protection, Management and Development of the East Africa Region (Mozambique Parliamentary Resolution No. 17/96)
- Protocol on civil responsibility over damages due to pollution by hydrocarbons (CLC 92) Mozambique Parliamentary Resolution No. 52/2001)
- Protocol for the setting up of an international compensation fund for damages caused by pollution by hydrocarbons (FUND 92) (Mozambique Parliamentary Resolution No. 52/2001)
- Convention for the Protection of the World Cultural and Natural Heritage (Ratified in 1982)
- United Nations Convention on the Law of the Sea (LOS) (Signed but not ratified)
- United Nations Framework Convention on Climate Change (Ratified in 1995)
- Convention on the International Trade in Endangered Species of Wild Flora and Fauna (CITES) (Signed but not ratified)
- The Southern African Development Community (SADC) treaty (Signed)
- Protocol on Shared watercourse Systems in the SADC (Signed 1995)
- The Zambezi River Multilateral Agreement (Signed 1987)

- Organisation on the Indian Ocean Marine Affairs Co-operation (IOMAC) (Member: 1991)
- Signatory of the Ramsar Convention
- Agreement to create the Committee for the Joint Management of Limpopo River and subsidiaries (Resolution 56/2004)
- Agreement on the Joint Management of Zambezi River and Subsidiaries (Resolution 64/04)
- International Maritime Organisation (Member: 1991)
- Convention on the Prevention of Pollution by Ships, 1973, and the associated Protocol, 1978
- Convention on the Cooperation against Pollution by Hydrocarbons, 1990,
- Stockholm Convention of 21/05, 2001,
- POP, on Organic and Persistent Pollutants,
- SOLAS, on the Safety of Life at Sea)

CHAPTER 4: EU and other Donor Cooperation with Mozambique

Between 2000 and 2004, Mozambique received $6.3 billion in foreign aid, of which $5.6 billion was in the form of grants, and the remaining $0.7 billion in concessionary loans. The share of foreign aid to the nation's total resource requirements has remained substantial. From 60% of (Gross National Income (GNI) in the early nineties, net foreign financing fell to 25% in the second half of the 1990s, and has remained at this level since, with a surge in 2002 due to debt forgiveness. Principal donor organisations active in Mozambique include the European Union, World Bank, Danida, DFID, UNDP, Sweden, The Netherlands and USAID.

4.1. European Commission

Cooperation between the EC and ACP (Africa, Caribbean and Pacific) countries is governed by the Cotonou Agreement which covers a twenty-year period from March 2000 to February 2020, but has provision for an update every five years. The overarching objective of the Cotonou Agreement is the reduction of poverty by a three-pronged approach tackling political, economic and social issues. It has five interconnected guiding aims: 1) to enhance the political dialogue dimension between ACP and EU by developing peace building policies, conflict prevention and resolution strategies, supporting good governance and tackling corruption; 2) to promote a participatory approach and involve non-governmental actors in the implementation of the Agreement; 3) to reduce poverty; 4) to reinforce economic and trade relationships, in particular regional integration and partnership agreements between EU and ACP regions; and 5)to improve financial co-operation. In terms of direct cooperation with Mozambique, the EC provides greater financial support than any other donor. In terms of the 9th EDF, Mozambique was allocated an indicative amount of EURO 274 million as "A" envelope (main programme) and EURO 55 million as "B" envelope (contingencies). Funds were allocated primarily to three sectors: macro-economic budgetary support 45-55%, transport 25-35%, food security and agriculture 0-15%. In addition, 10-15% of the envelope was allocated to health-HIV/AIDS, good governance and capacity building for civil society. This reflected a reduction in sectoral focus but an overall increase in development aid from the previous funding allocation. Major interventions foreseen within the transport sector included reducing the backlog of period maintenance on the road network and capacity building within the public sector, and rehabilitation of rural roads. Specific interventions foreseen within the food security and agriculture sector was the establishment of sustainable food security within a market economy through a multi-annual food security programme. In respect of the macro-economic budgetary allocation, support was foreseen for the Governments Macroeconomic reform programme with special attention to be given to objective of poverty reduction. Support for Health and HIV/AIDS was to be implemented within the Framework of the National Strategic Plan and National Action Plan to Fight HIV/AIDS, support for good governance in the preparation of a programme to reinforce the judiciary sector. A midterm review EC-Mozambique cooperation programme conducted in 2004 indicated that co-operation between the EC and Mozambique was progressing in a very

positive way, in harmony with the PARPA, as well as with the Country Strategy Paper and the National Indicative Programme for the 9th EDF.

4.2. World Bank

World Bank cooperation with Mozambique is governed by its Country Assistance Strategy (CAS) which covers the period 2004-2007. The primary aim of CAS is to support the Government of Mozambique's poverty reduction strategy (PARPA), focusing in three areas: (i) improving the investment climate; (ii) expanding service delivery; and (iii) building public-sector capacity and accountability structures. Funding allocation under this framework has been allocated as follows: $118 million for improving the investment climate, $35 million for expanding service delivery, $77 million for building public-sector capacity and accountability structures, and $260 for cross cutting issues Under the umbrella of improving the investment climate, the Banks aims to help the Government to sustain GDP growth per capita and reduce income poverty through improving the investment climate and facilitating public-private partnerships in infrastructure. Key projects to be supported in this sector include the Beira Railway project, the Southern Africa Regional Gas project, and Phase 2 of the Roads and Bridges project, a Sustainable Rural Development project designed to build on the PROAGRI 1 and the Transfrontier Conservation Areas project, as well as its existing project portfolio of projects (IDA's ongoing Energy Reform project, IDA's Communications Reform project, NWDP2, the privatization Petromoc, and the Railways and Ports project). Under the umbrella of expanding service delivery the Bank has indicated that it will focus on human development MDGs with specific contribution in: (i) achieving less risky sexual behavior, especially among high-risk groups, by raising condom use and delaying a youth's first sexual encounter; (ii) helping to achieve more reliable and sustainable high-quality water supply in rural areas and in the five principal cities, thereby also helping to improve health outcomes; (iii) improving EP1 and EP2 planning, management, and budget execution and also supporting gender parity initiatives and teacher development, so that recent improvements in primary school access are matched with improvements in quality; and (iv) supporting vocational, technical, and university education to increase the skills o f high-level workers. The Bank has also in dicated its intent to improve service delivery in health, education and agriculture by building the capacity to manage decentralized service delivery and motivating and retaining civil servants by providing improved incentives. Under the umbrella of building capacity and accountability the Bank aims to help the Government to improve public expenditure management and contain corruption.

4.3. DANIDA

Danish cooperation with Mozambique is governed by its Africa – Development and Security policy document which covers the period 2005-2009. Denmark has undertaken to invest approximately two thirds of its bilateral development assistance in Africa and work for multilateral organisations also focusing on Africa. Denmark's Africa policy is based on six general goals: Integration of Africa in the global economy (by working for increased

sustainable economic growth through favourable trade agreements and an expansion of the 'Everything But Arms' scheme, and strengthening of the negotiation skills of the African countries), promotion of business development in Africa (by improving national framework conditions and the potential for progress in the private sector, education, and access to credit financing), making peace and stability preconditions for development (though its seat on the United Nations Security Council and support to relevant regional organizations), strengthening the "Regions of Origin Initiative" in Africa to (by supporting the poor in the regions of origin hosting the refugees, and by working for a global repatriation fund), human rights and democracy in Africa (by enhancing its efforts for human rights, democracy and good governance in Africa), and improving access to health, education, water and a sustainable environment for the most impoverished Africans. Danish aid earmarked for Mozambique over the next five years amounts to a total of DKK 1,510 million (= U$D 246 million, DKK 290 per year from 2005-2007, increasing to DKK 320 million per year in 2008 and 2009). Sectors and areas identified for priority bilateral development assistance in Mozambique include energy, education, health, agriculture, general budget support, and environment.

4.4. International Conservation Union (IUCN)

IUCN is a leading international organization in the environmental arena in Mozambique. Their vision is to promote and acknowledge the linkage between natural resources environmental sustainable management practices with economic development and improved livelihoods. They promote participatory approaches and equitable sharing of costs and benefits associated with natural resources management. Equitable access to information for adequate decision making; human and ecosystems well-being; partnerships as a way forward in the implementation of the programme. Their programme committed approximately USD4 million for 2003-2006 and identifies 5 strategic themes of intervention: a) Unsustainable practices in the use of natural resources by promoting activities in valuation of natural resources, developing national accounts and internalisation of environmental costs; b) Partnerships between State Private sector and Communities in resource management; c) Capacity Building; d) Sustainable Livelihoods and Natural Resources Management in Protected and multiple Use Areas and e) Awareness Raising and Advocacy.

4.5. UK department for International Development (DFID)

DFID Mozambique has an interim Country Assistance Plan (CAP) that covers the period 2003-06. The CAP is organised around a 'poverty reduction triangle' of three key areas of intervention. These address (i) capable government, (ii) effective civil society and (iii) an enabling environment for growth, private sector engagement and trade. DFID's specific actions were configured through a set of Change Impact Monitoring Tables (CIMT) that provided justification for the foreseen spend and staff work programme. The CAP identifies the need to improve government's effectiveness and transparency through building

government systems, particularly in public financial management and services. The strategy focus on balancing accountability in government with supporting investments for an enabling environment for growth and for strengthening civil society. Engagement in sectors are seen as less critical and there is a move to General Budget Support (BS) to the GoM. DFID's aid to Mozambique since 2000 has been relatively stable, but with a sharp upturn in 2001/02 (Floods and emergency) which relates to a large (£20m) programme aid payment. 2004/5 saw a marked growth in aid (between USD60 and USD67 million) with approval of a new BS agreement, the first tranche for which is £30 million. DFID is the sixth largest donor over the past five years, but if debt relief is excluded, it would be the fourth largest after IDA, EC and USAID.

4.6. United Nations Development programme (UNDP)

The second Mozambique-UNDP Country Co-operation Framework (CCF 2002-2006) has the following Strategy: to support national efforts to reduce the incidence of absolute poverty in Mozambique by 30% within the first decade of the new millennium. This objective is realised through upstream and capacity building-related activities in two programme areas, Poverty Reduction and Democratic Governance. Under Poverty Reduction, UNDP supports interventions that will impact poverty in a direct way such as the promotion of pro-poor macro-economic and employment policies and strategies, the cultivation of an enabling environment for micro and small scale enterprise development and supporting strategies and initiatives that reduce the development impact of the HIV/AIDS epidemic. Under Democratic Governance, UNDP supports efforts to strengthen key democratic institutions, to enhance the effectiveness of selected public sector institutions, and to promote participatory local governance. CCF will promote a two-pronged intervention strategy: (a) upstream policy formulation and advocacy for enabling legislation and regulatory environment for Poverty Reduction and Democratic Governance; and (b) institutional development coupled with highly selective downstream activities linked to the upstream initiatives. The estimated budget for the CCF period is USD81 million.

4.7. Sweden

The overriding goal of Sweden's development cooperation with Mozambique during the period 2002–2006 is to contribute to the reduction of poverty in the country. The Mozambican government's own poverty reduction strategy forms the basis for this cooperation. The Swedish programme centres on three focus areas: democratisation and democratic development, sustainable economic growth and social and human development. Special emphasis is given to the province of Niassa in northern Mozambique where long-term multisectoral support is provided. Four main sectors receive Swedish assistance (figures in brackets were disbursements for 2003): education (SEK70m). research (SEK30m), roads (SEK110m), public Administration (SEK70m). Most of the support to research goes to

Eduardo Mondlane University (UEM) in Maputo, which Sida/Sarec have supported since 1978. The support to the Road Sector is primarily directed at rural roads and bridges.

4.8. The Netherlands

The Netherlands CSP was drafted by the Dutch Embassy in Maputo, in 2004. This document is not a public document. The Netherlands is an influential donor in Mozambique (7th). The CSP outlines a clear strategy for priority-setting of sector interventions as well as for a transition from project support to sector budget support with a clear vision for further development into general budget support. The initial focus on sector budget support is designed to improve sector policy implementation and thus better service delivery. It is believed that this will be required for a considerable period, but that once planning and implementation have improved and financial flows are secure, funds can better be provided through general budget support. The priority sectors for support are listed as being education, health/HIV/AIDS and water, while some support also goes to a Natural Resources Management Fund managed by IUCN. The Netherlands is an average-sized donor, with a budget of USD47 million in 2003 and USD54 million in 2004. Dutch non-governmental organisations active in Mozambique include NOVIB, HIVOS, SNV, the Netherlands Institute for Multiparty Democracy (NIMD), the Netherlands Institute for Southern Africa (NIZA) and the Netherlands Management Cooperation Programme (NPUM).

4.9. US Agency for International Development's (US AID)

The aims and priorities for development assistance provided by the United States of America for the period 2004 –2009 are governed by the US AID and US Department of State Strategic Plan for the period in question. The stated mission of US AID is to "Create a more secure, democratic, and prosperous world for the benefit of the American people and the international community". Major goals identified for the period 2004-2008 include fostering world peace and security (by promoting regional stability, eliminating counterterrorism, enhancing homeland security eliminating weapons of mass destruction, combating international crime and drugs, assist American citizens to travel, conduct business, and live abroad securely), advance sustainable development and global interests (by promoting democracy and human rights, economic prosperity and security, social and environmental issues, and humanitarian response), promoting international understanding (through public diplomacy and public affairs), strengthening diplomatic and program capabilities (through management and organizational excellence). Key priorities of particular relevance to Africa include a 5-year Emergency Plan for HIV/AIDS Prevention, Treatment and Care, and reducing the Threat of Famine in southern Africa.

CHAPTER 5: Conclusions and Recommendations

Mozambique is well endowed with natural resources. It also has large sections of unspoilt coastline and large expanses of natural vegetation. These resources and landscapes are protected to varying degrees by the legislative and policy framework but available capacity (human and infrastructural) in the ministries and government agencies tasked with the responsibility of enforcing the legislation are inadequate to ensure that these resources are used sustainable or efficiently, particularly in the face of rapid economic growth and an expanding population. Population density in Mozambique is presently very low (amongst the lowest in Africa) and has by no small measure contributed to the current well being of the environment. However, as the population expands and economic development proceeds, it is likley take its toll on the environment unless a great deal more attention is focussed on addressing loopholes in the existing legislative and policy framework and for providing the capacity required to ensure adequate compliance with the law.

Perhaps of overriding significance is the approach that the GOM has taken to management and utilisation of land and other natural resources in Mozambique. The Government's policy on the environment is one geared through the promotion of sustainable development in such a way that the use of natural resources fulfils the basic needs of the people and development of the nation in equilibrium with economic growth, technology development, environmental protection and social equity. As such, sustainable use of resources often takes second place to social and human development, particularly where people livelihoods are at stake. Land and other natural resources are generally seen and used as a social security system in lieu of the fact that much of the population has no access to alternative forms of social security. The system is viable at present only because population density is still very low. As the population of the country expands, so will pressure on land and resources until they will compromise the ability of the natural resources and environment to renew itself and will ultimately lead to complete breakdown in this social security system. At some point there needs to be a gradual transfer to an alternative social security system to avoid such a disaster from happening.

Corruption, which involves the use of public office for private gain, is also an important cross cutting issue in Mozambique. It is evident at all levels, ranging from situations where large businesses lobby senior officials to resolve problems and small businesses pay bribes to petty officials to avoid fines related to obscure outdated regulations. Opportunities for rent seeking by corrupt officials seems to be rife within a legal system that does not adequately take account of the available human or infrastructural capacity for implementation and/or enforcement. Many provisions in the legal system do not lend themselves to easy of enforcement and/or not are not adequately transparent so as to eliminate rent seeking behaviour.

Mozambique is heavily reliant on support from donor agencies (25% of the GNI at present). The European Union is one of the major role players in this respect, having put aside an indicative amount in excess of EURO 300 million for support to Mozambique over the next five years. This support will go a long way towards fostering economic and infrastructural development in Mozambique, but unless it is carefully managed could cause irreparable damage to the environment that would have significant longer term costs. The European Union (and other major donors) should seek to set a leading role in respect of ensuring assistance provided to the country does not only yield short term benefits that come at the expense of longer term sustainable development. Preparation of this environmental profile for the country is a clear indication of commitment in this respect, but needs to be followed by additional concrete action. Considering that much of the financial support provided will come in the form of sectoral or central budget support (as opposed to project specific support) such actions need to be broad and cross-cutting and must seek to ensure that the entire regulatory framework in Mozambique is sufficiently robust and dynamic to address current and future threats as they arise. It should be noted that this is far more difficult to achieve than it is to control for environmental impacts arising from specific projects.

On the surface, many of the interventions required to promote economic and infrastructural development in Mozambique appear to conflict directly with requirements for protection of the environment and conservation of resources, giving rise to an irresolvable standoff situation. For example, improvements in water resources infrastructure (including water storage infrastructure) is urgently required for the intensification of agriculture through expansion of irrigation, and for domestic water use in urban and rural areas. The impacts of dams are, however, generally considered to be amongst the most damaging interventions introduced by man on riverine ecosystems and associated agricultural and freshwater fish production. This apparent standoff can, however, be resolved by ensuring that the full costs of any development project or initiative are explicitly recognised and accounted for upfront, during the planning phase. Very often decisions to proceed with a particularly project or programme are made before a full assessment of the implications of such a project or programme is completed and, more importantly, before the full costs are accounted for. In situations where full cost accounting is completed ahead of a development project or programme, this often tempers the nature or at least the level of the development to the extent that there are trade-offs between the benefits achieved by the project versus the impacts it may have on other sectors in the long term.

Key conclusions and recommendations for consideration in respect of sectorally directed donor support in Mozambique are highlighted below. For simplicity these are separated into the key sectors identified in this report that have bearing on or influence the environment.

Land

Land access and use is pivotal in controlling economic development and natural resource use and protection. While the land law of the country have succeeded admirably in protecting

traditional and customary land use rights, land policy and law needs to be reformed in order that better protection can be afforded to the land itself, to ensure that development is promoted, and that opportunities for rent seeking are reduced. Several clear pitfalls which have a bearing on sustainable economic and social development that need to be addressed include the lack of incentive for land holders to protect or conserve the land in their charge, the nature of the land laws which make them expensive in terms of human resources to administer and make them open to abuse by corrupt officials, and a lack of any significant incentive for land holders to relinquish there rights to land and hence to free up new land for development.

Agriculture

Agriculture activity supports 80% of the population and its growth is mostly due to maize, sugar and tobacco production. It is also seen as a greatest natural resource based sector contributor to poverty alleviation. Together with the forestry sector they constitute 20% of GDP. Most of the agriculture growth seen in recent years has been related to extensification (area expansion at 2,4% yearly at the cost of forestry loss), and demographics (more hand-labour) but very little to intensity (tractors, irrigation, conservation practices, or other yield enhancing factors, which are mostly used only under big commercial plantations e.g. sugar). There is a need to move to productivity enhancing methods in order to arrest the tendency to cut more forest areas. However, since raising agricultural productivity must be one of the key pillars for sustaining economic growth and poverty reduction, the development of commercial agricultural will put more pressure, although in a more efficient manner, on natural resources. The development bias in urban areas continue to represent a great attractive to increase the rate of rural-urban migration (up to 8% annually) and the increase of number of people in the already important urban informal sector. Improvements in water supply infrastructure is also urgently required for the expansion of irrigation as this is currently well below its potential and is a major constraint in the intensification of agriculture in many areas.

Water

Water will probably become the most limiting natural resource in the future in the face of economic growth and development. The economy is both vulnerable to and constrained by water related factors (regional climatic variability, high dependence on international water resources, and under-developed water infrastructure, impacts of floods and droughts). Agriculture is mostly based on rain-fed farming and so very dependent on the gradual increase of water shocks (highly variable rainfall pattern and frequent droughts). Expansion of the extractive and tourism industry depends on access to (hydro)-energy and water. The useful capacity of the country's dams represents only 5% of the mean annual runoff, excluding Zambezi, indicating a need to develop adequate infrastructure in order to improve response to water shocks and guarantee reserves for future expansion. Development of any new water resources infrastructure must be done in a manner that takes account of the full costs of the development and minimises any impacts on the environment and other users of the water (this can be achieved by completing an Environmental Flow Assessment).

An important aspect for poverty reduction relates to the expansion of safe and sustainable water access for both rural and urban populations. This has been given some priority in recent years but the achievement of 27% of the rural households serviced with cleaned water is still very far from an acceptable level. Negotiations with neighbouring countries over rights to cross-border water flows also need much greater focus than it has been given up to now as this will become a major issue in the future, especially when it begins to constrain or even reverse economic growth and development in Mozambique. Talk of future wars being fought over water may be idle speculation in some areas, but this is certainly not the case in southern and eastern Africa where shortages of freshwater are becoming more acute all the time.

Forestry

Forestry has recently undergone major regulatory and policy changes regarding the benefit use of forestry resources, logging fees and enforcing the rule of law. However, much more needs to be done to ensure that logging activities in Mozambique continue within sustainable limits. Steps needs to be taken to ensure for example that management plans for timber harvest and timber inventories required for concession areas in terms of the law, are prepared and appropriate sanctions are applied when this is not the case. Non-wood forestry products are very important income for rural livelihoods and work also as an important buffer during periods of extreme climatic events. Reform is still lacking regarding the need to clearly induce harvesting in areas of difficult access instead of nearby urban areas (volume license fee). It is foreseen that forestry resource exploration will increase with the expansion of the road infrastructure, but we expect that would result in increased efficiency gains for the extracting industry. Measures like the export ban on high-quality uncut wood impact positively if there is first enough capacity in-country to process the amount and quality required by the export market, second, if the policy is effectively enforced.

It is also imperative that the authorities gain better control over the use of wood resources for energy production (mostly through charcoal production). Fuel wood is currently the most important source of domestic energy in the country (accounting for 85% of total household energy requirements), and is reported to be the highest in the SADC region. This is unacceptably high and cannot possibly be sustainable in the long term. Similarly, greater control needs to be exercised over slash and burn agriculture which also accounts for a significant albeit less well quantified loss of woodland resources. Environmental impacts of deforestation are far reaching and while they may not be that obvious now, they are sure to take a heavy toll in the future.

Mining

Mining is gradually increasing its presence in Mozambique due to a progressive legal framework. It must be remembered though that mineral extraction has been one of the most environmental damaging industries in the world. Aspects such as open pit extraction (coal in Moatize, heavy sands in Chibuto and Moma, artesanal gold in Niassa, etc) and development

of offshore gas fields require careful and dedicated specialised monitoring, regarding water consumption, water releases, and potential contamination of surface and groundwater aquifers.

Fisheries

Both marine and inland fisheries provide an important source of employment and/or livelihood to a large number of Mozambicans, as well as bringing in considerable amounts of foreign exchange. Management of the industrial fisheries seems to be at a level where catches have been stable and presumable sustainable for a considerable period. The same cannot be said for the artisanal and to a lesser extent the semi-industrial fishing sectors. Pursuing a policy of a largely open access artisanal fisheries sector may provide relief from absolute poverty for a large number of people in the short term, but in the long term is doomed to failure. This is already clear from the pitiful returns achieved by artisanal fisheries in the vicinity of the major centres and the dire state of many of the resources on which they depend. There is also considerable room for improvement in the collection of detailed catch statistics for all sectors of the fishing as this information is critical for proper management of the resources. Improvements in compliance would also be highly desirable and requires significant additional investment in monitoring, control and surveillance.

CHAPTER 6: Technical Appendices

Appendix 6.1: Reference list of environmental policy documents and action plans

General
Mozambique Constitution (2004)
Action Plan for the Reduction of Absolute Poverty , 2001-2005 (2001-2005) (PARPA).
Action Plan for the Reduction of Absolute Poverty , 2006-2009 (PARPA II).
Sea Act Law No 4/96,

Land and Agriculture
Land Policy (1995)
Agrarian Policy (1995)
Land Use Planning Policy (draft Feb 2004)
The Land Law (19/97)
Land law regulations (66/1998)
Technical appendix to the Land law (1999)

Fisheries
Fisheries Policy (Resolution No. 11/96)
Fisheries Master Plan
Fisheries law (No. 3/1990)
Marine Fisheries General Regulations (2003)
Regulations for Marine Fisheries (No 16/1996)
Maritime Fisheries Decree (43/2003)
Territorial Panning Bill
Ministerial Decree of 23 April 2002 (Moratorium on coral and ornamental fish collection and trade)
General Guidelines of Fresh Water Fish Farming (Decree no 35/2001)

Forestry
Policy and Strategy for Development of Forestry and Wildlife (8/1997)
Forestry and Wildlife law (No 10/1997)
Forestry and Wildlife regulations (Decree No 12/2002)

Mining
The Mining Law (Lei de Minas; Lei no 14/2002)

Water
Water Policy (7/1995)
Environmental Management
Framework Environmental Act (20/1997)

Regulations on the Procedure for Environmental Impact Assessment (Decree 76/98)
Procedure for Environmental Impact Evaluation (Decree No. 45/2004)
General Directive on EIAs (2000)
Manual for Environmental Auditing (2001)
National Biodiversity Strategy and Action Plan (NBSAP)
Environment Act No 20/97
Norms for the Environmental Impact Assessment (Decree no 76/98)

Tourism
Tourism Policy and Implementation Strategy (TPIS 2003)
Tourism Law No 4/2004
Strategic Plan for Tourism Development in Mozambique (SPTD 2004-2008)

CHAPTER 7: Administrative Appendices

Appendix 7.1: Study Methodology/work plan

Agrifor Consult SA was contracted by the European Commission (EC) to assist the Government of Mozambique in preparing a country Environmental profile (CSP). The main objective of the CSP is to identify and assess environmental issues for consideration during the preparation of a Country Support Strategy (CSP). It will also assist decision makers in the Mozambique and in the European Commission (EC) by providing clear information on key environmental challenges in Mozambique, as well as policies, strategies and programmes designed to address them. It will also ensure that the EC cooperation strategies systematically integrate environmental considerations into the selection of priority focal areas and also establish the necessary environmental safeguards for all cooperation activities undertaken in Mozambique. The study was completed by two environmental experts: Dr Barry Clark (Team leader) and Mr Kemal Vas (curricula vitae included in Appendix 7.5). The study was conducted through a eight step process starting with a briefing for the team leader at the European Commission in Brussels, a second briefing for both experts at the European Commission in Maputo. Activities for the remainder of the project included meetings with key individuals from Ministries and Directorates in Mozambique involved with or that have a bearing on environmental issues, meetings with key individuals from Donor organisations and NGOs in Mozambique working in the environmental field, site visits to areas of key environmental interest/importance in Mozambique, review of all available literature on environmental issues in Mozambique, preparation of the draft and final reports, and a debriefing for both experts at the European Commission in Maputo. A list of persons consulted for the project and their affiliations is provided in Appendix 7.2, while dates for specific activities are listed in Appendix 7.3. A list of documents consulted is provided in Appendix 7.4. Field visits by the project team included a trips to Xai Xai (Gaza Province) and Massingia (Gaza Province). In Xai Xai team members met with the the Directors of the Provincial Directorate of Tourism for Gaza province (Céu Matos) and Provincial Directorate of Environment (MICOA), and with the Danida technical assistant in the Centro Dissenvolvemento Sustentavel (Chris Davies, Sustainable Development Centre, Ministry of Environment). In Massingir, team members met with representatives for Ara Sul (Lizette Dias, Environmental Officer: Catchment Management Authority for the Limpopo River) and with the coordinator for the Limpopo Transfrontier Conservation Area (Henrique Massango). The primary purpose of the trips was to familiarise team members with key issues relating to coastal management, mining, tourism, conservation (transfrontier parks in particular), water management and agriculture.

Appendix 7.2.: Consultants Itinerary

Date	Location	Activity
2006/01/26	Cape Town/Brussels	Travel
2006/01/27	Brussels	Briefing at EC and Afrigor
2006/01/28	Brussels/Cape Town	Travel
2006/01/30	Cape Town/Maputo	Travel
2006/01/31	Maputo	Briefing at EC, team meeting
2006/02/01	Maputo	Review docs, project team meeting
2006/02/02	Maputo	Meeting at World Bank
2006/02/03	Maputo	Rev. doc., prep. inception report
2006/02/04	Maputo	Rev. doc., prep. inception report
2006/02/05	Maputo	Rev. doc., prep. inception report
2006/02/06	Maputo	Meeting at EC delegation, IUCN
2006/02/07	Xai Xai	Field visit to Xai Xai, meeting at CDS
2006/02/08	Massingir	Field visit to Massingia, meeting at ARA SUL
2006/02/09	Maputo	Meeting Swedish Embassy
2006/02/10	Maputo	Meeting at MICOA
2006/02/11	Maputo	Prepare report
2006/02/12	Maputo	Prepare report
2006/02/13	Maputo	Meeting at Corridor Sands Lda, Maputo
2006/02/14	Maputo	Meeting at Min. Fish.
2006/02/15	Maputo	Prepare report
2006/02/16	Maputo	Prepare report
2006/02/17	Maputo	Prepare report
2006/02/18	Maputo	Prepare report
2006/02/19	Maputo	Prepare report
2006/02/20	Maputo	Prepare report
2006/02/21	Maputo	Prepare report
2006/02/22	Maputo/Cape Town	Travel
2006/03/20	Cape Town/Maputo	Travel
2006/03/21	Maputo	Prepare report
2006/03/22	Maputo	Prepare report
2006/03/23	Maputo	Prepare report
2006/03/24	Maputo/Cape Town	Debriefing, Travel

Appendix 7.3.: List of Persons consulted

Rod de Vletter, Consultant to World Bank and Ministério du Tourismo
Noel Cooke, Social sectors and Thematic Budget Lines, European Commission, Maputo
Luís A. Santos, Engineering Adviser, European Commission, Maputo
Sigvard Bjorck, Engineering Adviser, European Commission, Maputo
Albert Losseau, Food security and rural development, European Commission, Maputo
Eduardo Leao de Sousa, Cluster Leader for Mozambique and Angola: Agriculture, Environment and Social Development Unit, The World Bank, Maputo
Sergio Margulis, The World Bank, Washington (by video conference)
Ebenizário Chonguiça, Head of Regional Programmes: Lusophone and Indian Island States, Coastal and Marine Ecosystems Programme, IUCN, Maputo
Isabelle Chauca, Instituto Investigatoria Pesquera (IIP), Ministério das Pescas, Massingia
Chris Horril, Technical assistant, Centro De Desenvolvimento Sustentável Para As Zonas Costeiras, MICOA, Xai Xai
Céu Matos, Director: Provincial Directorate of Tourism, Gaza Province, Xai Xai
Henrique Massango, Coordinator, Limpopo Transfrontier Conservation Area, Ministry of Tourism, Missingir
Joaquim Russo de Sá, Advisor to the Minister, Ministério das Pescas
Lizette Dias, Environmental Officer, Ara Sul, Direção National de Águas, Massingir
Eric, Head of Social and Thematic Budget Lines Section, European Commission, Maputo
Jose Manuel Elija Cuamba, Permanent Secretary, MICOA, Maputo
Luis Santos, Infrastructure, European Commission, Maputo
Jim Leggat, Commercial Director, Corridor Sands Lda, Maputo
Keith Ashby, Environment, Health, Security & Community Director, Corridor Sands, Maputo
Victor Zacarias, Director for Private Sector and Government Relations, Corridor Sands, Maputo
Herve Ohresser, General Manager of Aquapesca, Zambezia
Marcos Moya, General Manager of Indian Ocean Aquaculture SARL, Cabo Delgado
Antero de Pina, Project Officer Water, Sanitation & Hygiene Promotion, UNICEF, Maputo
Samira Izdine, National Institute of Agronomic Research, LMA Herbarium, Maputo, Mozambique
Helena Motta, WWF Country Coordinator, Mozambique

Appendix 7.4.: List of Documents Consulted

Alberto M.M., Mougel, E. & A. Zoulalian 2001. The sustainability of some Mozambican secondary species for the manufacture of wood-cement composites. In Sitoe A.A. & Matakala, P. Proceedings of the international workshop on miombo woodlands in the new millennium: trends, uses and their role in sustainable development. Casa Msika, Mozambique, 26-28 September 2001. pp 97-106.

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Appendix 7.5.: Curricula Vitae of the Consultants (1 page each)

Name:	Barry Clark
Profession:	Marine Biologist
Affiliation:	Director, Anchor Environmental Consultants Research Associate, University of Cape Town
Position(s) on Team:	Project Administrator, Estuarine Coordinator, Fish Specialist
Highest Qualification:	PhD
Citizenship:	South African
Language	English, Afrikaans Professional Societies International Association for Impact Assessment, South African Institute of Ecologists and Environmental Scientists
Employment (last 6 years)	Managing Director, Anchor Environmental Consultants
Previous employment	University of Cape Town, South African National Parks

Summary Profile

Dr Clark has ten years experience in marine biological research and consulting on coastal zone and marine issues. He has worked as a scientific researcher, lecturer and consultant and has experience in tropical, subtropical and temperate ecosystems. His main area of scientific study involved fisheries management and the biology and ecology of marine and estuarine fishes. He started his own consultancy firm (Anchor Environmental Consultants) in 1996, and as a consultant has been concerned primarily with human impacts on estuarine, rocky shore, sandy beach and temperate and coral reef communities as well as coastal and littoral zone processes. Dr Clark is also a research associated at the University of Cape Town, and is the author of 16 scientific publications in class A scientific journals as well as numerous scientific reports and popular articles in the free press. Geographically, his main area of expertise is southern Africa (South Africa, Namibia and Mozambique), but he also has working experience from the Middle East.

Publications:

Clark, B.M. 2005. Climate change: A looming challenge for fisheries management in southern Africa. Marine Policy 30 (1): 84-95.

Clark, B., Hauck, M., Harris, J., Salo, K. and E. Russell. 2002. Identification of subsistence fishers, fishing areas, resource use and activities. South Africa Journal of Marine Science 24: 425-438.

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Harris, J.M., Branch, G.M., Clark, B.M.., Coetzee, C., Dye, A.H., Hauck, M., Johnson, A., Kati-Kati, L., SiqWano-Ndulo, N., and M. Sowman. 2002. Recommendations for the management of subsistence fishers in South Africa. South Africa Journal of Marine Science 24: 503-523.

Harris, J.M., Sowman, M., Branch, G.M., Clark, B.M., Cockroft, A.C., Coetzee, C., Dye, A.H., Hauck, M., Johnston, A., Kati-Kati, L., Maseko, Z., Salo, K., Sauer, W.H.H., Siqwana-Ndulo, N. and J. Beaumont. 2002. The process of developing a management system for subsistence fisheries in South Africa: recognizing and formalizing a marginalized fishing sector in South Africa. South Africa Journal of Marine Science 24: 405-424.

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Lamberth, S.J., B.A. Bennett & B.M. Clark 1995. The vulnerability of fish to capture by commercial beach-seine nets in False Bay, South Africa. S. Afr. J. mar. Sci. 15: 25-31.

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1. Family Name: VAZ
2. First Name: Kemal Torcato
3. Date and place of birth: September 12, 196
4. Nationality: Mozambican
5. Civil status and dependents: Married, 2 children
6. Education:

Institution	University of Virginia, USA
Date: from – to	2002 - 2006
Certificate(s) or Diploma(s):	PhD., in Environmental Sciences (current phase - writing final thesis)
Institution	Swedish University of Agricultural Sciences, Department of Agriculture Engineering. Uppsala. Sweden.
Date: from – to	1994 - 1996
Certificate(s) or Diploma(s):	MSc., in Agriculture Resource Management
Institution	Eduardo Mondlane University, Faculty of Engineering, Department of Mechanical Engineering. Maputo. Mozambique
Date: from – to	1979 - 1982
Certificate(s) or Diploma(s):	Mechanical Engineer – *Licenciatura* (B.Sc. with honours)

7. Language Skills: (*indicate the level in a 1 to 5 scale*)

Language	Reading	Speaking	Writing
Portuguese (mother tongue)	Good (5)	Good (5)	Good (5)
English	Good (5)	Good (5)	Good (5)
Spanish	Reasonable (3)	Little (1)	Little (2)
French	Reasonable (3)	Reasonable (3)	Little (2)
Italian	Reasonable (3)	Little (2)	Little (2)

8. Other Skills: (e.g. Computer skills, etc.)

Programs	Experience
WINDOWS, EXCEL, WORD, POWER POINT,	mail - Good
ACCESS and SPSS	Reasonable

9. Current Position:

Specialist in Participatory Project Planning & Development (PPP&D), Monitoring & Evaluation (M&E), Environmental Impact Assessment and Agriculture Resource Management. Director for Environmental Affairs and founding partner of Verde Azul Consult Ltd. (a Mozambican Consultancy Firm registered since 1999).

Lecturer at the Eduardo Mondlane's University in the fields of Energy, Farm Operations and Environmental Management.

Trainer in Environmental Impact Assessments (USA Reg. 216, Mozambique Reg. 45/2004, WB).

l0. Years of Experience:

16 years of working experience, occupying different posts involved with environmental issues ranging from teaching to environmental management.

11. Years with Firm:

Since the company's foundation August 99 (6 years)

12. Key Qualifications:

BSc in Mechanical Engineering and an MSc in Resource Management and Systems Analysis within the field of Agricultural Engineering, Mr. Vaz is currently carrying out a PhD in Environmental Sciences in the University of Virginia, USA where he is also a trainer in Environmental Impact Assessments (USA Reg. 216, Mozambique Reg. 45/2004, WB).

Mr. Vaz has been a member of the faculty of Agronomy and Forestry Engineering (FAEF) of Eduardo Mondlane University since 1989. His extensive consulting experience includes: project evaluations; NGO and government organizational capacity building; project design, monitoring plans; SWAP (sector wide approach programmes); and strategic planning. He has experience both as a project manager and as liaison officer for other regional and international consulting companies on projects ranging from spatial development initiatives and urban structural planning to environmental impact assessments.

More specifically:

- He participated in the Cumulative environmental impact assessments of the InKomati River Basin, involving the Kingdom of Swaziland, the Republic of South Africa and the Republic of Mozambique as environmental expert for the Mozambican component. In the framework of this project he held public meetings and desk top reviews of previous studies in the region, created an information and a communication database, carried out all major projects (large dams, irrigation, agro-forestry, power generation, and other human activities) along the river and contributed to the redaction of the ToRs for the following phases of the river study.
- He carried out different Environmental Audits (ISO 14000 and EMAS standards) at the Obsolete Pesticides Station in Matola. Audited pesticides management routines and the actual effects of Maputo 2000 floods onsite. In the framework of this project he acted as a facilitator for the stakeholders (governmental officers, municipality, and implementing institution) in order to achieve sustainable and acceptable environmental standards at the station and carried out extensive staff interviewing.
- He enhanced the concept of "outsourcing" and NGO partnerships into public sector activities' implementation. He assisted local governments in the transition from Central Planning to Local Participatory Planning, and gradual phase out of project based donor assistance to SWAp (Sector Wide Approaches).
- He did extensive work on Integrated Analysis of Renewable Natural Resources Management in Mozambique.
- He prepared courses for agriculture extension officers on sustainable agriculture.
- He carried out different researchs on small scale farm production systems and conservation tillage.

13. Specific experience in the region: Mozambique

Country/ activity	Date from – to
Environmental Impact Assessment (EIA) and Management Training Course for USAID and USAID Partners in Mozambique (Reg. 216 da USAID, Reg. Moç. 45/200). With support of USAID, Partners and Sun Mountain Intl. Co- Facilitator in Chimoio and Nampula;	August 5 – 20,2005
EIA Training needs assessment for USAID partners in Mozambique. Preparation of practical case studies for conducting actual EIAs in Manica and Nampula provinces,.	May 2005
SWAp in the Health Sector in Mozambique, Preparation of training modules for Aid and Government officers in Coordination with KIT-Holland,;	January to June 2005
Mid-Term Evaluation of IUCN's "Environmental and Natural Resources Management Fund". Funded by Dutch Government and managed by IUCN (USD2 MILLION plus 2003 e 2005);	March to October 2005
EIA manuals preparation, revise Mozambican EIA applicable legislation, and actual planning details in coordination with Sun Mountain International, USAID, AFRICARE, World Vision, and CARE.	October 2005
"Targeting Swedish Support into SWAp in the Education Sector". Commissioned by M. of Education and Swedish Embassy.	July to October 2001
"2000-2004 Operational Plans for Provincial Directorate of Education (DPE), in Niassa". Commissioned by Irish Aid and Ministry of Education.	October 2000 to July 2001
"ORAM (NGO for Rural Association and Mutual Assistance) 1997-1999 Programme Evaluation". Team Leader. Commissioned by ORAM and Bread for the World.	18 January to 5 February 2001
Cumulative Environmental Impact Assessment for the Incomáti River Basin. Ist Phase. AfriDev/Verde-Azul Consortium. Commissioned by a Tripartite Permanent Technical Committee. Environmental Team Leader..	August 2000 to April 2001
Regional Training (Programming and Management Cycle. Project Design/ Logical Framework Analysis. Country Strategy and Programme Outline) Workshop for World Food Program (WFP)"	6th to 13th of November 1999.
Review of Danish 1993-1999 Agricultural Sector Programme Support in Tete Province. Team work with Nordic Consulting Group (NCG).	1st of May to 23rd of April, 1999
Impact Assessment, Monitoring, and Evaluation System Country Liaison, in Mozambique for USAID/RCSA (Regional Center for Southern Africa).	July, 1998 to July 1999
"Beneficiary Assessment of Agricultural Extension Services of PRDSA and PRDA of Ministry of Agriculture and Fisheries". Financed by IDA (International Development Association).	From 15 to 30 of May, 1997
"Lubombo Spatial Development Initiative – Agriculture Potential Component". Financed by the South-African Government.	15.03 to 7.04.97
Program Concept and M&E for FTPP (Forests, Trees and People Programme) East and Southern Africa. FAO, SIDA and NORAD sponsored initiative. Team Leader.	August 17 to 19, 2000
Project Concept and Development for Forestry and Wildlife Management in Inhambane and Zambézia.. Financed by FINIDA/UIF (Forestry Inventory Unit). Team Leader	July 12-14, 2000
"Support Project to Agrarian Policy Definition and Rural Development", of INDER financed by Caisse Francaise de Development.	3.06.99 - 3.06.2000
Structural Plans for the Metropolitan Area of Maputo, Financed by the World Bank. Contracted by JTK/Euroconsult.	6/07 to 20/12/98.
Development of the Research Agenda on Natural Resources Community Management in Mozambique. Facilitator. Financed by FAO/DNFFB/Dutch Embassy.	19.3.98
Co-Author of a manual on the same subject "From a Good Idea to a Successful Project" published by the Secretariat for East Africa Coastal Area Management (SEACAM), and translated into Portuguese and French.	1999

14. Professional experience

Country	Organization	Date	Post	Activities
Mozambique	CMC – engineering comp. WB funds	2005-2007 (on going)	Senior environmental controller	Monitoring & Mitigation of the EIA techniques for the road "Alto Molócué ao Rio Ligonha".
Mozambique	Ministry of Health/GTP of Nampula, Tete, Zambézia and Sofala Provinces	07/2001 to 02/2002	Main Facilitator	Provincial Health Strategic Planning
Mozambique	FDC (Foundation for Community Development)	12/2000	Team Leader.	Rural Integrated Project Development for Bilene-Macia District. Project formulation
Mozambique	Inhambane Province Government	09/200 to 10/2000	Team Leader	Agriculture Sector Diagnostic and Strategic Sustainable Planning in Inhambane Province
Mozambique	MICOA (Ministry for Environment Coordination).	11/1999 to 04/2000	Local Environmentalist	Environmental Audit (EA) at the Obsolete Pesticides Station in Matola. Various audit missions from.
Mozambique	Local government in Inhambane	09/1997	Facilitator	Capacity building on the Project Formulation, Development & Management for the Environment

15. Membership in Professional Societies:

N/A

16. Other Relevant Information/experience:

Country	Organization	Date: from/ to	Position
Mozambique	MO.LI.SV. (Italian Non-Governmental Organization)	02/1989 to 11/1989.	Consultant Engineer for PAABP- Program for Water Supply in the Fringe Area of Maputo
Mozambique	Empresa Estatal De Leite E Lacticinios (State Dairy Company),	04/1985 to 04/1988	Maintenance Division Manager

Appendix 7.6. Study Terms of Reference

BACKGROUND

With the EDF 9 NIP concluding in 2007, undertaking the End of Term Review and the development of a Country Support Strategy (CSP) for Mozambique is a priority.
The environment is now playing a prominent role in the CSP framework. In this context, the Commission now encourages the beneficiary country to prepare a Country Environmental Profile (CEP). The main objective is to identify and assess environmental issues for consideration during the preparation of a CSP, which will directly or indirectly influence EC cooperation activities.
The CEP will provide decision-makers in the partner country and in the European Commission with clear information on the key environmental challenges, as well as policies, strategies and programmes designed to address them. This information will ensure that the EC cooperation strategies systematically integrate environmental considerations into the selection of priority focal areas and also establish the necessary environment safeguards for all cooperation activities undertaken in Mozambique.
The Profile will establish the key linkages between the environment and poverty reduction. It will constitute an important source of baseline information and contribute to focusing political dialogue and cooperation with Mozambique on key areas of concern such as sustainable development, as well as raising awareness among policy-makers.
The lead national institution is the Ministry of Co-ordination of the Environment. (MICOA) Environmental issues feature strongly the Government's five-year government plan across all sectors, although there is less progress in implementing policies. The main donors in the sector are the Danish (with an emphasis on coastal protection and institutional support) and the World Bank (Dutch involvement will end in 2006). Detailed and recent studies of environmental issues pertaining to land, coastal management and forestry are available.

DESCRIPTION OF THE ASSIGNMENT

Beneficiaries

The consultants will assist the national stakeholders, the NAO and MICOA.

Objective

To prepare a Country Environmental Profile for Mozambique in support of the Country Support Strategy 2007-13.

Requested Services

The consultants will assess and report on the following issues:

The state of the environment

Identify the key issues, including facts (pressures, current status and trends) and problems in the following areas:

- Physical environment: air and climate, land, water and natural disaster risks.
- Biological environment: biodiversity, ecosystems, biological resources of cultural, social or economic importance.

The social and economical causes of the environmental situation and trends, and their consequences on human well-being and sustainable development, should also be presented. Specific issues to be addressed include de-forestation and coastal management.

Reference should be made to local and internationally recognised environmental indicators and quality standards to establish a consistent basis for comparison of environmental and sustainable development performance. The indicators selected should facilitate future monitoring and evaluation of the extent of environmental integration and be useful for future environmental assessments. Attention should be paid to the rate of change of indicators where information is available. If appropriate, the information could be organized according to eco-geographical subdivisions with the scale (regional, national, local) of the issues indicated.

Environmental policy, legislation and institutional framework

A brief description and a review of strengths and weaknesses of the following:

- National policies, environmental strategies and action plans (including, if possible according to the results of 2.3.1, an assessment of the environmental performance in meeting the objectives and targets).
- Legislation, current and in preparation, by the National Institutions covering development control, requirements for environmental assessments, sustainable use or conservation of natural resources, pollution control, land tenure and land reform.
- The effectiveness of legislation enforcement, and the provision for public participation in environmental issues, procedures for public participation in development control and environmental planning and public access to environmental information.
- National approaches to key international or regional environmental conventions such as those concerning climate change, biodiversity and desertification.
- The Institutional structures and responsibilities of the authorities dealing with environmental issues in policy making, legislation, planning, environmental protection, monitoring and enforcement.
- The level of co-ordination between sectoral institutions or ministries involved in environmental or natural resources management issues.
- The capacity and financial resources of authorities responsible for environmental management.
- The major NGOs, institutes or other institutional stakeholders.
- The extent and quality of protected areas (and, if relevant, other land use measures).

Integration of environmental concerns into the main sectors

The assessment should examine the integration of environmental concerns in the main sectors that have key linkages with environmental issues that might be identified for EC support, namely transport infrastructure and food security/rural development.

EU cooperation with the Mozambique from an environmental perspective

This should cover experience relating to interventions with specific environmental objectives as well as the integration of environment into other sectors, including the application of environmental assessment procedures. Where information is available the environmental impacts of EU cooperation or potential risks should be identified for the benefit of future programmes. The results of existing evaluations/reviews should be incorporated and lessons should be drawn for the future.

Cooperation funded by other agencies from an environmental perspective

This should cover involvement of other funding agencies and their experience in Mozambique and include a list of recent and planned projects/programmes, with an environmental focus or anticipated impact.

Conclusions and Recommendations

The key aspects of the state and trends of the environment in Mozambique, including policy and institutional constraints and challenges, should be clearly stated. This may be presented in a matrix, crossing environmental concerns and the main sectors or policies.

Based on a comprehensive assessment of available information and consultation with stakeholders, recommendations on how best to address environmental issues should be elaborated. Individual recommendations should be clearly articulated and linked to the problems to be solved and grouped according to the involved sector or institutional stakeholder. Recommendations should be easily used in the preparation of the Country Strategy Paper, taking into account the existing Country Strategy Papers (which will provide general guidance on the style and detail required) and already pre-identified options for the next CSP. Nevertheless, useful recommendations can also be made for the Government, other donors (particularly EU Member States) and the use of EC Thematic budget lines.

Recommendations are likely to cover direct environmental interventions as well as the provision of environmental safeguards for other activities. The relative priority of the recommendations and an indication of the challenges to their implementation should be given.

Recommendations should also be made as to how best the Commission and the Government can mainstream environmental issues into the next cycle of country strategy papers. Guidance should be given regarding Strategic Environmental Assessment in major sectors and performance indicators if budgetary supports are foreseen.

The constraints to preparing the profile caused by limited information should be described, and an evaluation of the need for additional studies, such as Strategic Environment Assessments or others, should be made.

Work Plan

The consultants' work plan should include the following activities:

- Consultation with EC country desk officers and other relevant officials, the EC Delegation in Mozambique, a selection of national and local authorities, key international funding agencies

operating in the Mozambique, plus key national, international civil society actors operating in the environmental field.

- Review of previous Country Environmental Profiles and Country Strategy Papers; evaluation reports with respect to environmental issues on development and economic co-operation produced by government, EC or other agency sources.
- Review of environmental literature, evaluation reports, environmental policy and legislation framework, legislation and regulations and enforcement relating to environmental issues, action plans, and progress in implementation.
- Review of environmental performance indicators selecting appropriate indicators from those suggested by organisations such as EEA/OECD/Eurostat.
- Field visits to sites of key environmental concern.

Required outputs

The assessment will deliver the following results:

- An assessment of the environment identifying key environmental factors influencing Mozambique's development and the responses to these.
- An assessment of national environmental policy and legislation; institutional structures and capacity, and the involvement of civil society in environmental issues.
- An assessment of past and anticipated future trends of environmental indicators.
- An overview of past and ongoing international cooperation in the environment sector.
- Recommendations and, as far as possible, guidelines or criteria for mainstreaming environmental concerns in priority development areas. These recommendations should support the preparation of the Country Strategy Paper and, as far as possible, include guidelines or criteria to be used for environmental mainstreaming in subsequent phases of the operation cycle.

Experts profile

The proposed mission shall be conducted by a team of two experts who should have the following profile:

- Expert level I (one) with at least 15 years wide experience in environmental issues, including institutional aspects; international environmental policies and management; environmental assessment techniques and experience in rapidly assembling and assessing information, and developing strategic recommendations. He/she will be the team leader.
- Expert level II (one) with 10 years experience with an environment background complementary to the team leader.
- Previous working experience in Mozambique or the region is requested for at least one team member.
- Experts should have an understanding of the EU environment and development policies;
- Experience in undertaking environmental analysis and preparation of development programmes would be an asset;
- Familiarity with Commission guidance on programming, country strategies, PCM, policy mix and integration of environmental issues into other policy areas is desirable;

- Experience of participatory planning processes would be an advantage;
- The experts should have excellent skills in Portuguese and English. Portuguese will be the working language, although the final report must be presented in both Portuguese and English.

location and duration

The mission should start by 1 February and conclude by mid-April 2006. The work will be carried out in Mozambique, with possible field trips to the provinces to be determined by the consultants. The team leader will visit Brussels for a one-day briefing and one day debriefing session. A total period of 51 working days is foreseen, based on the following indicative workplan:

Task	Expert I	Expert II
Desk analysis, including briefing by one expert in Brussels	2	
Field phase, including travel, draft report and debriefing	23	23
Debriefing in Brussels	1	
Report finalisation	2	
Total days	28	23

Reporting

Within five days of arrival in Mozambique the consultants should present a brief inception report, setting out the approach and timetable. It should indicate the list of organisations to be consulted and places to be visited (if considered necessary).

The study must be presented in the Country Environmental Profile report in the format given in Appendix 1.

The draft study in (5) copies (in Portuguese and English) will be presented to the NAO within two working days of the end of the field phase and prior to the debriefing meeting.

The findings of the draft study will be presented in a debriefing meeting for the NAO and the EC Delegation staff (to be held in the Delegation).

Within 15 working days, comments on the draft study will be received from the NAO and the EC.

The consultants will take account of these comments in preparing the final study (maximum 40 pages excluding appendices), which should be submitted within a period of 10 working days from the receipt of the comments. The final report in Portuguese and English (10 copies in each language).

Administrative information

The cost of translation for the draft and final studies should be budgeted as a reimbursable, if required.

Any costs associated with the in-country debriefing meeting will be borne by the EC Delegation.

A provisional budget for up to four visits (two per expert) to the provinces should be included under reimbursable travel costs.

Annex 1: Standard Report Format for a Country Environmental Profile

Maximum length (excluding appendices) 40 pages.

The following text appears on the inside front cover of the report:

'This report is financed by the European Commission and is presented by [name of consultant] for the … (National Institution) and the European Commission. It does not necessarily reflect the opinion of the … or the European Commission.'

1. Summary

This is an executive summary of the key chapters of the Country Environmental Profile clearly indicating priority challenges and areas for action at the country level.

2. State of the environment

This chapter will also set out an assessment of the state and trends of the environment as outlined in Section 4.1 of the TOR.

3. Environmental policy, legislative and institutional framework

This chapter will provide an assessment of the Country's environmental policy, regulatory and institutional framework for pollution control, natural resource use and sustainable development. It will be divided into sections as follows:

3.1. Environmental policy, legislation and institutional framework

This chapter must include an assessment of the key issues and capabilities of the main national institutions outlined in Section 2.3.2 of the TOR.

3.2. Integration of environmental concerns into the main sectors

This section must include an assessment of the key issues as outlined in Section 4.4 of the TOR.

4. EU and donor cooperation with Mozambique from an environmental perspective

This section must include EC and other donor assistance within the Country from an environmental perspective covering the issues outlined in Sections 4.5 and 4.6 of the TOR.

5. Conclusions and recommendations

This chapter will present the conclusions on the state and trends of the environment in the Country, including a summary of the key environmental issues in a table form. Recommendations will be made for major stakeholders (including the Government, the Commission and other donors) with a particular emphasis on how best the Commission can mainstream environmental issues into the new country strategy paper.

6. Technical appendices

I. Environmental maps of the Country

II. Reference list of environmental policy documents, statements and action plans, and other relevant technical information.

7. Administrative appendices

I. Study methodology/work plan (1–2 pages)

II. Consultants' Itinerary (1–2 pages)

III. List of persons/organisations consulted with their affiliation and contact details (1–2 pages)
IV. List of documentation consulted (1–2 pages)
V. Curricula vitae of the consultants (1 page per person)
VI. Terms of Reference for the Country Environmental Profile