<u>WWF EASTERN AFRICAN COASTAL FOREST PROGRAMME</u>

THE COASTAL TERRESTRIAL FORESTS OF KENYA

A REPORT ON

RESOURCES THREATS AND INVESTMENTS

Anthony Githitho

MARCH 2004

SUMMARY

The purpose of this report has been the assessment or re-assessment of the coastal forests of Kenya which fall within the Eastern African Coastal Forest Mosaic. The desk study sought to determine their current total area, distribution, quantity and quality. This was due to a recognition that although adequate information on coastal forests was available it was not fully collated for the purpose of planning for conservation projects in the area. Much of the information available also needed to be updated in the light of current knowledge and field experience.

The study concluded that vegetation which falls within the definition of Eastern African Coastal forest and its variant was approximately 139 000 ha (1390km2) which included woodland and coastal scrub forest as defined by White (1983) and refined by Burgess at al (2003). The previous figure of 66 000ha (660km2) is closer to the extent of classical true closed forest in coastal Kenya using exisiting data. Only under half of the 1390km2 inclding most of the closed forest was protected by various types of legal gazettements, the remainder, mostly in the woodland and scrub forest remained unprotected. Most of the sacred Kaya forests of the Mijikenda were now protected as National Monuments.

However,it was regretted that the data on which these estimates are made needs to be updated especially concerning unprotected forest areas which may have changed significantly since the last extensive survey was done almost 15 years ago. There is an urgent need to undertake a similar ground survey besides securing current remote sensing data for the coastal forest region. This exercise would provide the foundation for a comprehensive monitoring database sysem for coastal forests.

Past and current investments in conservation projects for Coastal forest were also analysed revealing a bias towards certain forests due various historical factors as well as their relative accessibility. They were also the largest and important for biodiversity. To remedy in future this it was suggested that future projects should be targeted at new and more inaccessible areas which face increasing and in some cases extreme threat. Such sites include among others:

- Tana Gallery Forests (under extreme threat).

- The Lamu District Woodland Scrubland System (Boni, Lunghi, Dodori etc)

- Brachystegia woodlands of Malindi North

- The medium sized forests > 500 ha mostly ocurring in South Kwale District

- Islolated Hill forest outliers such as Mwangea and Kilibasi

- The small high diversity patches on limestone outcrops of Kilifi and Kwale District

Unfortunately despite the recommendations of numerous survey and other reports the above forest areas are still largely unprotected. A primary component of conservation projects in these forests should therefore include bringing these sites into protective management of one type or other. Experience over the years has proved the value of gazettement as a primary conservation tool even if resources often lack to follow through on monitoring and active management.

A prioritization method undertaken by the Kenya Coastal Forest Task force in 2002 was revisited and seen to have merit. The prioritization however is best applied to identify and rank specific types of problems for intervention as opposed to absolute prioritization of sites. These include lack of baseline information, management infrastructure and level of immediate threat. It should be developed further and will serve as a useful tool to guide project development in future.

TABLE OF CONTENTS

COASTAL TERRESTRIAL FORESTS OF KENYA

1.   INTRODUCTION

The Kenya Coastal Forests are that portion of the Eastern African Coastal Forest system (EACF) which falls within the limits of Kenya's border with Somalia to the north and its boundary with Tanzania to the south. For purposes of this report it may be useful to define what constitutes an Eastern African Coastal Forest and this is attempted below.

1.1   THE EASTERN AFRICAN COASTAL FOREST SYSTEM

The Eastern African Coastal forest system as applied in this report (after IUCN) is an extensive one starting from as far south as the southern coast of Mozambique and extending into southern Somalia.

While the Eastern African Coastal forest of which Kenya is a part is defined primarily by geographic location, in addition the term 'coastal forest' has come to be associated with certain ecological / vegetational characteristics and climatic effects. This means that while most of the EACF occur along the coasts, certain sites have been identified as coastal forests which are not strictly coastal in location. Hence the Malawi Hills ecosystem though a considerable distance inland are regarded as being part of the EACF system.

What are the defining vegetational formation features of Coastal Forests? Using White's (1983) definition of 'forest' as a starting point ie.

> *'a continuous stand of trees with canopy varying in height from 10 m to 50 m or more, characterized by; several layers or storeys; tree overlaps interlaced with lianas; a shrub layer densest in forests with more open canopy. A true forest has sparse ground layer and may be absent or consist only of bryophytes. '*

then the typical EACF formation consists of *s*emi-evergreen or evergreen undifferentiated dry forest with the provision that:

(1) eastern African Coastal Dry Forests can occur where atmospheric humidity is high throughout the dry season, and
(2) these eastern African Coastal Dry Forests may have a lower canopy (to 7 m) than the minimum limit of 10 m adopted in White (1983). Representative samples include the '*Cynometra webberi-Manilkara sulcata'* community of the Arabuko-Sokoke forest.

The lack of clear 'differentiation' in the EACF is a very defining characteristic. The high number and diversity of species and the close commingling and complicated patchwork of the forests make it difficult to identify individual dominant elements which can be used for classification by forest ecologists.

Variant formation types include the *Eastern African Coastal Scrub (*White, 1983) which is intermediate in structure between forest (canopy height > 10 m) and bushland or thicket (canopy height < 10 m). In eastern Africa scrub forest may have a lower canopy (to 4 m) than the lower 7 m limit imposed by White (1983), but retains other forest features such as overlapping tree crowns, abundant lianes, a leaf-litter layer and emergent trees which

often exceed 10 m in height. Herbs are scarce to absent. Representative examples include scrub forest near Msambweni. Variant vegetation formation subtypes include the *Eastern African Coastal Brachystegia Forest (*White, 1983) dominated by *Brachystegia spiciformis* as seen in Arabuko-Sokoke forest. This formation type occurs on degraded/poor white soils with canopy crowns that rarely touch and never interlock and lianes and grasses are usually scarce or absent making it impenetrable by fire.

A Transitional Vegetation Formation sub-type include the Eastern African Coastal Riverine/Groundwater/Swamp Forests *(*White, 1983) in areas where the water table is high or where drainage is poor e.g along the Tana River where dominant canopy trees are predominantly of species with wide tropical African distributions but understorey trees and shrubs are dominated by species restricted to the Coastal Forest belt. Another is the *Eastern African Coastal/Afromontane Transition Forest* ('Transitional' Vegetation Formation type (White, 1983) in lowland areas at the base of the Eastern Arc and near the summit of the Shimba Hills, where rainfall is high.

As defined above the eastern limit of coastal forests of east Africa include the offshore islands of Pemba, Zanzibar and mafia and all islands up to 100 km east of the continental African coast between 2^0-25^0S but may also include Inhaca Island at 26^0S. **Mangrove forests are not included as eastern African Coastal Forests, since they are treated as an azonal vegetation unit outside of the Zanzibar-Inhambane region (White, 1983a, p.260) but they form an excellent transitional link and intervention zone between the Coastal Marine and Costal Forests eco-regions** as defined by WWF-EARPO. The northern limit include Somalia between Bad Daada and Raas Kaambaoni as described in Friis and Vollesen (1989) and mapped in Friis and Tadesse (1991). The forests belt occurs further south at the Kenyan-Somalia border, where the Mundane Range of hills meets the sea. An outlying island of the coastal forests occurs further to the northwest along river Tana (Medley, 1992).Altitudinal ranges from sea level to a maximum altitude which varies according to local ecological conditions, but is no where more than 1100 m in Tanzania

The EACF can also be seen as a patchwork consisting of closed true closed forest patches (re White definition) and all the intervening habitats between the core areas. It falls within the biogeographical region defined as the Zanzibar-Inhambane Regional Mosaic, one of the 18 such regions on the African Continent. The WWF-US include the EACF (referred to as the Northern Zanzibar-Inhambane Coastal Forest Mosaic) among its 'Global 200' priority Ecoregions'.

Hence the Eastern African Coastal Forest system is not merely confined to classical closed forest but variants of them, some structurally quite remote from true forests. In other words all the components of the mosaic will be regarded in this report as EACF types or forms. These include in addition to undifferentiated true closed forest:
- **Scrub Forest**
- **Swamp Forest**
- **Transition Woodland**
- **Woodland/Scrub Woodland**
- **Evergreen and semievergreen bushland and thicket**
- **Edaphic grasslands**
- **Secondary Grasslands and Wooded Grasslands**

- **Mangrove Forests**
- **Salt tolerant Beach Crest Vegetation, saline grass flats**

This provision has important implications in the analysis and review of Kenya Coastal Forest Cover data that will follow later in this report. Failure to agree on it has tended to create confusion elsewhere due the differences between EACF and the true forest type definitions

1.1.1 REGIONAL BIODIVERSITY VALUES

The floristic composition of the EACF indicates that coastal forests are dominated by trees whose global distribution is limited to the Eastern African Coastal Area. This feature is shared by organisms in other groups including birds, reptiles, amphibians and others. The EACF has been placed among the WWF Top Global 200 prioruty ecoregions to reflect its conservation value in terms of endemism and sheer diversity as well as the perceived threats it faces which are severe. Together with the Eastern Arc Mountain system, the EACF has been identified by the Critical Ecosystem Partnership Fund as one of its 25 top biodiversity 'hotspots'. Among its distinctions it ranks first for the densities of endemics for plants and for all reptiles among the world's hotspots.

Conservation International ranks the EACF 11th in species endemism and BirdLife International ranks it as one of the most globally important Endemic Bird Areas (Bennun &Njoroge, 1999). It is ranked by WWF as among the top 200 out of the worlds 850 ecoregions that are most important for global biodiversity conservation. The region contains many strictly endemic species, comprising 1,366 known endemic plants and 100 endemic animals, and shares many species with the adjacent Eastern Arc mountain ecoregion that is also of global biodiversity significance. In the whole EACF ecoregion, there are more than 4,500 plant species in 1050 plant genera with around 3,000 animal species in 750 genera (WWF-US 2003).

2. COASTAL FORESTS OF KENYA

The Eastern African Coastal Forests which fall within Kenya are found in the Coastal Districts of Kwale, Mombasa, Kilifi, Malindi, Tana River and Lamu with an extension in the inland district of Garissa in the far north west. **Although administratively within Kenya's Coast Province, the Taita Hills are not considered as Coastal Forests but rather as part of the 'Eastern Arc' mountain vegetational system which extends into Tanzania and includes the East Usambaras and Udizungwas**. In common with the EACF in the other Eastern African countries, the forests are characterized by tremendous diversity and also high fragmentation due to human activities over millennia.

Forest Types

The lack of differentiation of the vegetation makes analysis difficult except in the broadest sense but various attempts have nevertheless been made through the years. These include classifications by Dale (1939), Moomaw (1960), Greenway (1979), Polhill (1990) and others. White's classic description (1983) however continues to be the most used as it accommodates the bewildering diversity well. Within White's classification, Robertson and Luke (1993) identify 11 different vegetation types and provide examples

occurring on the Kenya Coast. which we will quote here. The forests in various parts of the region have one or more of the types present.

Table: Zanzibar-Inhambane Forest Vegetation sub-types from White (1983) occurring in Kenya (after Robertson and Luke 1993)

Biogeographic Region	Vegetation Type	Forest Site Examples
Zanzibar-Inhambane Regional Mosaic	Undifferentiated forest (wetter and drier types)	Wetter: Buda, Longomwagandi, Jibana, Raba Drier: Marenji, Kilibasi, Kivara, Kauma
	Transitional 'rain' forest	Wet valleys in South East facing Shimba Hills. (Not true rain forest but recives highest rainfall)
	Scrub Forest	Boni Forest, Edge of Tana flood plain
	Swamp Forest	Lower reaches of the Tana River, Ramisi
	Transition Woodland	Brachystegia Woodland in low-lying sterile soils eg Arabuko Sokoke, Marafa, Ganze
	Woodland/Scrub Woodland	Leeward base of Shimba Hills, Mwangea
	Evergreen and semievergreen bushland and thicket	Coastal thicket on coral rock, Brachylaena/Cynometra thicket on red Magarini sands
	Edaphic grasslands	Tana Delta, lower Dodori and Duldul Rivers
	Secondary Grasslands and Wooded Grasslands	Ukunda Area, Kwale District
	Mangrove Forests	Tidal lagoons and creeks, concentrated in Lamu area
	Salt tolerant Beach Crest Vegetation, saline grass flats	Shoreline

2.1   DATA, SURVEYS AND DOCUMENTATION

2.1.1   SOURCES OF INFORMATION ON FOREST RESOURCES

A number of sources exist for various types of information on coastal forest resources in Kenya. The text information or data is in the form of various reports on CF, compiled or prepared over the years by processing or analysing data obtained from field . Most of these reports are included in the bibliography. They are to be found in the libraries and offices of Resource management, Research and conservation institutions such as the Forest Department, Kenya Wildlife Service, National Museums of Kenya, Directorate of Regional Surveys, and conservation Bodies like WWF, Nature Kenya, IUCN and others based in Kenya. Unfortunately there is no central repository or resource centre where all such reports may be available together for reference and monitoring purposes and this may be desirable to facilitate coastal forest conservation programmes.

Visual, mage or spatial data on coastal forests is available in processed and raw form from various institutions with the mandate of compiling such information within the state and private sector. The private concerns would only have material if they have

undertaken assignments in the relevant area but State and International bodies are obligated to carry out periodic surveys. Below are institutions active in this area:

<u>Survey of Kenya, Nairobi (Government)</u> which has aerial photographic material relating to coastal forests among other resources at varying scales and prepared at varying times from the first half of the last century. The images are used to prepare various standard topographic maps for general and specific use by the public but are available in SOK archives. The SOK has undertaken a number of Land-Use mapping projects in the past including one supported by JICA in the mid-80s which included the Coastal Forests.

<u>Directorate of Resource Surveys and Remote Sensing DRSRS, Nairobi:</u> This department set up by the Government in 1975 to coordinate ecological mapping and monitoring in rangeland areas expanded its activities to include resource mapping of all kinds, The DRSRS possesses aerial and satellite material on coastal forests which it has the technical capacity to develop based on client need.

<u>Regional Centre for Services in Surveying, Mapping and Remote Sensing – RCSSMRS, Nairobi</u>. This is an International Centre based in Nairobi and specializing in satellite remote sensing information and training set up under the auspices of the United Nations Economic Commission for Africa. The centre is able to provide raw or processed satellite data in respect of all natural resource areas including Coastal forests.

<u>Private Commercial Companies</u>. Private Commercial Companies also exist provinding services in the area of aerial resource surveys and mapping. Examples are East African Geosurvey Ltd and Photomap Kenya, both based in Nairobi. Services include aerial photography as well as digital and conventional mapping.

<u>Kenya Marine and Fisheries Research Institute KMFRI</u> This institution located at Mombasa is the custodian of a Geographic Information database developed by UNEP to accompany the Kenya Coastal Atlas as part of the Eastern African Atlas of Coastal Resources Project EAF/14 in the late 90s. The database was developed using available processed data and new satellite imagery of the time and is updated regularly by KMFRI. The database is available for use to the public (Onganda, pers com 2004).

These bodies together represent a vast untapped resource available for the mapping and monitoring of Coastal forest resources together with biodiversity related experts at institutions like the National Museums of Kenya and NGOs like Nature Kenya.

2.1.2 PHYSICAL EXPLORATION AND DETERMINATION OF COASTAL FORESTS

While remote resource information has been available in the above institutions for may years it has only on few occasions been utilized to develop a complete picture of coastal forest resources by providing a basis for the actual physical exploration and analysis of the forests on the ground. This owes to a number of historical factors including low prioritization and poor insitutional coordination which will not be covered here.

The detailed physical exploration of the coastal forests of the later years tended to proceed almost as a parallel activity to the state aerial surveys using only the most generalized and widely available map information. The surveys were effective all the same in spite of this. Some of the earlier forest surveys by the Forest Deprtment actually preceded the wide use of the aeroplane.

The exploration and documentation of Kenya's Coastal forest from which we obtain most of our data on forest sizes and compositions has taken place in two broad phases: during the process of reservation through which forest and national reserves were set up by the Colonial Government in the first half of the 1900s and later in extensive botanical surveys of forest areas and their status particularly in the 80s.

Surveys for Reservation by Government in early 1900s

The process of reservation or setting apart of land for forestry uses in Kenya began shortly after the formation of the Forest Department by the Colonial Administration in the last years of the 19th century. The Coast region was of course included in the process and may have been the location of the first terrestrial forest reserves or Crown Forests as the Government was first based at the seaport of Mombasa. Mangrove forests had already been gazetted by 1896. The primary objective of established these forest areas was the protection and controlled utilization of wood resources.

Reservation at the Coast followed extensive surveys of unclaimed land within the 10 mile coastal strip (which marked the limit of Government as against local tribal community owned land). The surveys were undertaken on foot by Colonial Forest Officers employing porters and pack animals as there was no motorized transport and no roads. Any significant area of uninhabited or sparsely settled forest or woodland was examined to determine its area, species, timber quality (rather than species diversity) and any existing local rights or claims. The rule of thumb was that any area of forest exceeding 1 mile square was to be designated by the crown as forest.

The site was demarcated and fixed on a map and boundary marks placed. Proclamation as a Crown Forest would follow after this. Thus Government records document the first exploration and demarcation of the sizeable Arabuko Sokoke forest and Shimba Hills by 1910 (Forest Department records). The demarcation was mainly based around closed forest patches and it would appear from records that extensive areas of woodland were exluded by the exercise. According to one account for example, the plain south and east of the Shimba Hills was 'well wooded but had practically no forest or large groups of trees, nor trees of a large size' (Battiscombe, Forest Officer, in a letter to the Chief Conservator of Forests, 1908. Forest Department Records).

The process continued with the smaller forests until by the late 1930s most (but not all) areas with significant closed forest cover (using the 1 mile square rule) had been demarcated and gazetted FRs as they stand today. The exceptions to Forest Reserve gazettement were the Kaya forests relatively small forest patches identified by local tribal Elders as sacred sites for burial and other religious rites. These remained under the nominal control of local communities as well as all forests or woodland west of the 10 mile limit. Much later these sites would also be explored extensively in botanical surveys and come under other protective categories such as National Monuments. By the end of the 1930s coastal forest exploration for gazettement had reached the Lamu and Garissa area which represented the northern limits of forest and woodland (although falling within the EACF mosaic as we know it).

Floristic (botanical) and other related surveys in later years

In the second half of the twentieth century the work of individual botanists and other scientists in the coastal forest areas many not yet protected by the state (see section on reservation), underlined their enormous biological diversity and wealth of species. A number of the collections were made in Kaya forests preserved by traditional customs as sacred sites underlining the link between nature and cultural conservation in the region.

The scientists published scientific and other reports of their findings and expressed concern over the loss of forest cover and species of coastal Kenya. At scientific meetings and conferences increasing priority was being placed on obtaining better knowledge status of the coastal plant communities and developing strategies for their conservation especially those sites outside protected areas.

A number of important coastal forest surveys arose out of this process particularly in the 1980s, the most notable being a floristic survey of the Mijikenda Kaya forests by the National Museums (Robertson,1986), and a broader NMK botanical survey of all coastal forests by Robertson and Luke (1989-91). These studies were supported by the World Wide Fund for Nature. The driving force behind these later coastal forest surveys was therefore primarily conservation of species although their effect was to cause more of the coastal forests especially the small forest patches to be recognized for their conservation value and brought under State protection.

Floristic Survey of Sacred Kaya Forests, 1986

The Floristic survey of the Mijikenda Kaya Forests undertaken in 1986 arose out of the consistent findings of botanical studies at the coast over the years that these forest patches were highly important for plant species conservation. There was also concern that they were seriously threatened. The purpose of the survey undertaken by Ann Robertson of the NMK with WWF support was to determine the locations, size and status of as many Kaya forests as possible, hold discussions with local Elders about ways to conserve them and undertake botanical collections where possible.

The sacred Kaya Forests are situated in the coastal plain and coastal hills of Kenya, in East Africa and are residual patches (10ha -400ha) of the once extensive lowland forest of coastal Eastern Africa. Kayas have survived due culture and history of the (9) coastal Mijikenda ethnic groups. According to local traditions the forests historically sheltered small fortified villages ('Kaya' means homestead) of their ancestors when they first appeared in the region three centuries or more ago pursued by northern enemies. It would appear from early Government records that certain Kayas still held sizeable villages by the early 1900s. As conditions became more secure, the groups left the forest refuges and began to clear and cultivate away from them.

However the sites of the original settlements, often marked by forest clearings, were maintained by the communities led by their Elders, as sacred places for burial grounds, traditional ceremonies and as a symbol of community identity. The secret protective magic of each Mijikenda group (Fingo) was believed to be hidden there. Cutting of trees and destruction of vegetation around these sites was prohibited and while the surrounding areas were gradually converted to farmland, the Kaya sites remained as forested patches of varying size. All of the 9 Mijikenda groups have a Kaya or Kayas that they are identified with. Over time there had had been a decline in knowledge and respect for traditional values particularly in the last three or four decades resulting in the degradation and loss of many of the small Kaya forests and groves. This was coupled

with a rising demand for forest products and land for agriculture, mining and other activities due to increased population.

The 1986 survey covered over 20 Kaya sites recorded talks with Elders and collected interesting and also rare plant speciments was instrumental in bringing the Kayas to the attention of Government as valuable cultural and natural heritage. It also helped to build support for the Kaya Elders in the proteciton of the sites in conservation circles. Starting in1992, the State began to gazette Kayas as National Monuments. To date 40 Kaya forest sites have been gazetted (See schedule in Appendix).

<u>The Coast Forest (floristic) Survey 1989-91</u>

The Kaya forest yielded much of botanical interest and environmental concern and WWF-International agreed to support a broader botanical survey of coastal forests,status, conservation and management between in 1989-91. The project sought among other things to:
- Document the current status of Kenya's Coastal Forests
- Develop recommendations for protection and conservation of unprotected areas of Kenyas Coastal Forests

As part of the exercise a limited aerial survey was undertaken. Almost all of the larger forests and many of the other smaller forests were visited on the ground, <u>areas estimated</u> and plant collections made. The emphasis was on sites which had been little visited or documented. A comprehensive checklist of all known vascular plants of the coast region was prepared.

A comprehensive report was prepared with a number of critical recommendations including the protection of threatened high biodiversity patches such as Mwangea Hill, Kilibasi, Lunghi and Boni and Ras Tenewi, and better management of the Tana Primate National Reserve. The report was also attempted to prioritize sites in terms of their plant conservation importance. An interesting feature of this schedule was the fact that four Kayas appeared among the top ten prioritized sites. Most of the existing data on unprotected forest patch sizes and status derives from the report of this survey and it was the last major one undertaken.

2.2   CURRENT ESTIMATES ON COASTAL FORESTS AREAS AND DISTRIBUTION

Several attempts have been made to estimate the area of Coastal forest vegetation in Kenya over the years. For example Wass (IUCN, 1995) put the area of closed canopy forest of the Coastal Forest Region at 66 500 ha (665 km2) with an additional 16 000 ha (160 km2) termed as 'other forest associations' making a total of 825 km2. The Kilifi District Forest Masterplan (1994) estimated the forest cover of the then Kilifi District (now Kilifi and Malindi), to be approximately 100 000 ha (1000km2) including woodlands. This did not include Kwale District in the south coast where Shimba Hills is located. Burgess et al (2000) estimated the total area of the Kenya Coastal Forest Mosaic to be 66000ha (660km2). Burgess drew extensively from the CFS report of Robertson and Luke (1993).

A comprehensive table of all known forests and forest patches found at the Coast has been prepared this report (see appendix). The information was gleaned from various sources including literature review of past surveys, as well as reports from field work and experience by conservation workers active in the area such as the Coastal Forest

Conservation Unit. Consultations were held, in particular, with the Executant of the Coast Forest Survey for her views on the quality of the data based on her recollections and projected trends. The lowest, most conservative estimates were consistently used where no hard data existed.

The total <u>estimated</u> area of Coastal Forest cover (as opposed to gazetted area) in Kenya would appear from close study of existing data to be 139 000 ha (1390 km2) distributed over 107 forest fragments. This figure differs considerably from 66 000 (660km2) quoted widely in recent years from Burgess and others although it is largely from the same data, (including the Coast Forest Survey Report). One reason for this difference may be that we have included in our definition of 'Coastal Forest' all the forest types including transitional woodlands and other variants which are regarded as elements of the EACF. It is not completely clear whether Burgess et al worked on this basis and if so some inconsistencies are noted in the computation.

For example, the total Kenya CF area quoted by the IUCN report as stated above is 66 000 ha. However the from our table the combined estimated forest cover of just the Arabuko Sokoke forest (37 000ha) and the north Malindi Brachystegia Woodland area (30 000ha) already exceeds this figure. This is without the Kwale, Tana River and Lamu forest areas being considered. Could this be because the Brachystegia woodlands were discounted from the CF mosaic in other accounts? In the end, only a comprehensive remote sensing data analysis will resolve the question of total vegetation cover. That said some statistics for Kenya Coastal forest areas are provided below.

Table: Kenya Coastal Forests including Management Categories

Category	Land Tenure	Management Authority	Number Sites	Area Demarcated	Est.Total Area Forest	Comments
National Reserves	County Councils	Kenya Wildlife Service	4	114460	25 400	Including Shimba Hills NR
Forest Reserves FR	Government	Forest Department	14	63784	45 645	Excluding Shimba Hills
FR/NM dual sites		FD / NMK	3	2121	1190	Double gazetted
National Monuments NM	Government Local Authority	National Museums of Kenya	39	3844	3188	Most are sacred Kaya Forests
National Parks	Government	Kenya Wildlife Service	1	620	60	Unmanned adjacent A/Sokoke
Unprotected	-Local Authority -Govt. -Private	N/A	46	N/A	63 526	Includes a number of sacred groves

TOTALS			107		139 009	

Note: Shimba Hills is gazetted both as a Forest Reserve and a National Reserve. The National Park area is

Classification/Distribution of Kenya Coastal Forests by Size.

The distribution of Kenya Coastal Forest vegetation is rather complex and depends very much on definitions. A rough classification below makes a distinction between true closed forest and other variants within the mosaic.

Closed Forests within Kenya EACF Mosaic

There relatively few large true closed forest blocks or assemblages (tight groups) within the mosaic in Kenya, including the Shimba system and Arabuko Sokoke and possibly Brachystegia woodland which exceed a coverage of 9000 hectares each. The remaining closed forests occur as much smaller patches which can be roughly grouped into two categories:

- Very small fragments ie. Less than 500ha. Many of the Kayas fall within this group which are distributed quite widely over the whole coastal area.
- Fragments over 500 ha (but rarely exceeding 1500 ha). Most forest patches in this group are Forest Reserves occurring in Kwale District of the south coast. However Mwangea Hill and the Rabai Group (total assemblage: Bomu/Fimboni, Mudzimuvya, Mudzimuiru, Mzizima) in the North Coast would also fall in this category. The term 'medium sized' has been used to group them although this may be a misnomer considering the difference in area with the large forests which is very great

Woodlands and other EACF Forest types or variants

The area of woodlands and other variants within the Kenya mosaic is very extensive and occurs mostly in the Tana River and Lamu Districts in near the northern limit of the EACF mosaic. The total area of the Lamu woodlands including Dodori and Boni National Reserves and Proposed Boni and Lunghi Forest reserves is 193 083 ha.

The area composes a highly complex system of woodland, bushland and scrub on a series of parallel ridges with periodically waterlogged low-lying grasslands (Robertson and Luke, 1993). For this report we estimate the maximum area of 'closed' forest to be not more than 20 000 ha dispersed over the whole area but it could be less than this. It is convenient to place this vegetation type on its own with regard to size grouping.

Table: Size Class Distribution of Kenya Coastal Closed Forest vegetation

Fragment Size Class	Examples
Large: Exceeding 9000ha as a simple block or assemblage	Kwale Shimba Hills Group (Shimba, Mkongani N&W including Mwalunganje) Kilifi Arabuko Sokoke Malindi Brachystegia Woodland

'Medium' Over 500m but rarely exceeding 1500ha forest cover	Kwale: Gongoni, Buda, Marenji, Gonja Ramisi Palm Woodland Kilifi: Rabai Kayas, Mwangea Hill
Small Less than 500ha	Most of the Kayas and sacred groves in Kwale Kilifi and Malindi. Also high diversity limestone outcrop plant habitats

Management Categories

From our data for this report, just under 50% of all Coastal Forest Mosaic vegetation cover in Kenya has been awarded some form of protection. Mostly these are areas falling under true closed forest ather than variants . There are 4 national Reserves (254 km2 forest cover); 40 national Monuments (34 km2 forest cover); and 14 Forest Reserves (445 km2 forest cover); Numerous forest patches (over 45) forests patches covering an area of over 652 km2 have no legal protection and fall within local authority and private land.

Forest Reserves are managed by the Forest Department but the level of protection is weak given very insufficient capacity to patrol and ensure protection. Sacred Kaya forests had been protected by the local elders for generations using traditional sanctions which were often quite effective. There are almost 50 Kaya forest patches scattered throughout the ecosystem, most of which (40) are now protected under the Antiquities and Monuments Act. Forests within private land are at the mercy of individual land owners or estate managers and officially they are classed as unprotected and highly vulnerable.

National Parks and National Reserves (including Tana River Forests) are officially managed by the Kenya Wildlife Service.The largest National Park Area in the Coastal region is some 6.2km2 appended to the 416km2 demarcated area of Arabuko-Sokoke Forest Reserve but is really an anomaly having little wildlife or forest and is not managed in any way by KWS. Additionally, 63km2 of National Reserve forest can be found inside Shimba Hills National Reserve, 11km2 in Tana River National Reserve. Boni and Dodori National Reserves (estimated 100 and 80 km2 vegetation) are located in Garissa and Lamu Districts respectively.

Forests within the 652 km2 which have no formal protection include Ras Tenewi, Tana Delta, North Kilifi Brachystegia Woodland, Mangea Hill and Kilibasi Hill. This is despite the fact that majority of coastal forests in Kenya have globally unique biodiversity values. Most contain at least one endemic species (Burgess et al 2000) and all deserve some form of recognition and protection.

Currency of Data: The Urgent Need for Ground Review.

Thorough as this analysis may appear it is based on largely desk studies of existing data and discussion with individuals involved in Coastal forests today. As indicated earlier the last fairly exhaustive survey of forested sites was undertaken by Robertson and Luke almost 15 years ago. There is therefore urgent need to revisit all coastal forest sites with a view to determining current extent and condition so that conservation planning can be informed by data which is current. Comprehensive remote sensing images for the whole area should be secured to facilitate this exercise. There is enough capacity in the country for such an undertaking.

3.   KENYA COASTAL FOREST VALUES

The Coast region lags behind in human welfare development when compared to other regions and scores consistently higher than the national average in all the negative indices such as percentage food poor, absolute poor and hardcore poor (Ministry of Planning records).The high levels of poverty in the region means that the population is highly dependent on forests resources for their daily needs (food, medicines, and general livelihoods), which may be destructive to the environment. Subsistence agriculture and pastoralism are the major livelihood source for most people at the coast. Inappropriate land use practices however, result in degradation and loss of land productivity leading to widespread encroachment on forest land to grow more food and extract resources at rates that are not sustainable.

Use values:

The Coastal Forests are used for many purposes in addition to timber production. Burgess and Muir (1994), assessed main local uses for forests in eastern africa: pole collection; pitsawing; religious (spiritual) and ceremonial; gathering of medicinal plants; and clearance of forests to grow crops (agriculture); collection of edible plants and honey; mining and building hotels mainly for tourism. Coastal forests provide a source of building wood and charcoal energy (90% rural house-hold energy and 85% of urban household consumption) to the growing towns of Malindi, Watamu, Kilifi and Mombasa. Coastal Forests are the major known reliable source of pole wood (best poles from mangrove) used by local people for construction purposes. Pole cutting is concentrated in areas closest to human populations (Hall and Rodgers, 1986). Edible mushrooms are widely collected from coastal forests.

Efforts have been made by projects to introduce sustainable forest based enterprises. Household incomes in Arabuko-Sokoke Forest for example, have been transformed through modernized and coordinated extraction and marketing of coastal forests products such as bee-keeping and butterfly farming. In the Shimba Hills local communities within Mwalunganje conservancy, have earned incomes from tourism through the development of lodges. However all these activities have problems caused by weak organizational structures and procedures, market constraints and limited technical skills. The honey business for example is limited by problems of scale, technical skills and processing.

Bush meat is another valuable use of coastal forests by the poor local people who can hardly afford to buy livestock and chicken meats from the near by towns. For, example, around 60% of households living adjacent to the Arabuko Sokoke Forest, hunt there regularly, and in 1991 about 350kg meat/km^2 forest was harvested, with an estimated value of KShs 1,306,000 per annum (c.$35,000) (FitzGibbon *et al.,* 1995). In the

Arabuko Sokoke Forest, 30-40% of people collect wild honey from the forest (Mogaka, 1992).

Brachystagia huilliensis "Muhugu" ,*Combretum schumanii* (Mkongolo) and *Dalbergia spp* Mpingo from Kenya coastal forests such as Arabuko and Boni are the primary raw material for the woodcarving industry which is a vital element of the coastal tourism sector. Restriction by Government due to overexploitation means much of the material is harvested illegally from Forest reserves and other areas. The woodcarving industry at the coast has a significant impact in generation of wealth and employment. Currently it generates between US $ 20 - 25 million annually in export revenues hence the need to develop alternative carving raw materials.

Tourism development has taken place in some coastal forests including Shimba Hills and Arabuko Sokoke . In the two, roads, foot trails, camp-sites, car-parks, gates and signs facilities are available though improvement is needed. Mida-creek board walk (constructed by A Rocha Kenya) is another tourist destination area with benefits flowing to local people. A tourism pilot project is being undertaken at Kinondo, a sacred Kaya in the South Coast.These efforts indicate that coastal forests have a potential for both specialist and non-specialist forest tourism.

The area of exotic plantations in Forest Reserves for production of timber at the coast is small compared to other regions, however they should be targeted for improved management and production.

Biodiversity Values

The coastal forests of eastern Africa are recognised as an area of global importance for their concentration of narrowly endemic plants and animals (Statterfield *et al.,* 1998; Olson and Dinerstein 1998; Mittermeier *et al*., 1998). Half of Kenya's threatened woody plants occur in Coastal forests (Wass, 1995). These Coastal forests, combined with Taita Hills complex and the mountains east of the Rift Valley, account for almost all the rare forest biodiversity in Kenya, with a few other rare species scattered across the large blocks of montane forests. Overall, of the forest-dependent and nationally threatened species in Kenya's forests, about 50% of the plants, 60% of the birds and 65% of the mammals are found in the Coastal forests, which show the national, regional and global importance of this region despite its comparatively low forest cover.

The Kenyan Coastal forests have more than 554 strictly endemic plants (40% of the total) and 53 strictly endemic animals. According to Burgers and Clark (2000) and CEPF (2003), the area is considered to be a major global conservation priority because of the high endemism and severe degree of threat. It has a high congruence for plants and vertebrates, and ranks first for densities of endemic plants and vertebrates out of the 25 most important global biodiversity hotspots. This is because of the number of endemic plant and vertebrate species per unit area (Myers *et al*, 2000). The range of some of the endemic species is small, and single site endemism is common.

The range of biodiversity in each forest depends on the area, climate and productivity of the site. The largest of the forests is Arabuko Sokoke, which is ranked as the second most important forest for conservation of bird species in Africa. About 230 bird species have been observed in the forest, including six globally threatened species (Clark's

Weaver, Sokoke Scopes Owl, Amani Sunbird, Sokoke Pipit, East Coast Akalat and the Spotted Ground Thrush – a rare immigrant). Some 52 known endangered mammal species have also been recorded in the forest, including two taxa that are globally threatened (the Golden Rumped Elephant Shrew and the Sokoke Bushy-tailed Mongoose). It has a diverse fauna of reptiles and invertebrates, more significantly 250 species of butterflies of which four are endemic. There are over 600 plant species, among them 50 that are globally rare. Forests, such as Shimba Hills have just as high a degree of endemism as Arabuko Sokoke.

The Tana riverine ecosystem is also rich in biodiversity with total of 57 mammal species identified. These ecosystems provide the last refuge for the endangered Tana River Crested Mangabey *Cercocebus galeritus galeritus,* Tana River Red Colobus *Colobus badius rufomitratus,* De winton Long-Eared bat *Laephotis wintoni* among other rare species in Kenya. Apart from the two primates, there are few endemic and vulnerable plant apecies in the reserve. Such species include *Coffea sessiliflora Subsp. Sessiflora, P. msolo, Pavetta sphaerobotrys, subsp.tanica, populus ilicifolia* and *Oxystigma.* Over 300 bird species have been recorded in the riverine ecoystem. There are two threatened bird species in this area, Malindi pipit and the East Coast Akalat, *Sheppardia gunnifi.* Tana River system is also home to about 60 primary fresh water fish species.

Table: Summary of species outcomes for the Kenyan Coastal Forests Hotspot (Adapted from CEPF, 2003)

Taxonomic Group	Number of Species listed by IUCN Red Data Book status			Total
	CR	EN	VU	
Mammals	1	4	4	9
Birds	2	6	2	10
Amphibians		1	2	3
Gastropods		3		3
Plants	5	11	64	80
TOTAL	8	22	72	102

Table 3: Coastal Forests with at least two threatened species in IUCN Red List (Adapted from CEPF, 2003)

Forest	Number of threatened species		Total
	Animals	Plants	
Shimba Hills	10	46	56
Arabuko Sokoke	11	8	19
Diani (Medium Kwale)	3	8	11
Gongoni (M. Kwale)		11	11
Kaya Ribe		10	10
Mrima Hill (M. Kwale)	3	7	10
Lower Tana River	4	6	10
Buda (M. Kwale)		9	9
Pangani		9	9
Witu		9	9
Dzombo Hill Forest	1	7	8
Kaya Jibana		8	8

Kaya Ukunda	1	1	2
Kaya Waa	2		2
Shimoni Forest	1	1	2

3.1 INTEGRATION OF COASTAL FOREST VALUES INTO NATIONAL ACCOUNTING

It is increasingly argued that the economic value of natural forests should be clearly demonstrated to policy makers in order to justify their conservation in the face of competing land uses. National Governments should understand the implications for forests when changes in economic, financial and fiscal policy are made(Wass, 1994).

A whole field of environmental economics has developed to provide the tools to make such assessments. Pierce (1990) defined the total economic value of forest to be the sum of:
- Direct values (direct uses eg wood,non wood products, tourism)
- Indirect values (environmental goods and services eg water catchment etc)
- Option values (premium placed on conserving a forest for future use)
- Existence values (forest's intrinsic worth regardless of use)

Environmental costs include opportunity costs, management costs and damage costs. All these elements can be estimated using various direct and indirect methods. The overall economic impact is the **sum of benefits less the sum of costs** Hence Wass (1994) estimated the overall economic value of natural forests in Kenya as below

Type of Value	Estimated Benefit (Ksh 000s)
Direct Values	4 440
Indirect Value	2 100
Option Value	Not calculated
Existence Value	100
Total Values	6 640

Total Environmental Costs	5 490

Net quantified benefit	1 150

After Wass 1994

The total and net environmental benefits of coastal natural forests were not computed although the quantified costs of coastal natural forests was estimated at Ksh 418 million. An estimate of total net benefit of coastal forests as a proportion of the national aggregate would help to underline the importance of these forests whose option and existence values (which include biodiversity) are high compared to the rest of the country.

Among the guidelines suggested in Wass (1994) are that:
- Special efforts should be made to quantify non-market as well as market values of forest products and present the combined values in support of land use decisions
- Local, national and international values of forests should be taken into account

- Any proposed changes which might affect forests should be carefully analysed before approval

These guidelines apply as much to coastal terrestrial forests as others in the country as their values are essential component of the national resource heritage.

4. THREATS TO THE KENYA COASTAL FORESTS

Kenya Coastal forests along with other forests in the region have faced and continue to face a range of threats. All along the coast, forest habitats are shrinking as land is taken up for subsistence agriculture, settlement and infrastructure. The report of a WWF regional workshop on Coastal forest provides an excellent outline of the threats facing coastal forests as percieved by forest managers and conservationsists. The report, which will be quoted extensively in this section distinguishes between proximate or immediate threats and deeper rooted problems or 'root causes' . Among the proximal causes pertinent to Kenya coastal forests are included those described below (from WWF, 2002).

Proximal Threats

Expanding agriculture

The expansion of subsistence agriculture is the most critical threat facing Kenya CF. In general most soils are poor and are quickly depleted, being of a marginal nature and more suited to tree crops and livestock ranching. Cassava and maize planting consequently extends into any existing unprotected or free forest land in a continuation of the shifting cultivation strategy

Charcoal burning and fuel wood

Charcoal production is a major cause of habitat loss in areas close to large cities. Although not well documented the qantities of charcoal feeding Mombasa and Malindi urban areas from surrounding forest and woodland areas are quite enormous. Most of the charcoal comes from the woodland, bushland areas of the coastal forests which are usually unprotected or in private owners. Examples are the brachystega and cynometra woodland in the Ganze and Vitengene areas of Kilifi District.

Unsustainable logging

Most of the closed forest patches of the Kenya CF have been logged to exhaustion , some historically, under licence, but most illegally over the years. The exceptions include very limited areas in the Kaya forests and very remote areas. Logging now occurs as for charcoal in the marginal forest and woodland areas further and further away from commercial centres. An example of this is the Malindi north brachystagia woodland which is being logged at a very high rate to supply Malindi with timber and carvingwood (A Robertson, pers comm).

Destructive mining practices

The Kenya coast is endowed with a great variety and wealth of mineral resources which often form the substratum of the biodiversity rich coastal forest patches. In Kenya such

deposits include iron ore, limestone and marble, lead and more recently determined, titanium.

Two Kayas, Kambe and Kauma have been seriously encroached by mining for lead and iron ore respectively. Significant destruction of forest cover was occasioned by the scooping of high grade silica sand in Arabuko Sokoke and Msambweni. The high diversity habitats on coral limestone in the Pangani area of Kilifi have also been affected by extraction of the limestone for cement manufacture. The limestone occurs in an extensive 4-8km wide band along the coast some 70m thick. Some of the best quality and quantity titanium deposits on the African continent are found all along the coast and underlie much of Arabuko Sokoke by the estimates of a recent exploratory survey.

<u>Human-Wildlife Conflicts</u>

Human-wildlife conflicts caused by the shrinking forest areas contribute to a hostile social and ploitical attitude among coastal dweller to forest conservation. Marading elephants in Shimba Hills and Arabuko Sokoke are responsible for even further impoverishment of forest –adjacent communities.

Root Cause Threats

The immediate threats outlined above are themselves due to deeper root causes at various levels including local national and global as elaborated below (from WWF, 2002).

<u>Local threats</u> include high population growth and lack of alternatives putting pressure on limited land and forest resources. Endemic poverty means people in the coastal regions have no capital of any time and end up consuming both the production of forests as well as the natural capital or growing stock. In addition declining respect for traditional systems has had led to encroachment and logging of Kaya forests.

<u>National Threats</u> are occasioned by national economic development policies which for example may focus on rapid development of infrastructure and consumption of natural resources. There is need to take the environmental impacts into consideration in plannng.Other national threats include inadequate Institutional and financial capacity to enforce forest rules and regulations exacerbated by a retrenchment policy by government results in more vulnerable forest resources. Boundaries for many coastal protected forests have for example not been maintained and extension services to promote afforestation are poor.

Land tenure issues at the coast are instrumental in rampant destruction of forest woodland as large percentages of rural populations lack secure title to land. Sectoral policies and laws relating to natural resources have tended to be in conflict with each other although the new comprehensive environmental law may resolve this.

<u>Global Threats</u> include macroeconomic policies promoted by multi-lateral International organizations such as the World Bank which propose economic growth strategies invovling expolitation of countrys' natural resource base. Restructuring of public service staff has resulted in massive lay-offs which have had an adverse impact in environmental management activities. International market trends including the

development of the Kenya coast as mass tourism destination if not managed well may place a strain on forest habitats owing to infrastructural and other needs.

5. TRENDS IN CONSERVATION PROJECTS AND INVESTMENTS IN KENYA COASTAL FORESTS.

A number of externally funded projects have been developed and Implemented in Kenya's Coastal Forests most particularly from the early 1990s (See Table) on top of the annual government administration budget for its forest management departments and agencies (FD, KWS and NMK). Some points need to be noted however. There are some gaps in the data due to the fact that some budget allocations are split between several implementing partners, which make calculations of funding allocations problematic.

Table: Projects/Investments in Kenya Coastal Forest

Site/ Coverage	Period	Budget	Activity/ project name/ institution	Donors/ Supporters	Activities / Comments
Coastal Forests General	1989-91	SFR 268 000	Coast Forest Survey	WWF International	Botanical survey of all identified coastal forest patches
	2001-05	UK f 1000,000	Certification of Goodwood for Carving	UK DFID Darwin Initiative	Training farmers and carvers to produce and carve farm-grown timber
	2002-04	US $ 48 000	Certification of Goodwood for Carving	UNDP/GEF Small Grants Programme	Training farmers and carvers to produce and carve farm-grown timber
Arabuko Sokoke	1992-	Total US $ 200 000	Kipepeo Butterfly farming Project	UNDP-GEF IUCN Japan	Develop enterprise for farmers to produce butterfly pupa for export. Training, marketing, env awareness.
	1996-2001	US$ 1,000,000	Arabuko Sokoke Forest Conservation Project	Birdlife International/ EU	Rural Development activities, Ecotourism Development, Strategic Plan Development, Participatory Forest Management piloting
	2000-2003	Ksh 16 000,000	Community Conservation Interventions at Arabuko Sokoke (Project)	EU Community Development Trust Fund Biodiversity Cons. Programme	Implemented by multidepartmental management team of FD, KWS, NMK and others. Expanding forest based enterprises, an awareness programme and reduction of human-wildlife conflicts
	2001-2004	US $ 1,500,000	Alisei Farm Forestry and Natural Resource Conservation Project	European Union	Implemented by Alisei (Italian NGO), KEFRI and EAWLS. Develop on-farm forestry around A/Sokoke and diversify agroforestry products. Land fertility improvement, beekeeping
	2003-	US $ 1 000 000	Enhanced Sustainability of Arabuko Sokoke thru' Improved NRM	USAID thru Nature Kenya	Develop PFM guidelines. Improve nature based businesses. Develop participatory NRM plans
	2004-	US $ 300 000	Kindernothlife Project	NABU Kindernothlife	Around Arabuko Sokoke. Skills training for primary school leavers, income generation and ecotourism

Witu Forest environs	1994-		German Assisted Settlement Programm GASP	GTZ	Part of integrated Land Settlement Programme including agroforestry extension and env conservation. Planting buffer zone forest. Reserving forest /woodland patches
Tana Gallery Forests	1995/96	Proposal approved for US$ 6 million. Project terminated	Tana Primate National Reserve Project	World Bank / GEF Large Grant	Development of Protected area infrastructure, studies. Relocation of communities Project aborted due to community resistance
Shimba Hills System	1994-96	Project terminated due to externality	Sustainable Use of Natural Resources	GTZ	Rural Development and CBO support to Forest Adjacent Communities
	2004-	US $ 240 000	Shimba Hills Forest Landscape Restoration Project	WWF, Lafarge	Implemented by KWS, FD, NMK around Shimba Hills Forest. Enterprise development. Ecotourism, afforestation, awareness activities
Mijikenda Sacred Kaya Forests	1985-86	Ksh 30 000	Preliminary Floristic Survey of Kaya Forests	WWF International	Location and Identification of Kaya forests and consultations with communities
	1992-1994	US $ 20 000	Kaya Forest Conservation Project	WWF International	Organizing local communites, Protection support. Plant Survey cont. Gazettement
	1995-2001	UK f 600 000	Coastal Forest Conservation Project	World Wide Fund for Nature WWF UK	Legal reform, Community Institutions, awareness, gazzettement
	2001-2003	US $ 75 000	Kaya Kinondo Ecotourism Project	Ford Foundation/W WF	Piloting Community Ecotourism on sacred site, Awareness, enterprise.

Proposals under development

Kenya Coastal Forests	Proposal Stage 2004	US $ 1000 000	Mainstreaming Kenya Coastal Forest Conservation in National Pov. Reduction and Dev	Proposal to GEF MSP	To be mplemented by FD, KWS and other partners. Capacity building for communities. PFM development. Enterprise Development. Ecological monitoring

Analysis of Kenya CF Projects

It is quickly apparent from the table that selected forest areas and types have been the focus of most external investment in terms of projects over the last 20 years. These areas are Arabuko Sokoke, Shimba Hills and the sacred Mijikenda Kaya forests which fortuitously are also key for biodiversity conservation. There are various reasons for this bias. Arabuko Sokoke has been identified as a promary conservation site for endemic birds for many years (second most important site on the Africa mainland). The continued focus on Sokoke to some extent reflects the consistent interest and fund-raising efforts

of the International bird conservation fraternity which have been active at the site since the early 1980s.

The Kayas have benefited from WWF's involvement in conservation activities in the eastern Africa coastal forest mosaics over the last 20 years in Kenya and Tanzania. The richness of biological life forms in the region combined with severe threats have been a cause for this commitment. Also activities of highly competent taxonomists at the coast and their personal interest in the CF as well as their lobbying efforts have also played a part. For the Kayas. Successful execution of projects seems to have encouraged donors to invest in extensions to project activities. The effect has been to bring Kayas and other small forests to public notice.

Although Shimba Hills is blessed with high plant diversity, for many years its draw has been attractive and unique large mammals including elephants and the graceful Sable antelope as well as its beautiful landscapes. The long-standing interest in these species by wildlife managers as well as concerns about intense human-wildlife conflict is reflected by projects initiated there.

The involvement in the above sites is also a function of their relative accessibility compared to other sites of comparable biodiversity interest. Remote forest areas with poor communications in terms of roads have suffered project neglect as a result. It must be said that their remoteness has also protected some of them from serious destructive human impact. These areas need to be part of a deliberate strategy to bring all coastal forests under some kind of conservation activity. Noteworthy among them are:.

- The whole of Lamu Boni, Dodori and Lungi woodland/scrublands extending into Garissa (Ijara?) district. While some of the area is under KWS protection, extensive areas have no management whatever. Considerable poaching of timber for carving and furniture goes on.

- Tana river gallery forests. An attempt by the GEF to develop some local protection infrastructure collapsed in the mid 90s due to local political agitation and deforestation has continued.

- The Brachystegia forests in the north of Malindi district which are still unprotected although identified as priority areas more than 10 years ago and listed as an Important Bird Area.

- The 'Medium sized' forests occurring in Kwale district which have been gazetted as FRs for many decades yet have no significant management presence due to the difficulty of looking after the small scattered sites. These include Marenji, Mrima, Gonja, Dzombo.

- Isolated Hill forest outliers such as Mwangea and Kilibasi

- High biodiversity forest patches on limestone outcrops usually associated with rivers in Kilifi and Kwale districts. These include Pangani and Kachororoni

While a significant number of projects have been biological surveys and gazettement of sites, most of the projects implemented in the Kenya CF have sought to reduce

utilization pressure on the forest biodiversity. This is attempted by increasing awareness about the resource, helping develop alternative tree based resources and income earning activities. Significant resources have also gone into building local community capacity to protect and manage resources as well as their nature based enterprises. One or two of the projects have sought to influence national law and policy relating to conservation of forests with communities.

6.   PRIORITIZATION / TARGETING OF INVESTMENT IN KENYA COASTAL FORESTS

Numerous attempts have been made to prioritize the Kenya CF in terms of urgency of need for conservation projects. This has been a vexing issue because most coastal forests even the smaller ones are important in terms of conservation of plant and other species. Also data has been incomplete for quite a while especially for the more remote areas introducing a highly subjective element to such an evaluation.

Many of the sites are unique and different sites have different problems making fair comparism almost impossible. It is more important to develop a system which identifies the different tpyes of problems faced by coastal forests and where these are found for specific targeting of particular issues rather than attempting an absolute ranking of sites in importance.This could also indicate the prevalence of certain needs.

A serious attempt to do this was undertaken by the EACF Kenya National Task Force meeting in Mombasa in 2002. A matrix was built up providing a rapid impression of where urgent conservation activities are most needed, after agreement on key aspects of all the forest areas including size, institutional activity, threat etc. (See extract in appendix)

The matrix sought to provide pointers to:
- Which CF had the greatest need to address a certain key issue
- Where potential for positive impact was greatest
- Where there was greatest need for capacity building
- etc

Issues to be considered were placed in three areas with sub-issues. These were Information/baseline data, Management Ativities and capacity and threats. A pairwise ranking was use to compare each site against the other and these were totalled up (see appendix). The finding was that for each issue or area a certain forests tended to rank higher than others eg benefit sharing with communities was more developed in Arabuko Sokoke and Shimba though this was probably a function of the project activity in those forests over the years. In other cases low threat was merely a function of the remoteness of the site rather than true threat. Lack of information about various sites was a serious handicap and this needed to be addressed.

It was agreed that with better information the matrix could be refined in conjunction with mapping information to create a strong tool for suitability analysis for Kenya CF prject sites. The matrix could be used for identifying a need for interention in a forest for a certain issue. This would then be followed up by more detailed and critical assessment on the ground by local experts.

## 7.	SUMMARY AND RECOMMENDATIONS

The purpose of this report has been the assessment or re-assessment of the coastal forests of Kenya which fall within the Eastern African Coastal Forest Mosaic. The desk study sought to determine their current total area, distribution, quantity and quality. This was due to a recognition that although adequate information on coastal forests was available it was not fully collated for the purpose of planning for conservation projects in the area. Much of the information available also needed to be updated in the light of current knowledge and field experience.

The study concluded that vegetation which falls within the definition of Eastern African Coastal forest and its variant was approximately 139 000 ha (1390km2) which included woodland and coastal scrub forest as defined by White (1983) and refined by Burgess at al (2003). The previous figure of 66 000ha (660km2) is closer to the extent of classical true closed forest in coastal Kenya using exisiting data. Only under half of the 1390km2 inclding most of the closed forest was protected by various types of legal gazettements, the remainder, mostly in the woodland and scrub forest remained unprotected. Most of the sacred Kaya forests of the Mijikenda were now protected as National Monuments.

However,it was regretted that the data on which these estimates are made needs to be updated especially concerning unprotected forest areas which may have changed significantly since the last extensive survey was done almost 15 years ago. There is an urgent need to undertake a similar ground survey besides securing current remote sensing data for the coastal forest region. This exercise would provide the foundation for a comprehensive monitoring database sysem for coastal forests.

Past and current investments in conservation projects for Coastal forest were also analysed revealing a bias towards certain forests due various historical factors as well as their relative accessibility. They were also the largest and important for biodiversity. To remedy in future this it was suggested that future projects should be targeted at new and more inaccessible areas which face increasing and in some cases extreme threat. Such sites include among others:

▪	Tana Gallery Forests (under extreme threat).

▪	The Lamu District Woodland Scrubland System (Boni, Lunghi, Dodori etc)

▪	Brachystegia woodlands of Malindi North

▪	The medium sized forests > 500 ha mostly ocurring in South Kwale District

▪	Islolated Hill forest outliers such as Mwangea and Kilibasi

▪	The small high diversity patches on limestone outcrops of Kilifi and Kwale District

Unfortunately despite the recommendations of numerous survey and other reports the above forest areas are still largely unprotected. A primary component of conservation projects in these forests should therefore include bringing these sites into protective management of one type or other. Experience over the years has proved the value of gazettement as a primary conservation tool even if resources often lack to follow through on monitoring and active management.

A prioritization method undertaken by the Kenya Coastal Forest Task force in 2002 was revisited and seen to have merit. The prioritization however is best applied to identify and rank specific types of problems for intervention as opposed to absolute prioritization of sites. These include lack of baseline information, management infrastructure and level of immediate threat. It should be developed further and will serve as a useful tool to guide project development in future.

References

Arabuko-Sokoke Forest Management Team. 2002. *Arabuko-Sokoke Strategic Forest Management Plan 2002–2027.* BirdLife International, Cambridge.

Beentje, H. & S. Smith. 2001. FTEA and after. Syst. Geogr. Pl. 71: 265-290.

Bennun, L.A. & P. Njoroge. 1999. *Important Bird Areas in Kenya.* Nairobi, Africa: Nature Kenya.

Burgess & G.P. Clarke, eds. IUCN: Cambridge and Gland. Pp. 191–199.

Burgess, N.D. 2000. Global importance and patterns in the distribution of coastal forest species. In *The Coastal Forests of Eastern Africa.* N.D. Burgess & G.P. Clarke, eds. IUCN: Cambridge and Gland. Pp. 235–248. Burgess, N.D. & G.P. Clarke, eds.. 2000. *The Coastal Forests of Eastern Africa.* IUCN: Cambridge and Gland.

Burgess, N.D., D. Kock, A. Cockle, C. FitzGibbon, P. Jenkins, & P. Honess. 2000. Mammals. In *The Coastal Forests of Eastern Africa.* N.D. Burgess & G.P. Clarke, eds. IUCN: Cambridge and Gland. Pp. 173–190.

Burgess, N.D., G.P. Clarke, & W.A. Rodgers. 1998c. Coastal Forests of eastern Africa: status, species endemism and its possible causes. *Biological Journal of the Linnean Society* **64**: 337–367.

Burgess, N.D., G.P. Clarke, J. Madgewick, S.A. Robertson & A. Dickinsen. 2000. Distribution and Status. In *The Coastal Forests of Eastern Africa.* N.D. Burgess & G.P. Clarke, eds. IUCN: Cambridge and Gland. Pp. 71–81.

Butynski, T.M. & G. Mwangi. 1994. Conservation status and distribution of the Tana River red colobus and crested mangabey. Unpublished report for Zoo Atlanta, National Museums of Kenya, Institute of Primate Research and East African Wildlife Society. Pp. 67.64

CEPF, 2003. Ecosystem Profile. www.cepf.net

Clarke, G.P. & N.D. Burgess. 2000. Geology and Geomorphology. In *The Coastal Forests of Eastern Africa.* N.D. Burgess & G.P. Clarke, eds. IUCN: Cambridge and Gland. Pp. 29–39.

Clarke, G.P. & S.A. Robertson. 2000. Vegetation Communities. In *The Coastal Forests of Eastern Africa.* N.D. Burgess & G.P. Clarke, eds. IUCN: Cambridge and Gland. Pp. 83–102.

Clarke, G.P. 2000. Climate and climatic history. In *The Coastal Forests of Eastern Africa.* N.D. Burgess & G.P. Clarke, eds. IUCN: Cambridge and Gland. Pp. 47–67.

Clarke, G.P., K. Vollesen, & L.B. Mwasumbi. 2000. Vascular Plants. In *The Coastal Forests of Eastern Africa.* N.D. Burgess & G.P. Clarke, eds. IUCN: Cambridge and Gland. Pp. 129–147.

Ferraro, P.J. & A. Kiss. 2002. Direct payments to conserve biodiversity. *Science* **298**: 1718–1719.

Fitz ibbon, C.D., H. Mogaka & J. Fanshawe. 1995. Subsistence hunting in Arabuko-Sokoke Forest and its effects on mammal populations. *Conservation Biology* **9**: 1116–1126.

Forest Department. 1994. The Kenya Forestry Plan. FINNIDA/Forest Department, Karura, Nairobi.

GOK, 1994. *The Kenya National Environment Plan (NEAP) Report.* Ministry of Environment and Natural Resources. The Government Printer, Nairobi, Kenya.

GOK, 1999. "The Environmental Management and Co-ordination Act, The Government Printer, Nairobi, Kenya.

Gordon, I. & W. Ayiemba. 2003. Harnessing butterfly biodiversity for improving livelihoods and forest conservation: the Kipepeo Project. *The Journal of Environment and Development* **12**: 82–98.

Kanga, E. 1996. Survey of Aders' Duiker *Cephalophus adersi* and other ungulates in the Arabuko-Sokoke Forest Reserve, Kenya. Unpublished Report, national Museums of Kenya and Zoo Atlanta. 65.

Kenya Forest Department. 1994. The Kenya Forestry Plan. FINNIDA/Forest Department, Karura, Nairobi.

Kesley, M. G. & T. E. S. Langton. 1984. *The Conservation of Arabuko-Sokoke Forest.* ICBP Study Report No.4. International Council for Bird Preservation, Cambridge.

KWS, 1990. The Main Report. A Policy Framework and Development Programme 1991-1996. Kenya Wildlife Service, Nairobi, Kenya.

KWS/FD, 1991." Memorandum of Understanding for the Joint management of Selected Forest". KWS & FD, Nairobi, Kenya (unpublished).

Lovett, J.C. & S.K. Wasser, eds. 1993. *Biogeography and Ecology of the Rain Forests of Eastern Africa.* Cambridge University Press, Cambridge

Lovett, J.C., J.R. Hansen & V. Holrlyck. 2000. Comparison with eastern Arc Forests. In *The Coastal Forests of Eastern Africa.* N.D. Burgess & G.P. Clarke, eds. IUCN: Cambridge and Gland. Pp. 115–125.

Lowe, A.J. & G.P. Clarke. 2000. Vegetation Structure. In *The Coastal Forests of Eastern Africa.*N.D. Burgess & G.P. Clarke, eds. IUCN: Cambridge and Gland. Pp. 103–113.

Mariki, S.W., F. Shechambo & J. Salehe. 2003. The contribution of environmental goods and services to Tanzania's economy: with reference to poverty reduction. IUCN-EARO, Nairobi.

McNeely, J.A. & S.J. Scherr. 2003. *Ecoagriculture.* Island Press, Washington.66

MENR, 1994. *Kenya Forestry Master Plan: Development programmes.* Forest Department, Ministry of Environment and Natural Resources (MENR), Republic of Kenya, Nairobi, Kenya.

Muriithi, S. & W. Kenyon. 2002. Conservation of biodiversity in Arabuko-Sokoke Forest, Kenya. *Biodiversity and Conservation* **11**: 1437–1450.

Myers, N. 1990. The biological challenge: extended hot spot analysis. *The Environmentalist* **10**: 243–256.

Robertson, S.A. & W. R.Q. Luke. 1993. Kenya Coastal Forests. WWF, Nairobi.

Robertson, S.A. 1987. Preliminary Floristic Survey of Kaya Forest on Coastal Kenya. Unpublished Report. National Museums of Kenya, Nairobi.

Rodgers, W. A., 1998. An introduction to the Eastern Arc Mountains. *Journal of East African Natural History* **87**:7–18.

The 2002 IUCN Red List of the Threatened Species. IUCN, Cambridge and land.

UNEP. 1998, Eastern Africa Atlas of Coastal Resources: Kenya. UNEP, Nairobi.

United States Department of State. 2002a. Background Note: Kenya.

USAID. 2000. USAID Kenya Strategic Plan: Environmental threats and opportunities ssessment. USAID, Nairobi. http://www.frameweb.org/pdf/Kenya.PDF

USAID. 2003. http://www.usaid.gov/regions/afr/country_info/kenya.html

Wass, P., 1995. Kenya's Indigenous Forests: Status, Management, and Conservation. IUCN, Gland, Switzerland & Cambridge, UK.

White, F. 1983. The vegetation of Africa. A descriptive memoir to accompany the UNESCO/AETFAT/UNSO Vegetation Map of Africa. Paris, UNESCO

Whiteman, A. 2003. Recent trends in fiscal policies in the forest sector in Africa. In *State of the Worlds Forests 2003*, pp 108-121. FAO, Rome

Wieczkowski, J. & D.N.M. Mbora. 1999–2000. Increasing threats to the conservation of endemic endangered primates and forests of the lower Tana River, Kenya. *African Primates* **4**: 32–40.

World Bank. 2001. www.worldbank.org/data/quickreference/quickref.html)

WWF-EARPO. 2002. Eastern African Coastal Forest Progamme. Regional Workshop Report. Nairobi 4–7 February 2002.

WWF-US 2003a. Ecoregional reports: Eastern Arc Forest. Eastern and Southern Africa Biomes. J. Schipper & N. Burgess, authors.

WWF-US 2003b. Ecoregional reports: Northern Zanzibar-Inhambane coastal Forest Mosaic. Eastern and Southern Africa Bioregions. J. Schipper & N. Burgess, authors.