

NATIONAL ASSESSMENT OF COASTAL FORESTS RESOURCES (Mozambique)

A National review report to be used in the development of the WWF-EARPO Eastern Africa Coastal Forests Ecoregion Programme

By

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1. BACKGROUND INFORMATION

Mozambique is a large country with a total area of close to 800 000 km². The population is concentrated in the southern provinces of Maputo, Gaza and Inhambane and in Zambezia and Nampula in the center- north. Current figures put the Mozambican population at a little more than 18 million. Mozambique's beaches along its 2 700 kilometers of coastline, and its once abundant wildlife have drawn visitors since the colonial era. People from over the world came to one of the richest game parks in Southern Africa, Gorongosa National Park, which was considered to be the showpiece of colonial Mozambique's conservation effort (Massinga, 1996), and several other hunting areas one of which is nowadays part of Limpopo National Park.

The Mozambican Coastal Zone, which extends over 2 700 km, is characterized by owning a significant variety of ecosystems, both marine and terrestrial, and a relatively high population density. The country consists of a central plateau which steps down to extensive coastal plains representing 44% of the country, with the remainder made up of plateau (43 %), and Montana regions (13 %) (Barnett, 1996). It is estimated that around 40 % of the inhabitants of Mozambique live in the 42 coastal districts (World Bank, 1996). The Coastal strip and Beira corridor concentrate 60 % of the total country's population (Pereira, 2001). A large and impoverished portion of the population of this zone depends primarily on the outstanding natural resources for which they harvest for their daily subsistence. It is estimated that more than 30% of the urban population and 50% of the rural population live in absolute poverty with severe food insecurity and face severe food shortages for a prolonged period during the year.

In other hand this area is also the main development target that the government have found to implement the spatial development Initiatives, namely: Libombos Spatial Development Initiative (Maputo Corridor, Limpopo and Gaza Corridor), Beira Corridor and Nacala Corridor. Mozambique is perceived as a sunny beach tourism destination (Soto, 2001) and because of that, the once rugged national coast is experiencing a huge devastation because of tourism facilities development. The continuous use of the Coastal Forest resources for economic purposes, such as fuel wood and timber extraction, grazing, tourism development, urban expansion, clearing for agriculture and fire have caused extensive changes in the original vegetation structure. The ongoing environmental destruction that results from the economic dependence of the community on the production of charcoal, building materials and carvings for income fishing can only be reduced by developing alternative sources of income for the community.

2. DESCRIPTIONS OF COASTAL FOREST

Accordingly to MICOA (1996) there should be a separate definition of the boundaries for the " marine area " and the " land area ". For the marine area the boundary of the territorial waters (12 nautical miles) serves as a delimiter for the Coastal Zone. While for the land area, the definition should be the most flexible and broadest possible, according to the following criteria:

- *Large physiographic units.* The coast of Mozambique would be split in three parts, according to the morphological differences already defined in other studies. These are: (i) The south zone, parabolic dunes and coastal lagoons with a *faixa directriz* (directrix land strip) of medium width; (ii) The central zone, a Mangrove estuary zone with a *faixa directriz* of greater width, and (iii) the north zone, a coral zone with a *faixa directriz* of lesser width.
- *Ecological criteria.*
- *Administrative criteria*

Burguess and Clarke (2000) define Eastern African Coastal Forests as "archipelago-like regional sub-centre of endemism in the Swahilian regional centre of endemism and the Swahilian/Maputaland regional transition zone ". This definition refers to the chorological position. Floristic composition: Coastal Forest is one which is dominated (i.e. containing more than 50% of all individuals of trees with a dap (diameter at breast height of 10 cm or more) by Swahilian near endemic trees species, i.e. trees species whose global distribution is limited to the area of coast. In terms of its forest types and sub-types Eastern Coastal forest is defined as a collective term to compass the typical vegetation formation type (eastern African Coastal Dry Forest) as well as variant and transitional formation types and sub-types. So due to this fact a forests that share features of Coastal Forests with the forests of other phytochoria are treated as transitional formation.

Mozambique expands over an area of 794 770-km² land and inland water bodies included. The vegetation cover including the forests classified as High forest, low forest, Thicket, Wooded Grassland and Mangroves extends over an area of 618 274 km² or 78 % of the national land territory including inland waters (Saket, 1994). Of this, the Mangrove Forests area in Mozambique is estimated as 396 080 ha. While the total area of potential timber productive forests for whole country is estimated at 197 354 km² or 24.83 % of the total Mozambican land. In terms of production, the timber productive forest types have the capacity of yielding 8.828 M.c. m of timber per year. Of this quantity about 1.195 M.c.m. is of timber has commercial values. Without considering wildlife, the forestry resources in Mozambique are rich and have the potential to continue providing the local population with most needs and the national economy with valuable contribution, provided that these resources are put under proper management and rational utilization regimes and forestry legislation is reinforced and respected (Saket, 1994).

2.1 Total area of Coastal Forests

The total area of Coastal Forests in Mozambique is estimated to be 4.778 Km² with 55 of forests blocks (WWF-EARPO, 2002). This area is considered though indicative, as more survey work is needed for its confirmation. The vegetation is a mixture of several floristic elements and communities, including tropical (particular in the north and along the coastal), afro-montana (at relatively low altitude owing to the compensating effect of increasing latitude on temperatures

Mangrove vegetation: The total area in 1972 was 408 080 ha, but according to Saket (1995) in 1990 this size dropped to 396 080 ha. The Mangrove Forests decreased of 14 570 ha but at same an increase was recorded in some areas which was estimated at 2 570 ha. The rate of deforestation of this forest type over 18 years is therefore equal to 2.9 % or 0.16 % per year of the area.

TABLE 1. Mangrove cover area in 1972 and in 1990 and the size of deforestation in Mozambique

PROVINCES	MAGROVE AREA (HA)		MAGROVE AREA (HA)		DEGRADED AREA (HA)	NEW MANGROVE AREA (HA)	CHANGE (%)
	1972	1990	1972	1990			

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Maputo	14 605	12 599	2 217	211	15.2
Gaza	387	387	0	0	0
Inhambane	20 094	19 848	246	0	1.2
Sofala	129 997	125 317	6 334	1 654	4.9
Zambezia	159 417	155 757	3 766	106	2.4
Nampula	55 849	54 336	2 006	493	3.6
Cabo Delgado	27 739	27 836	0	106	0
Total	408 079	396 080	14 569	2 570	3.9

Source: Saket (1994); World Bank (1996)

As a consequence of increasing population pressure and economic development along the Coastal zone, there is tendency to over-exploit Mangrove resources and to convert original mangroves land into other use with motives of getting higher monetary profits (salt pans, fish ponds, garbage dumps, and luxuriant real estates). Their environmental and protective functions have also been severely impaired, with adverse social economic and environmental impacts on the locals, farmers, fishermen and oyster collectors.

2.2 Main forest blocks-number

Coastal conservation areas: Considering the diversity of habitats along the length of Mozambique coastline and the economic importance of the littoral waters, remarkably few coastal areas are protected (World Bank, 1996). Marromeu reserve (150 000 ha), Licuati Forest Reserve (3 500 ha), Maputo Elephant Reserve (70 000 ha), Pomene Reserve (20 000 ha), Bazaruto N. Park (8 000 ha), Zinave National Park, Banhine National Park, Gile Reserve, Quirimbas National Park, Niassa Reserve. Situated in the Zambezi River Delta system, the Marromeu Reserve comprises mangroves swamps, freshwater swamps and miombo forest. The Maputo Elephant Reserve, located in the Southern part of the country, belongs to Maputaland Center of endemism and is comprised by Dune vegetation, Grasslands, Floodplains swamp Forests and Mangroves. The Licuati Forest Reserve is mainly comprised by Sand Forest, which lie within the vegetationally complex of Maputaland Center of Endemism. This region includes Maputo E. Reserve and part of the Natal (South Africa).

2.3 Brief description of main resources available from Coastal Forest

2.3.1 Physiography - form canopy structure and, dominant species

Conventional, in phytogeographic terms (Massinga & Hatton 1994-5 citing White, 1983) the Coastal Zone traverses two phytogeographical regions:

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

These two phytochoria differ floristically, but both comprise a complex matrix of forests (Sand Forests (Miombo woodlands, Evergreen forests, Riverine forests, Dune forests, Wooded grassland, Secondary grassland, seasonally flooded Edaphic grasslands, and Mangroves communities)(Massinga & Hatton, 1996; Saket, 1994; B. J. van Rensburg *et al* 2000). In northern Mozambique, the width of the coastal belt mosaic varies considerably, as it penetrates further inland along broad river valleys (FIG 1).

Mangrove Forests are floristically well developed in the northern and central sectors of the coast and less so long the southern part (Massinga & Hatton 1996). They are seldom very extensive between their landward and seaward faces (except at the Zambezi River delta) and are semi-continuous along the coast. The Mangrove Forests are classified separately from other natural wood vegetation. In fact they are distinctive by their location along the coast in the river mouths. Being evergreen are composed of *Avicenia marina*, *Ceriops tagal*, *Sonneratia alba*, *Rhizophara mucronata*, *Bruguiera gymnorrhiza*, *Bruguiera cylindrica*, *Heritiera littoralis*, *Xylocarpus grannatum*, *Pemphis acidule* and *Lumnitzera racemosa*. They have a physiognomy between the low woody vegetation to stand of more than 10 m high. Mangroves occur

most of the time in small units.

Dune vegetation is the most fragile forest type of Coastal Forest system. Species: *Mimusops caffra*, *Diospyros rotundifolia*, *Sideroxylon inerme*, *Euclea natalensis*, *Eugenia capensis*, *Olax spp*, *Bridellia cathartica* and *Brexia madagascariensis* among others. Due to the long history of anthropogenic land use along the coast, much of this landscape today comprises a mosaic of agricultural fields, with grassy follow and the orchards of exotic trees species, such as coconut (*Coco nucifera*), cashew nut (*Anacardium occidentale*) and mango (*Mangifera indica*). In general, a more or less continuous cover of dune forest occurs between Ponta do Ouro in the south and Bazaruto in the north. Following the dune forest there are, grasslands, wooded grassland, swamp forests (in the South), and woodland. The parabolic Coastal dune a stretch from Bazaruto to Ponta de Ouro and beyond to Natal, at Mlalazi River (28° 57'S)(850 km long) characterized by high parabolic dunes and north-oriented capes and barrier lakes. These dunes systems attain heights of 120 m and are considered to be the highest vegetal dunes in the world (Massinga & Hatton, 1996).

According to Saket (1995) evergreen forest occur, also along the coast, principally over the Chiringoma hills where *Erythrophloeum suaveolens* (Missanda), *Millettia stuhlmannii* (Panga-Panga), *Pterocarpus angolensis* (Umbila), etc. are very frequent, and in some restricted locations, in Gaza and Inhambane provinces, where it is composed of *Androstschys johnsonii* (Mecrusse) also known as Cimbiri. Most of this forest type falls in the class of High Forest (Productive Forest).

Miombo Woodlands are geographically located in the northern of Limpopo River Coastal area. The Miombo woodlands are composed mainly of deciduous woody vegetation where *Brachystagia spp* and *Strichnos spinosa* are the dominant species in some locations. Sometimes they appear in the pure stands. *Brachystagia* is commonly associated with *Julbernadia globiflora*, *Pterocarpus angolensis* (Umbila), *Burkea africana*, *Bridellia micrantha*, *Cynometra sp.*, *Dalbergia melanoxylon*, *Swartzia madagascariensis*, *Millettia stuhlmannii* (Panga-Panga, etc. while *Strichnos* is usually associated with *Combretum spp*, *Terminalia spp*, *Pteleopsis myrtillifolia* etc. These formations occur in broad extent in the northern Provinces (Cabo Delgado, Niassa, Nampula and Zambezia) and confined in smaller scattered areas in the Southern Provinces and in the centre of the country where the association of *Trichilia emetica* and *Sclerocary birrea* becomes sometimes dominant (Saket, 1995). The dry deciduous tropical forests that are part of the extensive Miombo woodland vegetation located in Nangade and Mueda districts of Cabo Delgado are composed by *Pterocarpus angolensis* (Umbila), *Bombax rhodognaphalon*, *Sterculia africana*, *Dalbergia melanoxylon*, *Sterculia quinqueloba*, *Millettia stuhlmannii* (Panga-panga, *Julbernadia globiflora*, *Afzelia quanzensis*, *Brachystagia spp* and *Syzygium guineense* among others.

Sand Forests has a poorly developed understorey, and is characterized by the presence of the following tree species: *Dialium schlechteri*, *Afzelia quanzensis*, *Balamites maughamii* (precious), *Newtonia hilldebrandtii*, *Pteleopsis myrtifolia*, *Drypetes arguta*, *Hyperacanthus microphyllu*, and *Erythrophleum lasianthum* (Van Rensburg *et al* 2000; Pereira, *et al.*, 2001). These forests have a distinctive boundary (1-2 m) of almost bare soil protecting it from the effects of annual fires. The Sand Forest rarely burns and fires usually stop at the border, creating a unique environment for itself (Matthews, 2001). The more open, mixed woodland forest is characterized by common, woody savanna species such as *Acacia burkei*, *Albizia vericolor*, *Afzelia quanzensis*, and *Albizia adianthifolia*. In addition, it has a well-developed grass understorey represented by *Aristida*, *Ponarthritis* and *Perotis* species (*ibida*). The soils are homogeneous, gray siliceous, aeolian sands, which are highly leached (dystrophic) and relatively acidic (water pH c. 6.1) (B. J. van Rensburg *et al* 2000). Matutuine district vegetation has the unique and rare forest types known as Sand Forests or Licuati forest (Chaposa, 2001).

2.4 Main goods and services from main forest blocks

Strictly speaking, all Mozambican Coastal Forests have globally unique biodiversity values which make them deserving equally priority in terms of conservation needs and management. The high biodiversity value and uniqueness of these southern coastal formations is gaining increasing recognition (Massinga & Hatton, 1996). Shifting cultivation (slash and burn) for cropping, firewood and charcoal production to supply the urban centres and big cities located on this ecosystems and hunting for trading and subsistence have been pointed as the main problems for the conservation of these sensitive forests. Currently, the excessive dependence on wood fuels as a source of domestic energy, coupled with the increasing scarcity of natural resources in rural areas, is causing numerous problems of a

socio-economic and environmental nature (Tsamba and Soto, 1987). By its nature this area is extremely sensitive and fragile eco-systems (dune forests, beaches, Mangrove groves, Sand Forests, rocky coasts coral reefs, estuaries, lagoons, humid zones, sacred groves and other areas with high bio-diversity (miombo and every green forests). Because of these natural resources, the Coastal Zone is in general impacted by numerous and sometimes conflicting economic interests, such as cities and towns, traditional and semi-industrial fishing, forest harvesting, mining tourism development historic sites, marine parks, among others. Many of these development and economic interests are externally driven to this sensitive area, with all associated type of externalities.)

2.5 Local values

Mangroves: Local people use *Avicenia marina* as timber for construction of bed, firewood and fodder; *Bruguiera Gymnorhiza* is harvested as poles for building materials and firewood; *Sonneratia alba* is mainly used for honey production, fire wood and boat building; *Ceriops tagal*, is used by the locals as poles, firewood and timber for boat construction; *Sonneratia alba*, *Rhizophara mucronata*, *Bruguiera gymnorhiza*, *Bruguiera cylindrica*, *Heritiera litoralis*, *Xylocarpus grannatum* is used as medicine for abortion and for stomach (cure) as well as firewood *Pemphis acidule* and *Lumnitzera*. Coastal Forests and its associated ecosystems provide jobs (rural communities), non-timber products (food, medicine, edible mushroom, honey, bush meat used to supply local people with animal proteins, and cooking utensils as well as bundles of other tools used in communal areas.

2.6 National level values

The Coastal Forests and its associated ecosystems are rich in Mineral gas that contributes to national development. With long and rugged Coastal Zone Mozambique is well endowed in natural resources that can support viable sunny beach tourism development if well conceived and planned. So Among national values there are:

- Commercial timber (export and domestic market)
- Medicinal plants that Mozambique export
- Mangroves services (birds sanctuaries) they contribute to the fish productivity for whole economy and environmental control and cleaning.
- Tourism assets (wilderness Dunes in Ponta de Ouro), beaches and forest for campsites location and wood and building material production.
- Health and prosperous carving industry that uses the following species:
 - Species: *Dalbergia melanoxylon*, *Berkemia zeheri* (North and Center)
 - *Millettia stuhlmannii*, *Azelia quanzensis*, *Spirostrachys africana*, *Trichilia emertica* (South)
- Plantations (timber, environment and fuel energy). They were established for national economy purposes in order to relief pressure on native forests that are meant to produce timber for export.
- Mangrove- removing pollutants from water areas; they provide habitat and primary organic matter to the entire estuarine and marine food chain, trap, concentrate and recycle nutrients.

These forests provide a range of important mainstream livelihood activities along coastal zone such as: carving, fishing within mangrove areas and lagoons, agriculture, tourism, aquaculture, salt production, harvesting of Mangroves and Miombo woodlands, wildlife hunting and harvesting of medicinal plants. The most common goods and services derived from Coastal Forests include timber for domestic and exporting markets, wood for carving, fuel-wood, honey, poles, land for cropping, water, pasture and fodder for animals, medicinal plants, watershed protection, habitat for wildlife and ethnic communities, tourism attractions and assets, and cultural and religious groves and important ecological functions for human been. The demand for traditional medicine is over 80% of the population both poor and well-off consumers. During the early 1990s it was estimated that about 5 million people in Mozambique were dependent on wildlife for meat protein, with rural communities deriving between 40 % and 80 % of their protein requirement from bush meat (Barnett, 2000 quoting UNCED, 1992). Therefore the total amount of game meat consumed annually within Mozambique could represent as much as 182,000 mt to 365,000 mt at an economic value of between 365 and 730 million per year (Barnett, 2000). It is reported that traditional hunting societies spread up around the country derive over 25% of their monthly income from bush meat (MISAU/MPF, 1997 quoted by Barnett, 2000). The most important value of wildlife is that it provides in many cases additional and sole sources of such cash income

2.7 Regional and global values

Wetlands and Mangrove Forests both assets have regional and globally values Wetlands play a very important environmental functions such as exporting organic matters to adjacent aquatic ecosystems, where it forms the basis of commercial fisheries. They also control floodwaters. Other functions and services are: providing recreational and tourism opportunities; providing land for shifting agriculture. Mangroves host migratory shorebird aggregations (birds sanctuaries). The Mangrove eco-system should, therefore, be valued for the non-consumptive services it provides and for supporting a rich biodiversity. So Mangrove is resource that needs to be utilized and managed for the benefits of man and eco-system in general.

2.8 Biodiversity hotspots

Between Maputo and Inhambane much of the indigenous coastal vegetation behind the dune has been cleared for agriculture. Indeed the high biodiversity value and uniqueness of these southern coastal formations is gaining increasing recognition (Massinga & Hatton, 1996). Coastal degradation in Mozambique occurs in relation to variety of incompatible human activities, such as agriculture, forestry, fishing, tourism and urbanization. This result in coastal erosion, habitat destruction of forests and mangroves, beaches, sea grasses beds and reefs biodiversity loss, land degradation and depletion of fish stocks. The total number of vascular plant species Maputaland Center is estimated to be between 6 000 and 7 000. It is also said that about 1 222 species/ intraspecific taxa and 58 genera of vascular plants are endemic or near endemic to the region. Van Wyk (1995) has suggested that at least 1 100 species of vascular plants occurs in the Maputaland Center that in terms of the Coastal Forest lay between Ponta de Ouro and Xai-Xai coastline. This has the highest biodiversity of this stretch of coast. Of the more than 472 species of birds and 14 mammals, 23 reptiles and 7 freshwater fishes (Massing Hatton, 1996). Maputaland Center of Endemism covers an area of 27 000 km² within Mozambique and South Africa with about 2 500 species of vascular plants occurring in Maputaland Center (Pereira, *et al.*, 2001).

Furthermore, patches of Sand Forest, imbedded within a matrix of open and closed Mixed Woodland, are under considerable threat. In Mozambique commercial afforestation, local use of fuel wood, and clearance for agriculture are taking place within this habitat type (Davis *et al.*, 1994 in Van Rensburg *et al.*, 2000). So fourteen of the species of dung beetles found in this area can, however, be threatened as endemics and 26 species recorded in the Sand Forest and Mixed Woodland habitats of Tembe were not recorded in other adjacent forest types (Van Rensburg *et al.*, 2000). Since there are significant differences in both dung beetles and plants between the Sand Forest located in Tembe and those in Sileza, it is clear that representative patches of these forests should be conserved in this region.

2.9 Endemic species

The Mozambican Coastal Forests have the highest plant diversity and harbors the highest proportion of endemic plant species. (Van Rensburg, *et al.*, 2000). For instance, a study done in the southern part of Coastal Forest found that a total of 5556 bird records representing 112 species and 36 families, were obtained form two Sand Forests habitats. But that, the number of rare species recorded within each habitat types varied form 16-28, and a total of 65 from 112 species sampled was considered rare in at least one of four habitats location of entire study (. (Van Rensburg, *et al.*, 2000). About 2 500 species of vascular plants occurring in Maputaland Centre Maputaland Centre of Endemism that covers an area of 27 000 km² within Mozambique and South Africa, 230 species area endemic of the region (Pereira, *et al.*, 2001).

Table 2. Endemism among selected groups of plants and animals in the Maputaland-Pondoland region, Maputaland center and pondoland center (Massinga and Hantton, 1996 after Van Wyk 1994)

	MAPUTOLAND- PONDOLAND REGION	MAPULOLAN D CENTRE	PONDOLAND CENTRE

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Total number of vascular plant & intra-specific taxa	6 000-7000	1 100	1 500
Endemic/near-endemic vascular plant (genera)	58	4	6
Endemic/near-endemic vascular plant (specific & intra-specific taxa)	1 222	168	118
Endemic/near-endemic mammals (subspecies)	41	14	1
Endemic/near-endemic birds (subspecies)	148	47	6
Endemic/near-endemic reptiles ((specific & intra-specific taxa)	38	23	1
Endemic/near- endemic frogs (specific & intra-specific taxa	17	3	0

2.10 Commercial

Timber and bush meat and charcoal/firewood are the main products harvested from the Coastal Forest eco-systems. Madjadjane community located in Maputo Reserve Buffer Zone has reported illegal harvesting of herbal medicine by individuals who sell them in South African markets. Timbers from natural forests are the main source of exchanges for the government. The timber can be sold locally or to external market processed or in logs. For example, the cubic meter of logs of *Dalbergia melanoxylo*n (precious species) is sold at 700 to 1000 USD, while its sawn wood can earn as much as USD 8 000/m³ FOB price (Nhantumbo and Soto 1994).

2.11 Cultural and spiritual assets

They are several cultural assets along the Coastal Forests. The Chirindezene and Licuati sacred forests in the south are some of the well-protected sacred groves by local custom and used for ceremonies and celebrations. In Catuane a forest inventory for a local community identified 4 cultural areas in the forest, normally used for meeting (Banjas) and other community activities. These local cultural assets are equally important compared with sacred groves. Many local cemeteries are also found in the Coastal Forests and communities treat them as cultural and spiritual values.

2.12 Water

Coastal Forests are the main font and storage of fresh water in the coastline zone. Important and international rivers eco-systems are integrant part of the Coastal Forests zone. Hence water provides an input into economic production in sector such as agriculture and domestic consumption. The conservation of catchments has direst effect in water productivity and flow.

2.13 Forest services and products

Timber resources are no longer considered as the main forest products. Many forest services are now considered such as: land for agriculture (normally shifting cultivation); building materials, food and palm wine, medicine, firewood and charcoal, e cultural and sacred values, bush meat and habitats, shelter and food for many living been including man. Environmental regulation, water production and conservation, erosion control, gathered medicinal plants, indigenous fruits, bush meat, tourism, palm wine, household

2.14 Main threats to conservation and sustainable management of Coastal Forests

Despite their obvious conservation importance, Sand Forest patches in the Maputaland Center of Endemism in the southern Mozambique are under considerable threat from deforestation (Matthews, van Wyk & Rooyen, 1999). Agriculture, afforestation, invasive plants, mining, overgrazing, forest harvesting (commercial timber and charcoal), tourism and urbanization have been pointed as the major threats to Maputaland Center (Pereira, *et al.*, 2001). The Licuati forests have been under pressure due to high levels of charcoal production and illegal logging of commercial species, mainly *Afzelia quanzensis* (Pereira, 2001 citing Borges, 2001). The Sand Forest destruction has been ongoing for many decades' outsides

reserves. Only small portions of Sand Forest are protected in two conservation areas in Mozambique (70 000 ha in Maputo Elephant Reserve out of total of 170 000 ha; 3 300 ha out of 80 000 ha (buffer zone of the forest reserve) in Licuati forest. These Sand Forests have been impacted by diverse land use options (clearing for agricultural cropping, timber harvesting and charcoal production and unplanned tourism activities). These forest types contain butterfly faunas that differ from the forest edges and from other disturbed areas and because of their unique species, they need special preservation and sound management effort.

The agricultural sector, which is composed of both the livestock and crop components, hinges on the exploitation of land resource (soil and vegetation). In this context, it has direct and indirect influences on the indigenous forest resources in terms of their exploitation and conservation. The direct effects result from the competition for land between forests and agriculture while the indirect effects result from the exploitation of the forest resources either for subsistence purposes (food, energy, building material) and or for income generating purposes. Deforestation and land degradation are two principal symptoms of unsustainable land use (Ravaoli and Ekins, 1995). These are caused by population pressure, land use changes, overgrazing, unsustainable harvest (e.g. hardwoods) and unsustainable agriculture. Climatic change is one of the negative externalities resulting from deforestation and annual wildfires. Other negative actions and threats remain as:

- Clearing of forest for establishment of agricultural projects for export of agricultural crops (coconuts, Sisal, cotton, tobacco) without environmental impact assessment.
- Shifting cultivation caused by poor productivity of the land available for the peasants and bad land Utilization policy resulting from the lack of *land evaluation and land use planning*
- Weakness of the forest institutions
- Inadequate and inefficient forest exploitation techniques & destructive harvesting methods
- Forest and wildlife destruction caused by uncontrolled fires and harvest and poaching
- Breakdown in traditional system of forest management, leading to pressure on resources due to lack of local respect control mechanisms
- Conflicts over control and use of local forest resources
- Population increases in the forests and communal areas, placing heavy pressures on forest resources
- Exclusion- people disposed of their customary land when forests were gazetted
- General rural poverty – hence high dependence on natural resources base
- High cost of forest conservation to forest adjacent communities
- Unsustainable harvesting rates
- Regeneration and recruitment, particular of harvest species impaired
- High frequency of large forest fires
- Loss of species diversity

In general, migrants and fishermen and vendors are occupying spaces traditionally available for other purposes such as cultural and grazing use; Coastal residents are being placed in a disadvantageous position by the breakdown of traditional customs and by the outsiders which are aggressively more kin to business than the locals.

3 POLICY FRAMEWORK: FOREST AND WILDLIFE POLICY

The principal legislation controlling the Forest Sector is the Forest Regulation of 1965, of the Legislative Diploma number 2642 of September 20, 1965 (Regulamento Florestal). It defines three main functional land use categories for the conservation and utilization of the country's forest resources:

- **Conservation Areas (group I):** parks, and reserves in which harvesting is not permitted;
- **Production Forest Areas (group II):** set aside exclusively for management on sustained basis;
- **Alienated Forest Areas (group III):** forest may be removed after authorization.

The forest types of group I include the National Parks, the Integrated National Reserves and the Forest Reserves (RF.16). It also includes other protected and fragile forest formations for environmental and other important purposes like:

- Dunes or hill forest formations
- Watershed system or water resources conservation
- Forest for military defense purposes
- Others (sacred groves and sanctuaries)

The group II forest types correspond the forest zones with high potential and economic interest exclusively for timber production by the industry and Sawmill. The Law states that these forest formations cannot be converted into agricultural uses even for the family-farm sector. The forest exploitation in concession regime is only allowed in these groups in order to ensure the future supply to the forest industry. This type of forest is considered to be the permanent country's forest heritage. The group III comprises the so-called alienable forest formations where harvesting is partly allowed as well as clearing for agricultural and other purposes. These forest formations can be converted into other land uses such as agricultural expansion, communal grazing areas and other development needs. Therefore, this group ceases to be a permanent forest heritage.

In Mozambique approximately 40% of forest cover is of this formation, i.e., the woodland forest or savannah forest. The main rural areas covered by these kinds of forests are broadly called Miombo upper Limpopo River. The Law stipulates that this type of forest can be alienated or allowed to be exploited with a simple harvesting license for woody biomass, poles and timber. Only the Conservation Areas have been defined and gazetted. There are no clearly defined Production Forest Areas gazetted, nor are there policies or implementing instruments with regard to category III.

In Mozambique, most of fuel wood consumed in the major towns is obtained from nearby rural areas without any fees being charged at all. Hence, the "free access" to the natural woodlands has resulted in the depletion of forest resources. Furthermore, the fact that the Forest Legislation establishes that all rural dwellers have a free access to the forests as long as they harvest wood for their own consumption, could not be reinforced during the years of drought and war when this resource a ready source of income. The access to forest for other benefits such as recreation, cultural activities, etc, is open to all local users. However, user groups are not obliged by law to carry out any management activities in the forests only being called upon by the forest staff through the local chiefs and elders to assist in fire fighting activities. The law established that all those involved in charcoal production or in selling other forest products are required to obtain a license from the Forest Department. Nevertheless, in practice only the commercial loggers obey the regulation despite that due to the limited capacity, the Forest Department has no control over the number of commercial users.

The lack of instruments for reinforcement meant that the major problems of forest and wildlife conservation and sustained management are not yet solved.

3.1 Other existing policies and sustainability

The land policy was used as an umbrella document for formulation of the forestry and wildlife policy especially through the possibility of delimitation and demarcation of community land as a land use category, which has a significant consequence on the Community Based Natural Resource Management policy as well. Other relevant policies in formulation and implementation of the Forestry and Wildlife policy included the agricultural and environmental policies, the tourism policy and energy policy.

The development of these policies also reflects the objectives of the Chapter 11 of the Agenda 21 as well as the principles governing the forestry sector especially the following:

- Generation of economic and social benefits for the current and future generations
- Involvement of the users of the resources in the planning and sustainable use and management
- Conservation of the resources, especially the maintenance of biodiversity

The forest policy is integrated in the priorities of the agricultural sector and rural development, which promotes rational and

sustainable utilization of the resources in order to contribute to the economy and to the rural communities in particular. The main issues in the policies are:

- Encourage participation of the communities and the private sector in reforestation programs
- Promote the processing of wood products
- Reduce the exportation of logs, and ensure value added from the wood products
- Incentive the use of the so called secondary species aiming to reduce the pressure on few species
- Promote the rehabilitation and effective occupation of conservation and protected areas
- Educate the population on the importance of wildlife and reduce poaching.
- Implement measures for protection of endangered species

The policy defines four main objectives: *economic, social, ecological and institutional*. The economic objective intends at encouraging sustainable management and contribution to the GDP by the private sector. The participation of the community in integrated management of natural resources and fire is seen as an important policy objective in the current formulation. It represents a paradigm shift from the emphasis on participatory reforestation to the participatory management of the natural resources. The ecological objective is to protect, manage and use areas of conservation in order to achieve the sustainability of land use and maintain the biodiversity. Finally the institutional objective is to improve the organization of the sector as a whole, training of personnel, and reinforce the technical and administrative capacity at provincial, district and local levels. The sustainability of the forestry and wildlife policy will depend on the implementation strategies.

Other strategies include the establishment of industrial plantations for domestic supply and export by the private sector. The current experience on plantations in Mozambique is of failure due to lack of technical, financial and administrative capacity. Reforestation was once a government strategy for supply of wood products to the major cities and to the only processing industry for the exotic species. In the 1991 strategy for forestry development, a new approach was adopted which consisted of the participatory reforestation, i.e., involvement of the users/communities in the replacement of the resources. Community forestry, social forestry and agro forestry systems were introduced and in many cases did not bring the expected outcome. Therefore, this scenario demands an adequate analysis of the technical and market issues as well as planning the implementation of this strategy.

4. MAIN ON-GOING PROGRAMMES AND PROJECTS RELEVANT TO COASTAL FORESTS

4.1 Mecufi Coastal Zone Management

The Coastal Zone area of the Mecufi district lies between 13° 26'S in the south (the mouth of the Megaruma River) and 13° 26'S in the north. In phytogeographic terms, the Mecufi district is located within a coastal belt of varying width (the Zanzibar-Inhambane regional mosaic that extends along much of the Mozambique coast to Tanzania, Kenya and southern Somalia (MICOA, 1996 citing Hatton & Massinga, 1994).

The Mecufi Coastal Zone Management project was conceived as a " support project " for the government and NGOs active in the project area. The objectives of the Mecufi Coastal Zone Management Project is to reduce pressure on the natural resources base of the Coastal Zone, by encouraging improved management and conservation practices. The goal is to contribute to the conservation of the natural resources in the overall district and general improvement of the living conditions of the rural population. This goal should be achieved through environmental education, direct community participation and inter-sectoral coordination. Duration: 3 years + 9 months (From December 1992 to September 1996). Headquarter at the Mecufi district (Cabo Delgado Province).

The expected results were:

- Secured coordination among the institutions and organizations working in the field of resources conservation in the Mecufi district.
- Strengthened ability of the rural population to practice self-help in connection with measures to conserve natural resources.
- Improved of the socio-economic situation for women
- Introduction or establishment of village management nuclei.
- Establishing a training mechanism to raise awareness among the villagers, schoolteachers, official administration and

extension workers.

- Establishing a strategy for Coastal Zone management in Cabo Delgado.

The project-executing agency is the Ministry for the Coordination of Environmental Affairs (MICOA)

4.2 The Quirimbas National park- The Eastern African Marine Ecoregion

The Quirimbas National Park is the newest national park in Mozambique created and established in 2002. It is the first National Park that Cabo Delgado Province has in its history. It includes the Arquipelago de Quirimbas with eleven islands, coastal zones and the Banco São Lazaro, comprising a total area of 7 500 Km². Quirimbas National Park comprises four ecoregions, namely the marine region (coral reefs and islands), the Mangrove Forest, the Miombo Woodland and the Savanna Grassland. T

The Eastern African Marine Ecoregion has proposed the following actions: Draw up and implement a seascape management plan, which will include: (i) sustainable fisheries management plan, (ii) Sustainable livelihoods and community management; (iii) sustainable tourism development plan; (iv) sustainable financing mechanisms for conservation; (v) Strategies to reduce mortality of endangered species; (vi) Promotion of management and enforcement capacity of local authorities; (vii) develop joint management of transboundary activities in Mtwara-Quirimbas with Tanzania. For more detailed information consult the Eastern African Marine Ecoregion strategic Framework.

4.3 Miombo Project (Mozambique, Zimbabwe, Malawi, Zambia, e Tanzania)

Management of Miombo Woodlands (Project B7-6201/97-09/VIII/FOR)

Sub-projects: Impact of Sectoral, extra-sectoral and macroeconomic policies on miombo woodland management; Forestry Harvesting technologies, Local Institutions enhancement

Mozambique: Sub-project: Impact of Sectoral, extra-sectoral and macroeconomic policies on miombo woodland management.

- Budget:
- Donor Agency: UE
- Implementing Agency: CIFOR
- Duration: 5 years
- Main area of focus: Forest harvesting technologies, Institutional
- Year of beginning: 1996

4.5 Programme Proposal: Sustainable natural resource management for the Zambezi basin, CIDA

Objectives:

The goal of the programme: The maintenance of the Zambezi River Basin as a viable regional resource for development. To conserve the wetlands ecosystems and associated natural resources of the Zambezi River Basin.

The Objective of such programme is:

To enhance the management capacity of the core resource managers and institutions, with emphasis on the ecosystem approach.

The expected long term results include: Improved local, national and regional resource management capacity and therefore reduced rates of deforestation, land degradation, water pollution and water wastage; The establishment of effective and empowered national and regional institutions and/or authorities and, improved regional cooperation in the management of the Zambezi River.

4.5.1 Project: Zambezi basin wetlands conservation and resource utilization project (Mozambique, Zambia, Malawi, Namibia, e Botswana)

Mozambique: *Wetlands resource conservation, tenure and utilization.*

- Budget: (first year) \$1,456,300,
- Donor Agency: The Canadian International development Agency (CIDA)
- Implementing Agency: IUCN country offices
- Duration: 5 years
- **Main area of focus:** agriculture, aquatic weeds, awareness, base-line data, biodiversity, capacity, climate cycles, demographic pressure, education, fire, fishing (other than prawns), forestry, gender, health, hydro-electric dams, indigenous knowledge, land tenure, Mangrove Forests, poverty, resource use conflicts resolution, prawn production, tourism, transport and wildlife.
- Year of beginning: 1996

Six distinct sub-projects: These are the Zambezi Delta in Mozambique (*Wetlands resource conservation, tenure and utilization*), the Lower Shire in Malawi, the Barotse Flood Plain in Zambia, the Chobe- Caprivi area in Namibia and Botswana, IUCN-ROSA and IUCN-Montreal.

The major activities identified:

- Awareness
- Information and communication
- Community well-being
- Inventory, monitoring and evaluation
- Management of wetlands resources

Total expenditure during the first year of project was anticipated to be Canadian \$1,456,300, which made up of national sub-project: Delta: \$352,100; Lower Shire-\$200,300; Barotse Flood Plain - \$242,800;Chobe-Caprivi- 214-900; IUCN-ROSA - \$278,700 and IUCN- Montreal- \$167,500.

“The critical assumption for the ultimate success of this programme is the concept of the ecosystem approach which includes not only cooperation and coordination between nations, but also at numerous lower levels such as between water or agriculture departments”.

4.6 Gaps and weaknesses

In principle some targets were identified and some conservation goal established, but to prioritise them, then the following factors are missing: *size, condition and landscape context**.

Given the critical importance of for example, Coastal Forests (Dune Vegetation, Wetlands, and sand Forests) in maintaining ecosystems and production systems, the focal conservation targets should be well described in terms of these factors so that we can be able to: (I) assess the stresses and its sources[^]. Strictly speaking the target 2(project 4) is a sacred grove (with less than 10 ha of area) currently well protected and conserved by local customs. It is not a community forest area though people use it for cerebrations and ceremonies and is not threatened so far.

Other needs that are not yet being addressed include:

- Gathering of spatial and temporal data in relation with the whole Coastal Forest. Other data may be (i) Land use /land cover (ii) Vegetation map prepared from satellite imagery (LANDSAT) and other sources; (iii) Existing managed areas; (iv) Human population; Road & Other transportation features and (v) Abiotic. This information and data will allow the

* Characterising the size, condition, and landscape context of viable occurrence provides the basis for assessing stresses- the destruction, degradation, or impairment that afflicts the priority target. It also aids in the development of conservation goals and other strategies.

[^] Only the destruction, degradation or impairment of the target resulting directly or indirectly from human causes should be considered stress(e.g.)

planners and the decision makers to visualize in broad-scale what are the main destructive activities taking place in the coast region. For example in some cases especially where traditional customs and knowledge's are longer existing the priorities should be managing people and their economic activities. There is a need to properly manage people. The majority of management problems are created by people and if we do not manage the people, it is impossible to manage the resources (Young 1991, quoted in Soto 2001). With such king of information decision- makers can be better informed and persuaded for the need for conservation of the remaining forest areas.

- Inventory of the Coastal Sacred Forests and others (cultural and spiritual uses). These are the important focal targets for conservation purposes. The assessment will include the location demarcation and mapping of these sacred groves. The lack of data (quantity and status and total area) is one of the important gaps toward Coastal Forest conservation and planning.
- Need to identify the clients (community residents, traditional leaders, planners, resources managers, government officials [various levels], politicians, entrepreneurs, medias and others opinions influencers) and partners and all stakeholders in the conservation and wise use of Coastal Forests.

The main problem has been the fact that some of the development initiatives in private hunting areas or tourism tighten poaching control and limit access to resources consequently locals no longer have access to resources such as meat, timber and firewood for household consumption. Despite the potential for eco-tourism, however, there is currently no framework for recreation and eco-tourism planning in the country. There are currently no standardized criteria for site selection for integrated recreation and tourism planning particularly in the coastal conservation areas and beaches. The only available guidelines not yet put in practice i. e "directivas para avaliação ambiental do turismo costeiro" os SEACAM – Secretariat for Eastern African Coastal Area Management. This is a blue print document as tourism areas in beach settings continue badly planned and with no environmental impact assessment during the establishment phase. Developers have selected the most sensitive dune areas for tourism development adventures.

5. GREENING COASTAL FORESTS RESOURCES VALUES INTO NATIONAL ACCOUNTING

5.1 Coastal Forest Resources

Coastal Forests as Natural Resources Assets are an extremely important but undervalued capital into the global economy. They are many problems, which arise when trying to gain an estimate of the value of these resources, not least of which is the nature of assets themselves (mangroves, dunes forests, gas mines, sacred forest, etc.) The NRA come in many different forms, often have no market values and no standard measurements units. The nature of resources i. e. renewable/no-renewable also brings many difficulties in the estimation of standing stocks. Annual flows and suitable depreciation levels. Another important consideration is that resources can be reduced in quantity through usage but they can also be compromised in quality. These occur through the processes of depletion and degradation. Degradation process is very difficult to quantify (influences often synergistic) with time lagged and cross-border flows). This will be the case of the Sand Forests in the South (Mozambique and South Africa, for example). Costing of the damages to the environment and human health and well being is even more controversial.

Focusing on wild species, their commercial value is quite small compared to that of domestic species, but it certainly is not trivial. In particular, two major industries, forestry and fisheries, rely far more heavily on wild stocks than on plantations and aquaculture. The most known comprehensive study of the contribution of wild species to a national economy was undertaken for the world's largest national economy, that of the United States, by Christine and Robert Prescott- Allen (1986). They estimated that between 1976 and 1980 the harvest of wild species accounted for roughly 4.1 % of the U.S. gross domestic product, about \$27 billion per year, without including the role of wild in agriculture (e. g. wild insects pollinating crops, wild plants for fodder, wild species providing genetic materials for the improvement of domestic species). It is likely that the percentage is much higher than 4.1 % for many developing countries like Mozambique endowed with vast tropical forest and Coastal Forests reach in commercial wild species including wildlife meat and timber.

However a significant portion of the goods derived from biota area not bought and sold commercially (). They are direct used for direct subsistence by the people who collect them. Wild species gathered from nearby eco-systems are often very important to subsistence lifestyle, especially for fuel and building materials. Because of this and other reasons it is not easy to estimating the total volume and values of wild species products that are consumed directly by the people who grow and harvest them.

The aim for ecological economists is the integration of ecological costs and benefits into the System of National Accounts (SNA.). This would lead to more ecologically and environmentally friendly, economically sustainable growth especially for those most rich forests eco-systems, as are our Coastal Forests. They are number of different approaches, which can be followed in the quest for ecological accounting.

Two options exist- the first is the creation of a separate set of accounts for NRA (Natural Resources Assets). These accounts could use a Balance Sheet to record resources stocks and Income Statement to assess annual flows from the Coastal Forests. This system would be easier to implement, as it would not involve extensive revision of the current SNA. The U. N. in their latest revision of the System National Accounts has endorsed this option. The accounts could provide means of measuring and monitoring changes in ecological and environmental conditions through the compilation of measures analogous to GDP (Domestic Gross Product) and other macro-economic indicators. This revised System of Ecological and Economic Accounting (SEEA) has been recommended as the new international standard. It focuses on including the depletion of scarce and sensitive resources and measuring the cost of ecological degradation and its prevention. It could utilize physical accounts and express these in ecological measure additional to the normal national account outputs. Alternatively monetary accounts could be constructed and used to present ecologically adjusted measures of Income and welfare from these coastal eco-systems. They are however extensive problems with monetary valuation of NRA. Keeping the ecological accounts separate from the National Accounts is simpler however; its very ease could make it less useful. The fact that the national account can be completed without ecological measures means that there is no pressure to collect ecological (environmental) data. Secondly because it is separate it will not alter the high impact measures such as GDP and so the same policy choices will continue to be made.

The Second option is complete integration of the ecological costs into the national accounts, this would involve assessing all resources stocks and accounting for all flows which affect the stocks. The difficulty arises in assessing all the National resources Assets (NRA) and the hugely sources of degradation (pollution). When complete this would result in ecological Adjusted National Accounts (EANA), (adjusted for defensive expenditure, NRA depletion and ecological degradation) correspond to a more rigorous definition of income as the maximum amount that can be sustainable consumed. This income concept encompasses not only current earnings but also changes in asset positions. This type of accounting would allow policy makers to still place a lot of emphasis on measures such as NNP (Net National Product) but we would be better for it knowing that they incorporate ecological costs.

5.2 Valuation of NRA

In order to include NRA in any form of national accounting, whether it is directly or through satellite accounts, requires some form of valuation of the assets in question (Eastern Africa Coastal Forest Ecoregion). The question then is, do we value the stocks and flows of the assets in monetary terms or as physical units?

Monetary approach. Monetary valuation would be easiest to incorporate into the SNA but it has extensive valuation problems including the being no market price, no equivalent substitute and non-standard methods. It allows complete integration of ecological costs into SNA. There is however, the question of what exactly we are trying to measure (i.e. current welfare, sustainable income) and this influences the adjustments that are necessary.

Physical approach. Physical measurements make much more logical sense as detailed assessments can be made in the most appropriate measure for the resources under consideration. Physical measures will however, make it nearly impossible to include NRA directly into the National accounts and thus GDP will not be adjusted. Although physical accounts could be converted with relative ease into monetary values and then incorporated, this has the advantage of allowing international comparisons and regional aggregations. Physical measurement is best used with a system of satellite accounts where

ecological accounts are constructed separately. The problem arises in deciding what to measure. To many variables risks duplication and too few may then miss important ecological (environmental) impacts. Most countries recommended the use of around 50 indicators. Characteristics of potentially useful indicators include: (i) a time series of information; (ii) measures which are sensitive to action by controlling authority; (iii) uncontentious, easily collected and processed; (iv) result in a high impact with the relevant audience.

A physical account allows the assessment of the NRA in terms of set standards or target levels. Collected data can be used to forecast future use of NRA (resources budgets). The systems under use have done much for assessing the ecological and environmental profile of the countries concerned and for demonstrating linkages between natural resources (environment) and economy. However the use in economic analysis and the relevance to policy makers is unclear.

6. CAPACITY BUILDING ISSUES AND MANPOWER AVAILABILITY FOR RESOURCES ASSESSMENT WITHIN MOZAMBIQUE

The formulation and implementation of the forestry and wildlife policy is under responsibility of the National Directorate of Forestry and Wildlife within the Ministry of Agriculture and Fisheries. This is comprised of a Department of Forestry which deals with forest management as well as the conservation areas; the Department of wildlife deals with wildlife management and conservation as well as Bee-keeping; the Department of Economics and Development is responsible for planning, control of industry in terms of issue of permission for exploitation of concessions, resource evaluation and data management; the Department of Law Enforcement and monitoring of endangered species; finally the Department of Forestry and Wildlife Research carrying out applied and basic research with emphasis on ecology, management and silvicultural. At the provincial level the Provincial Directorate of forestry and Wildlife (SPFFB) represent the DNFFB.

One of the main problems with the current institutional arrangement is the scarce human resources and their uneven distribution as well as lack of training. Also it can be seen that although the production part (provision of concessions, development of the industry, rational use of the wildlife resources in the state protected areas) can be easily undertaken within the existing structure, the major development and strategy issue in the new policy is the CBNRM and partnership between the stakeholders. Therefore there is need to create capacity for CBNRM outside of the National Directorate of Forestry and Wildlife for implementing pilot CBNRM project.

The manpower shortage is a serious impediment to attain the Forest Department's objectives of development and protection of the forest resources. The current number of manpower hinders the Forest Department to administer, resources assessment and systematically collect stumpage fees. Thus, the revision of stumpage fees and establishment of forest concession guidelines are unlikely to reduce deforestation and generate forest base revenues, unless accompanied by strengthening of the staff and creation of institutional capacity at the National/Province/District Directorate of Forestry and Wildlife. Government needs to develop the capacity to set priorities and monitors progress instead of implementing pilot project with the consequences of overlooking the performance of the implementation.

The point is that a high-level agency for setting policies and ensuring implementation across sectors is needed to sharply improve forest management in the context of Mozambican situation. In parallel, where inter-sectoral decision need to be made like managing the Coastal Forests Resources, Wetlands, Water within a river basin, or protection of large populated forests areas, coordination is required. Then, regulatory and monitoring functions need to be independent. Generalizations are more difficult to make for protecting forests and natural habitats. The value of protecting forests to local communities and regions is often surprisingly high and the value of the land for agriculture is often lower than anticipated. This calls for the planner and managers to carefully analyzing each case and clarify not only how much should be protected, but also who should pay.

The satisfaction of the above policy will depend on the capacity for developing norms governing the use of forests and wildlife, i.e., adequate legislation, but the crucial issue is the capacity to reinforce the legislation. This means that training and recruitment of manpower is a condition *sin qua non*, for successful implementation of the strategies. The state role is to

guarantee the formulation of policy, create conditions for implementation of the legislation, and ensure primary processing, development of eco-tourism, reforestation and rehabilitation of wildlife stocks.

The local government is the main vehicle in law enforcement, control and prevention of fires. On the other hand, the communities shall participate in the planning of use and sustainable management of the resources, take responsibility for law enforcement as regards the use of fire and ensure that they benefit for the resources.

The private sector has to invest on conservation and NRM including SPA (social programmes), form partnership with communities and NGO's, fund raising for conservation of biodiversity and sustainable NRM and assist in building capacity at local level. The current legislation is kin in that the private sector inventing in the forest resources production has due to share the revenues locally produced with the local community, through the provision of jobs, improvement of the local infrastructures and so on. These local communities must benefits from the exploitation and management of the local resources as custodians. Neither government nor aid agencies are equipped to make judgments about how local people value their environment. A participatory process is essential. Local participation also has high economic and environmental returns in implementing programmes in forestation, forest management, soil management and park management.

The main role of the DNFFB is to create conditions for the larger sector to work towards the market-economy basis, through the implementation of the institutional analysis, which resulted in better definition of activities to be carried out by DNFFB, the civil society and the private sector. Also the creation of partnership between the stakeholders is an important strategy for devolving and sharing the costs and benefits of natural resource management. Others duties are: monitoring and regulation of timber extraction in addition to other natural resources management issues; controlling illegal wildlife exploitation.

At the district level the officials may operate depending on the availability of resources for staffing and activities of the district. District Agriculture or DNFFB officials monitor extraction of indigenous timber (timber and charcoal/charcoal), feeding information up to provincial and national structures. At this level technical expertise for resources assessment is lacking. Therefore there is need to create capacity for Coastal Forests (assessment and management). At National and provincial levels though not enough, the sector has same capacities in terms of equipments tools and means needed to assess the Coastal Forest resources. However in terms of manpower and expertise still these levels need to create a capacity for forests assessment and management.

As regards the involvement of the community in NRM, the strategy was *creation of pilot areas of CBNRM, capacity building on participation at all levels, and creation of community based organizations including all stakeholders, creation of legal mechanisms for empowerment of the communities* as regards the access to resources and ownership. The latter relies on the delimitation and demarcation of the community land and its definition as a land use category. There is a compelling need for increased capacity building on the part of community to take advantage of existing opportunities to utilize the Coastal Forest resources and eco-systems wisely as a mean of improving their living standards. So vertical integration of capacity enhancement is required all the way through from the local, national institutions level to the regional policy level.

While many of these skills are urgently required perhaps highest priority is for enhanced abilities in the areas of: (I) resources assessment/ resources use assessment, capacity building, resources use conflict resolution at the local, provincial and national levels.

7. FORESTRY CONCESSIONS

A concession system for timber harvesting has been recognized in international conventions, agreements and protocols as promoting more sustainable and responsible timber harvesting than more conventional techniques. The government has just finalized the process of developing concession system for national forestry resources. A process of competitive bidding should assign commercial concession to companies with suitable industrial, technical and administrative capabilities, assigning them the right to harvest only timber and other non-timber products. In fact they should only start the harvesting after the demarcation and mapping of the concession area including the annual cutting compartments (Plots). This has not

been yet requested by the Forest Department as a condition for commencing the harvest activities and as direct consequence no one has implemented the management plan. The concession regime was and still never controlled effectively and as a result the productive forests, which are part of the country's heritage, are converted into other land uses such as agriculture and animal husbandry. The population living near the areas of exploitation did not benefit at all from the activities carried out and the concessionaires did not reinvest in any infrastructure or in training personnel. Forest Concessions have not been very successful in encouraging sustainable management of tropical forests. Elsewhere, Poore pointed out that several countries have substantial areas of forest that do not quite qualify as under sustainable management. A small additional effort would bring these forests under sustainable management, and most logged areas could be brought into sustainable forest production with little effort.

These improvements are designed to introduce performance incentives into the allocation and operation of concessions. Unless national forest resources can be protected and managed, there will be little forest left to meet the country's growth in domestic demand for forest products, to meet increased export demands, to contribute to the country's economic development and development of the forested regions.

It is acknowledged that in the country, with cutbacks in staff and funding the agencies and ministries responsible do not have the capabilities to manage the forests, or to supervise on-the-ground forest activities. Thus just when forest resources in general and coastal forests in particular are most in need of management and protection, the government is least able to do so. Forest concessions are, by nature, in remote areas. Supervision and monitoring of concession by government forest services is difficult, as we have seen. In other hand there are too many non-timber and environmental benefits from natural forests for deregulation to be an efficient solution.

For natural tropical forests there are opportunities to strengthen forest concession contracts and procedures, to support forest management with economic incentives, to encourage or require concessionaires to undertake forest management activities, and to put forest management and concession management on a more businesslike footing.

More often concessions are beyond the needs of concessionaires in terms of their sizes. Concessionaires acquire large forest areas, often more for future "insurance" purposes or speculation than for regular timber supplies. Not only does this mean that public resources are lying idle, but these unused forests are, paradoxically, also the ones that are especially prone to deforestation by shifting cultivators.

Low forest fees distort forest management decisions; encourage inefficiencies in utilization, silvicultural investment, and conservation. Low forest fees mean that timber is under priced and encourage poor utilization of timber in the forest and by processing industries. Poor collection rates direct individual efforts away from productive activity towards- avoidance and evasion, "rent seeking", "bribe taking" and other "unofficial" payments. Low forest fees provide insufficient revenue to fund government forest management and supervision of concession operations and jeopardize the long-term financial and biological sustainability of national forest resources. Concession fees properly designed, can serve a number of forest policy objectives. In many case forest concessions are not ensuring production of non-timber forest products, or of the non-market, public, or collective benefits of the forest such as water management benefits, environmental and biological diversity benefits.

cutting plan and logging which means that no timber should be alloweble for cutting before the concession has been intirely demarked and gazetted. The forest management concessions should be designed to achieve protection and sustainable management of forest lands for both timber and non-timber forest the land uses.

The major problems are in implementing and enforcing them. The forest concession procedures proposed involve first the allocation of concession contracts by bidding or other competitive allocation, followed by the management of concession by the concessionaire, and supervision, monitoring, and auditing of concession operations by the government. Our suggestion is that supervision, monitoring, and auditing of concession operations should be done by an independent agency so that the performance is well assessed. On the ground inspection of forest boundaries, proper layout of roads and inspection of road plans, on-the-ground inspection of logging plan layout and marking of trees, and on-the-ground inspection of logged areas

following logging are key monitoring indicators. If implemented they could also provide the basis for certification of forest management and of forest products.

If the country is to achieve sustainable forest management on forest concessions a way must be found to fund and implement on the ground inspection and supervision of concession. And boundary marking is a key step in management of forest concessions and in the prevention of agricultural incursions.

A well-designed road system and proper road construction will contribute to an efficient logging system, reduce logging and log transport costs, and minimize the environmental impacts of logging. This should provide concessionaires with an incentive for efficient road planning and construction. However, in practice, with a very short-term horizon, concessionaires often put insufficient effort into road planning and construction. The result is inefficient road layout, expensive log transportation, and environmental damage from poor road layout. For efficiency, road inspection can be combined with on-the-ground inspection of the logging plan and inspection of the tree marking. It is important that the on-the-ground inspection of road layout, the logging plan, and tree marking be done and approved before logging begins.

The cutting area should be inspected on the ground again following logging to ensure that the logging was done according to the silvicultural plan, that logging was done in line with environmental requirements and with minimum damage to the residual stand, that only marked trees were cut, that logs and felled trees are not left, and that only marked trees are harvested. So that the performance review provides the incentive for concessionaires to manage the forests sustainable both for timber and for the non-timber environmental benefits.

7.1 Wood Export Bans

As listed in the section AAA, some of the issues that the policy addresses are: The main issues addressed in the policies are: (i) Promote the processing of wood products; (ii) Reduce the exportation of logs, and ensure value added from the wood products; (iii) Incentive the use of the secondary species aiming to reduce the pressure on few species; (iv) Promote the rehabilitation and effective occupation of conservation and protected areas; (v) Implement measures for protection of endangered species.

Mozambique has two kind of timber harvesting licenses viz. forest concession and felling license (simple License system), the latter being widely granted for limited quantities over a limited period of time. By regulation these licenses should be issued for different forest types, but in practice they use the same forest type, productive forest. Concessions are supposed to operate under forest management plans in order to allow a sustainable forest use, while no obligation is placed for the harvesting under simple license. Both operators have the same export market that gives more advantages to the simple license in competitiveness terms

In order to create more timber processing capacities and jobs and reduce logging exploitation Mozambique is undertaking and implementing logs exports restrictions as a policy implementing strategy that is perceived to make logs cheaper for the domestic mill sector, which is supposed to expand. Few species are allowable to export as log (*Pau preto- Dalbergia melanoxylon and monzo, pau rosa*). The rationale argument for this is that it presses log values and income by more than the value added in processing and later exports to lumber or plywood. In fact this is true and less complicated issue if processed product exports are not limited. For the Timber harvesters, the nation forgoes high export log prices. The general perception is that, there is the environmental benefit of less logging if export restriction can reduce overall harvest levels.

To summarize, in addition to environmental benefits if total harvests are reduced, gainers from wood export restrictions are domestic log processors (concessionaire) buying cheaper logs on the open market. However, under competition it's ultimately domestic consumers who gain from lower wood products prices. In case in analysis for export bans on logs, it is not always clear whether net effects will be positive or negative, especially in our case with very limited capacity of processing plant.

7.2 Forest certification

Certification of forestry and wildlife products, i.e., use of sustainable harvesting technologies and environmentally sound eco-tourism allowing conservation of resources and biodiversity will increase the competitiveness of the local produce in the international market.

7.3 Summary of some constraints

Forestry and Wildlife

- Lack of technical staff and manpower.
- Lack of equipment, infrastructure and funds needed to mobilize existing staff in the field
- Inadequate and uncompetitive salaries
- An absence of any mechanism through which the agency can retain revenues and re-invest them in the conservation of wild resources

Specific to the Forest Resources

Poor management and increased degradation of natural forest resources due the:

- No boundary demarcated or retracement surveys required for forest concessions purposes
- Inefficient use of commercially valuable forest resources
- Rural communities are not involved in the license process for forest exploitation or conservation of forest reserves
- The growing demand for firewood;
- The expansion of agriculture and inadequate agriculture practices;
- Forest burn due to the shifting cultivation, hunting and honey gathering

Specific to Wildlife

- Depleted wildlife as a result as unsustainable use
- An absence of protection and management systems due to an absence of staff in the field
- Difficulties in tourism development (poor infrastructure inside and outside of the Parks)

7.4 Link to socio-economics and resources assessment.

Small scale farming on land derived from slash and burn agriculture is common on the nutrient poor sandy soils throughout the coastal region. Since 1994, the situation in the southern African sub region has changed significantly, due to the improved political situation throughout the sub-region, as well as the gradual establishment of peace and stability in the country. These inter-related events have led to an increase in tourism activities along the coastal area. Of concern in tourism development is the granting of concession areas (some several thousand hectares in size) for camping grounds, ecotourism ventures, etc, activities that compete with local communities for the limited space and resources along the coastal zone. The illegal and uncontrolled tourism activities are a cause for increasing concern along much of the southern Mozambican coast. Illegal harvesting of fish and forest resources is widespread along the coast. These and other socio economic activities are causing a massive degradation of the Mozambican Coastal Forests.

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ANNEXES

ANNEX 1 . NATIONAL PARKS

Name	Location	Area (Km ²)	Year/ Proclamation	Objectives
Gorongosa N. Park	Sofala	3 770	1960/1993	Protection: diversity, habitats, ecosystems and its associated flora and wildlife
Limpopo N. Park (ex-hunting area 16)	Gaza	10 000	2001(1969) /2001	Ecosystems protection; Part of transfrontir (big Limpopo Park)
Zinave N. Park	Inhambane/Gaza	3 700	1973/1973	Protection: Semi-arid ecosystems and associated wildlife(girafa Ostrich, etc)
Banhine N. Park	Gaza	7 000	1973/1973	Protection: Semi-arid ecosystems and associated wildlife(girafa Ostrich, etc)
Bazaruto N. Park	Inhambane	156	1971/1971	Protection: marine species (dugongo, marine tarta)
Quirimbas N. Park	Cabo Delgado	7 500	2002/2002	Conservation: Coastal and marine ecosystems

Annex 2 : Hunting areas(coutadas)

Name	Location	Area (Km ²)	Year of establishment	Objectives
Coutada4	Manica	12 300	1969	Conservation and Tourism
Coutada5	Sofala	6 868	1972	Conservation and Tourism
Coutada6	Sofala	4 563	1960	Conservation and Tourism
Coutada7	Manica	5408	1969	Conservation and Tourism
Coutada8	Sofala	300	1969	Conservation and Tourism
Coutada9	Manica	4 333	1969	Conservation and Tourism
Coutada10	Sofala	2 008	1961	Conservation and Tourism
Coutada 11	Sofala	1928	1969	Conservation and Tourism
Coutada 12 Coutada	Sofala	2963	1969	Conservation and Tourism
13 Coutada14	Manica	5683	1960	Conservation and Tourism
Coutada 15	Sofala	1353	1969	Conservation and Tourism
	Sofala	2000	1969	Conservation and Tourism

Highlighted are hunting areas in the Coastal Forests

ANNEX 3. National Reserves.

Name	Area (Km ²)	Year of establishment	Location)	Objectives
Niassa Partial Reserve	45 000	1960	Niassa	Miombo Woodland conservation and its associated wildlife
Marroneu Reserve	1 500	1960'82	Sofala	
Gilé Partial Reserve	2 100	1960/82/	Zambezia	Buffalos(protection)
Pomane Hunting Reserve	200	1964	Inhambane	Rinos (protection)
Maputo Elephant Reserve	700	1960/1932/1994	Maputo	Mangais (protection) and Elephants (protection)

Annex 4. Coastal Forest reserve blocks

Name	Location	Area (Km ²)	Status
Mecuburi Forest Reserve	Nampula	1 954	
Mapalué Forest Reserve	Nampula	51	
Ribaué Forest Reserve	Nampula	52	
Matibane Forest Reserve	Nampula	42	
Baixo Panda Forest Reserve	Nampula	196	
Derre Forest Reserve	Nampula	1 700	
Moribane Forest Reserve	Zambezia	53	
Nhapakue Forest Reserve	Sofala	31	
Nhamitanda Forest Reserve	Sofala		
Inhaminga Forest Reserve	Sofala		
Bobole Forest Reserve	Maputo		
Licuati Forest Reserve	Maputo		