CRITICAL ECOSYSTEM PARTNERSHIP FUND

ECOSYSTEM PROFILE

EASTERN ARC MOUNTAINS & COASTAL FORESTS OF TANZANIA & KENYA BIODIVERSITY HOTSPOT

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INTRODUCTION

The Critical Ecosystem Partnership Fund (CEPF) is designed to safeguard the world's threatened biodiversity hotspots in developing countries. It is a joint initiative of Conservation International (CI), the Global Environment Facility (GEF), the Government of Japan, the MacArthur Foundation and the World Bank. CEPF supports projects in hotspots, areas with more than 60 percent of the Earth's terrestrial species in just 1.4 percent of its land surface.

A fundamental purpose of CEPF is to ensure that civil society is engaged in efforts to conserve biodiversity in the hotspots. An additional purpose is to ensure that those efforts complement existing strategies and frameworks established by local, regional and national governments.

CEPF aims to promote working alliances among community groups, nongovernmental organizations (NGOs), government, academic institutions and the private sector, combining unique capacities and eliminating duplication of efforts for a comprehensive approach to conservation. CEPF is unique among funding mechanisms in that it focuses on biological areas rather than political boundaries and examines conservation threats on a corridor-wide basis to identify and support a regional, rather than a national, approach to achieving conservation outcomes. Corridors are determined through a process of identifying important species, site and corridor-level conservation outcomes for the hotspot. CEPF targets transboundary cooperation when areas rich in biological value straddle national borders, or in areas where a regional approach will be more effective than a national approach.

The Eastern Arc Mountains and Coastal Forests of Tanzania and Kenya hotspot (hereafter referred to as the Eastern Arc Mountains and Coastal Forests hotspot) is one of the smallest of the 25 global biodiversity hotspots. It qualifies by virtue of its high endemicity and a severe degree of threat. Although the hotspot ranks low compared to other hotspots in total numbers of endemic species, it ranks first among the 25 hotspots in the number of endemic plant and vertebrate species per unit area (Myers *et al.* 2000). It also shows a high degree of congruence for plants and vertebrates. It is also considered as the hotspot most likely to suffer the most plant and vertebrate extinction for a given loss of habitat and as one of 11 "hyperhot" priorities for conservation investment (Brooks *et al*. 2002).

THE ECOSYSTEM PROFILE

The purpose of the ecosystem profile is to provide an overview of biodiversity values, conservation targets or "outcomes," the causes of biodiversity loss and current conservation investments in a particular hotspot. Its purpose is to identify the niche where CEPF investments can provide the greatest incremental value.

The ecosystem profile recommends strategic opportunities, called "strategic funding directions." Civil society organizations then propose projects and actions that fit into these strategic directions and contribute to the conservation of biodiversity in the hotspot. Applicants propose specific projects consistent with these funding directions and investment criteria. The ecosystem profile does not define the specific activities that prospective implementers may propose, but outlines the conservation strategy that guides those activities. Applicants for CEPF grants are required to prepare detailed proposals identifying and describing the interventions and performance indicators that will be used to evaluate the success of the project.

BACKGROUND

International interest in the Eastern Arc Mountains and Coastal Forests hotspot has increased over the last three decades as the realization of its biodiversity importance and of the global crisis affecting tropical forests has deepened. Although descriptions of the wealth of biodiversity in the forests of the Eastern Arc Mountains date back to 1860 and there has been outstanding scientific work in the hotspot during the last 100 years, concerns for its conservation are relatively recent. Until about 30 years ago, nearly all the investment in the forests of the area had been in plantations, many of which were established after clearing indigenous forest.

The situation is now greatly changed and the last decade has seen a series of publications, workshops and conferences on the biodiversity and conservation of this hotspot (mostly organized by the United Nations Development Programme/Global Environment Facility (UNDP/GEF) and the WWF Eastern Africa Regional Programme Office (WWF-EARPO). These have produced a wealth of recent information on biodiversity issues (in particular on the distribution of endemic species across sites) and on forest status and management. This information has greatly reduced the time and effort needed to prepare this profile.

Current concerns for the conservation of the Eastern Arc Mountains date back to the 1978 Fourth East African Wildlife Symposium at Arusha. The conference was attended by 150 delegates, most of whom were not especially interested in forest conservation. However, a post-conference trip to Amani in the East Usambaras resulted in a report to the Government of Tanzania, drawing its attention to the biological importance of and threats to the Eastern Arc Mountains (Rodgers 1998).

In 1983, the Tanzania Forest Conservation Group (TFCG) was founded. In December 1997, there was a landmark international conference on the Eastern Arc Mountains at Morogoro, Tanzania attended by more than 250 delegates (Burgess *et al*. 1998a). During this conference, working groups reported on urgent issues such as the status of the remaining forest and participants presented papers on biodiversity, sociology and management. Much of the more recent conservation effort in the Eastern Arc Mountains dates from this conference, although one of the most important of these had already started with a UNDP/DANIDA project. This led in turn to a GEF Project Development Fund (PDF) Block A proposal and grant to characterize the conservation issues in the Eastern Arc Mountains in more detail.

The Block A process started after the December 1997 conference and included preliminary assessments of biodiversity values, conservation concerns, priority actions, financial constraints, sustainable financing opportunities, effectiveness of previous donor interventions and the development of preliminary proposals for GEF projects in the Eastern Arc Mountains. A three-way matrix was constructed showing levels of biodiversity and endemism, the degree of threat and the level and effectiveness of previous interventions. This enabled a ranking exercise that revealed that three of the main forest blocks (East Usambaras, Udzungwas and Ulugurus) were exceptionally diverse and that there was no major donor or public support for the Ulugurus. The Ulugurus, therefore, became a focus in the development of a PDF Block B proposal supported by UNDP and the World Bank. This PDF/B involved extensive stakeholder consultations and resulted in: 1) an outline and plan for a participatory and strategic approach to conservation and

management in the Eastern Arc Mountains; 2) proposals for institutional reforms in the forest sector with a particular focus on facilitating participatory forest conservation and management; 3) a needs assessment for priority pilot interventions in the Ulugurus; and 4) the legal establishment of an Eastern Arc Mountains Endowment Fund (EAMCEF). The outcomes from this process were integrated into larger forest biodiversity concerns and into a proposed $62.2 million Tanzania Forest Conservation and Management Project.

During this time, awareness of the biodiversity values of the East African coastal forests had also grown. In 1983, a team from the International Council for Bird Preservation (ICBP, now BirdLife International) surveyed the avifauna of Arabuko-Sokoke Forest on the north coast of Kenya and drew attention to its globally threatened bird species (Kelsey & Langton, 1984). A detailed survey (Roberston, 1987) of the sacred *Kaya* Forests (conserved by the Mijikenda, a group of nine tribes on the Kenyan coast) highlighted their conservation importance for trees and led to a comprehensive survey of Kenyan coastal forests commissioned by WWF (Robertson & Luke 1993). This focussed on the plant species and on the status of the forests and made recommendations for their conservation.

The Frontier-Tanzania Coastal Forest Research Programme carried out a series of biodiversity surveys from 1989 to 1994 (Lowe & Clarke 2000; Clarke *et al.* 2000; Burgess *et al.* 2000; Broadley & Howell, 2000; Hoffman 2000). In 1993 a workshop on the East African coastal forests was held in Dar es Salaam. This raised the profile and conservation action in these forests and led to a series of status reports on the conservation and management of the Tanzanian coastal forests (Clarke 1995; Clarke & Dickenson 1995; Clarke & Stubblefield 1995). These and other studies are summarized in another landmark publication for the hotspot (Burgess & Clarke, 2000).

More recently, WWF-EARPO organised a series of workshops to develop an Eastern Africa Coastal Forest Programme covering Kenya, Tanzania and Mozambique (WWF-EARPO, 2002). Thirty-one scientists and stakeholders from these three countries attended a regional workshop in Nairobi in February 2002. It aimed at developing a regional synthesis on coastal forest resource issues and a vision, strategy and way forward for realising the coastal forest programme. There was a strong focus on country-based group work. Maps of the region were updated, threats and root causes were analyzed, country conservation targets were agreed on and preliminary logframe action plans were developed for each country. National Coastal Forest Task Force meetings in each of the three countries subsequently refined these action plans. The document resulting from the February 2002 workshop includes comprehensive annexes which list the coastal forest sites (showing their locations, areas, status, altitudes and threats) and the endemic animals, as well as the threat analysis and country action plans. A list of endemic plants, taken from Burgess & Clarke 2000, was supplied to the workshop but not included in the report.

On 12 March 2003, a CEPF workshop was held in Dar es Salaam to define the investment niche for CEPF, building on all the previous effort. Participants included 48 people from scientific and research institutions, government departments, NGOs, field projects and donor organizations, all of whom worked in or had knowledge of the hotspot. The outputs from the workshop were subsequently incorporated into a wide-ranging consultation process that helped to define the investment priorities for CEPF in this hotspot.

Geography of the Hotspot

The Eastern Arc Mountains and Coastal Forests hotspot runs along the Tanzanian and Kenyan coasts from the border with Somalia to the north to that with Mozambique to the south (Figure 1). The bulk of the hotspot is in its western expansion in Tanzania, which takes in the Eastern Arc Mountains and the water catchment system of the Rufiji River. There is a narrow hook-like extension of the hotspot near the Kenya/Tanzania border. This follows the Eastern Arc Mountains to their northernmost limits in the Taita Hills in Kenya. The hotspot also projects northwards for about 100 km in an extension that includes the forests of the Lower Tana River in Kenya. The hotspot includes the Indian Ocean islands of Mafia, Pemba and Zanzibar.

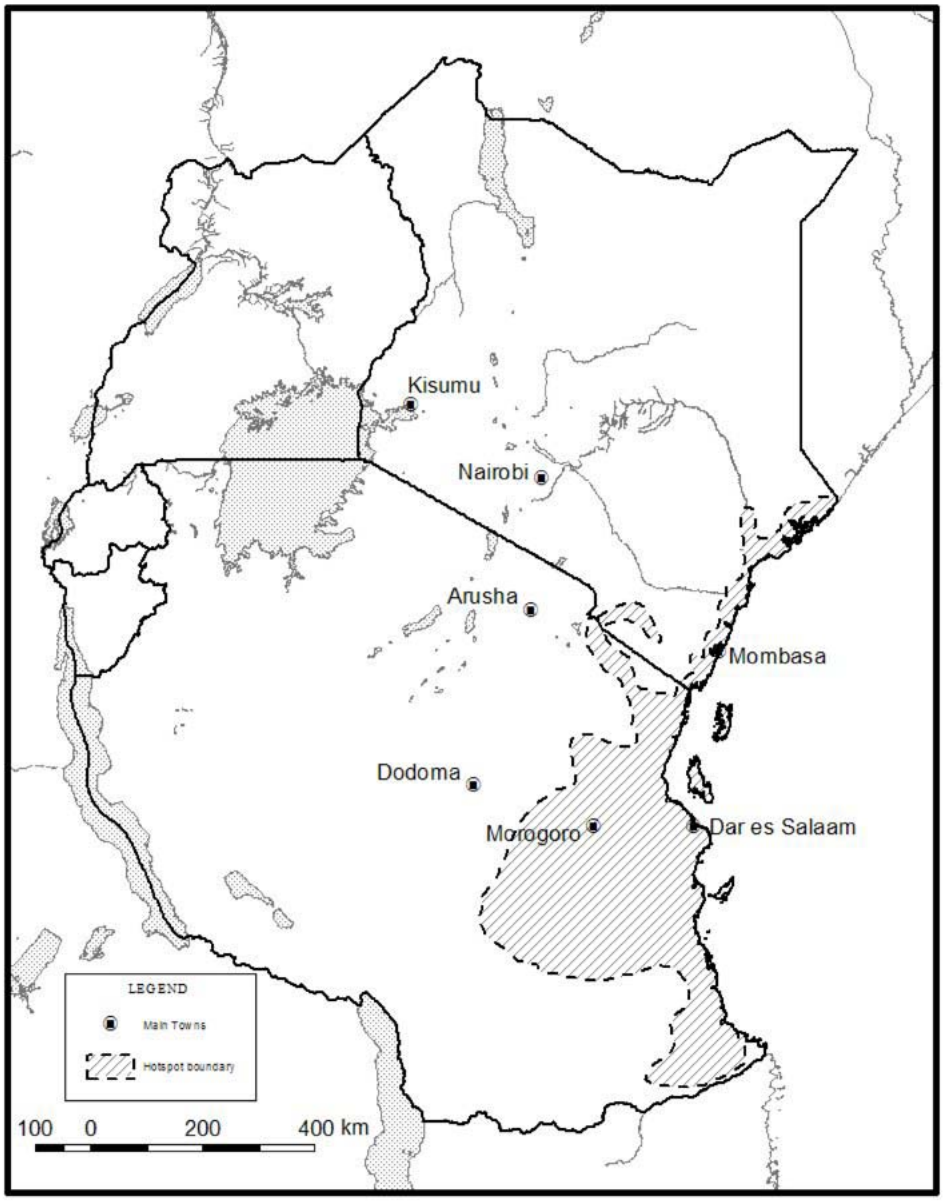
In terms of plant biogeography, the hotspot straddles two ecoregions: Eastern Arc Forest and Northern Zanzibar-Inhambane Coastal Forest Mosaic (WWF-US 2003a, b). These two ecoregions are mostly discontinuous but do meet in the lowlands of the East Usambara, Uluguru, Nguru and Udzungwa Mountains as well as in the Mahenge Plateau (WWF-US 2003a,b; Burgess pers. com.). A considerable proportion of species (e.g. nearly 60 percent of plants) are found in both ecoregions and the distinction between them has been a matter of some debate (Lovett *et al*. 2000). However, each of these forest types contains an impressive number of strict endemics. Lovett *et al*. (2000) conclude that the forests in these two ecoregions are very different, with differences in altitude and rainfall leading to a steep gradient of species replacement with elevation.

The Eastern Arc Mountains

The Eastern Arc Mountains stretch for some 900 km from the Makambako Gap, southwest of the Udzungwa Mountains in southern Tanzania to the Taita Hills in south-coastal Kenya (Figure 2) (Lovett & Wasser 1993; GEF 2002). They comprise a chain of 12 main mountain blocks: from south to north, Mahenge, Udzungwa, Rubeho, Uluguru, Ukaguru, North and South Nguru, Nguu, East Usambara, West Usambara, North Pare, South Pare and Taita Hills. The highest point (Kimhandu Peak in the Ulugurus) is more than 2,600 m in altitude, but most of the ranges peak between 2,200-2,500 m (GEF 2002; WWF-US 2003a). Geologically the mountains are formed mainly from Pre-Cambrian basement rocks uplifted about 100 million years ago (Griffiths 1993). Their proximity to the Indian Ocean ensures high rainfall (3,000 mm/ year on the eastern slopes of the Ulugurus, falling to 600 mm/year in the western rain shadow) (GEF 2002). Climatic conditions are believed to have been more-or-less stable for at least the past 30 million years (Axelrod & Raven 1978). The high rainfall and long-term climatic stability, together with the fragmentation of the mountain blocks, have resulted in forests that are both ancient and biologically diverse.

The original forest cover (2,000 years ago) on the Eastern Arc Mountains is estimated at around 23,000 km^2, of which around 15,000 km^2 remained by 1900 and a maximum of 5,340 km^2 remained by the mid-1990s (Newmark 1998; GEF 2002). At that time the Udzungwas contained the largest area of natural forest (1,960 km^2), followed by the Nguru, Uluguru, Rubeho, East Usambaras, South Pare, West Usambaras, Mahenge, Ukaguru, North Pare and Taita Hills (6 km^2). These and the following estimates of forest status and losses in the Eastern Arc

Figure 1. Location of the Eastern Arc Mountains & Coastal Forests hotspot



Mountains are all taken from Newmark 1998. Losses were greatest, relative to original cover, in the Taitas (98 percent), Ukaguru (90 percent), Mahenge (89 percent) and West Usambaras (84 percent). The forests had become highly fragmented, with mean and median forest patch sizes estimated at 10 km^2 and 58 km^2, respectively. By 1994-96, the Udzungwas and the West Usambaras contained the largest numbers of patches (26 and 17) and only one mountain block (Ukaguru) had more or less continuous forest. At that time there were an estimated 94 forest patches in the Eastern Arc Mountains. Within forest patches there was considerable degradation. Of the closed forest that remained, only 27 percent had closed forest cover. With the exception of a few sites where there has been active intervention, the situation at present is far more likely to have deteriorated than improved since 1996.

The East African Coastal Forest Mosaic

The area defined by the Coastal Forests of Tanzania and Kenya in the hotspot includes the intervening habitats between the coastal forest patches. Although the main biodiversity values are concentrated in the forests there are a significant number of endemics (especially plants) in non-forested habitats. This part of the hotspot is therefore a mosaic, which stretches from the border of Kenya with Somalia, to the border of Tanzania with Mozambique, including the islands of Zanzibar, Mafia and Pemba. This part of the hotspot is, largely for practical reasons, partly defined by national boundaries; coastal forests in Somalia (very little left) and Mozambique (large areas) are poorly known and are excluded. Northern Mozambique could be included with further survey work. With the exception of Somalia, the mosaic, as defined here, corresponds to the WWF ecoregion known as the "Northern Zanzibar-Inhambane Coastal Forest Mosaic" (WWF-US 2003b). This falls within the "Zanzibar-Inhambane Regional Mosaic," which is one of 18 distinct biogeographical regions that White (1983) recognized for Africa.

In Kenya, the Northern Zanzibar-Inhambane Coastal Forest Mosaic is mostly confined to a narrow coastal strip except along the Tana River where it extends inland to include the forests of the lower Tana River (the northern-most of which occur within the Tana Primate National Reserve) (Figures 1, 2). In Tanzania, the Mosaic runs from border to border along the coast, contracting in the Rufiji Delta region. There are also some outliers located up to ca. 300 km inland at the base of a few of the Eastern Arc Mountains (Udzungwa, Mahenge, Uluguru and Nguru) (WWF-US 2003a). Much of the Mosaic has been converted to subsistence agriculture, interrupted by plantations and human settlements, including the large cities of Mombasa and Dar es Salaam (populations of more than 700,000 and 3 million, respectively).

Geologically, the coastal forest strip has been subject to considerable tectonic activity and to sedimentation and erosion associated with movements of the shoreline (Clarke & Burgess 2000). Most coastal forests are found between 0-50 m and 300-500 m, although in Tanzania they occur up to 1040 m (Burgess *et al*. 2000). Rainfall ranges between 2000 mm/year (Pemba) to 500 mm/year (northern Kenya and southern Tanzania) (Clarke 2000). There are two rainy seasons (long, April-June; short, November-December) in the north, but only one (April-June) in the south. Dry seasons can be severe and El Niño effects dramatic. Climatic conditions are believed to have been relatively stable for the last 30 million years (Axelrod & Raven 1978), although variation from year to year can be considerable, leading to droughts or floods.

By the early 1990s, there were about 175 forest patches in the Coastal Forest Mosaic (Kenya 95, Tanzania 66) covering an area of 1,360 km^2 (Kenya 660 km^2, Tanzania 700 km^2) (Burgess *et al*. 2000). Mean patch size was 6.7 km^2 in Kenya and 10.6 km^2 in Tanzania. Modal patch-size classes were 0 – 1 km^2 in Kenya and 5-15 km^2 in Tanzania. The two largest coastal forests are both in Kenya (Arabuko-Sokoke, minimum area 370 km^2; Shimba, minimum area 63 km^2) (WWF-EARPO 2002), while in Tanzania there are no coastal forests larger than 40 km^2 (WWF-US 2003b). There is some uncertainty with these figures because of differences in criteria for patch inclusion in the data set (e.g., the exclusion of all but a few small patches (<2 km^2) from the Tanzanian data set and their full inclusion in the Kenya data set). The available information is also somewhat out of date and the current situation is, again, far more likely to have deteriorated than improved. No reliable estimates are available for the coastal forest with intact and contiguous canopies or for the extent of forest loss in recent history.

BIOLOGICAL IMPORTANCE

In this section, biological importance is assessed primarily in terms of endemic species. Subsequently, in the Conservation Outcomes, the emphasis is on the Red Lists of threatened species that occur in the hotspot. Because of the relatively small area of this hotspot, the high degree of threat it faces (Brooks *et al*. 2002) and the current criteria for inclusion in the Red List (IUCN 1994), all, or at least most, of the endemics are candidate "threatened species." This consideration is perhaps most obvious in the case of the plants where there are more than 1,500 endemic species in the hotspot, but only 236 (16 percent) are currently included in the Red List.

The global biodiversity values of the hotspot are widely recognized (Lovett 1988, 1998a, b, c; Myers 1990; Myers *et al*. 2000; Brooks *et al.* 2001; Brooks *et al*. 2002). This hotspot is home to at least 1,500 endemic plant species, 16 endemic mammals, 22 endemic birds, 50 endemic reptiles and 33 endemic amphibians (Lovett & Wasser, 1993; Burgess *et al*. 1998a; Burgess & Clarke 2000; Myers *et al*. 2000). It is considered as the hotspot most likely to suffer the most plant and vertebrate extinction for a given loss of habitat and as one of 11 "hyperhot" priorities for conservation investment (Brooks *et al*. 2002). Because of the small area of the hotspot, the densities of these endemics are among the highest in the world. At the global level, some 0.37 percent of all species (in eight major taxa) are estimated to be endemic to the Eastern Arc Mountains and 0.20 percent endemic to the Coastal Forest Mosaic (Burgess 2000).

The distribution of these endemic species within the hotspot merits special consideration. First, nearly all the EACF forest patches have biodiversity values and most contain at least one endemic species (Burgess & Clarke 2000). Second, there are many disjunct distributions, particularly amongst the birds and the plants (Burgess & Clarke 2000). Third, there is a huge turnover of species between patches, especially in the less mobile species. Forests that are only 100 km apart can differ in 70 percent of their millipedes (Hoffman, 2000) and in 80 percent of their plants (Clarke *et al.* 2000). In some invertebrate taxa, 80-90 percent of species can be strictly endemic to a single site (Scharff *et al*. 1981; Scharff 1992, 1993; Burgess *et al.* 1998b).

These distribution patterns are commonly found in both the Eastern Arc Mountains and the lowland Coastal Forest Mosaic. They indicate that much of the habitat fragmentation in this area is natural and sufficiently ancient for much speciation to have taken place in isolated patches and for species to have persisted here and there due to stochastic effects. However, over a period of

hundreds or perhaps thousands of years, there has also been considerable loss of habitat and habitat continuity between the natural fragments (loss of connectivity), as a result of human activities. This issue needs careful consideration when conservation interventions are planned.

Biodiversity in the Eastern Arc Mountains

In the Eastern Arc Mountains, around 40 percent (800 of more than 2000) of the plant species and 2 percent of genera (16 of about 800) are estimated to be endemic (Lovett & Wasser 1993; Lovett 1998b; GEF 2002). This area is the centre of endemism for the African violet, with 20 out of 21 species being endemic. Trees have attracted the most attention, but non-vascular plants also show significant endemism (32 of about 700 species of bryophytes) (Pocs 1998). The endemics are found in most of the forest types, as well as in intervening habitats such as rocky outcrops, heathland, montane grasslands and wetlands (Lovett 1998b).

The degree of faunal endemism in the Eastern Arc Mountains varies widely across taxa. Six percent of mammals, 3 percent of birds, 68 percent of forest-dependent reptiles, 63 percent of forest-dependent amphibians, 39 percent of butterflies and 82 percent of linyphiid spiders are endemic (GEF 2002). Some of these species have extremely limited distributions. The Kihansi spray toad, described in 1998, is found in an area of less than 1 km^2 (Poynton *et al*. 1998). Three endemic bird taxa (variously described as full species or subspecies) are restricted to the 6 km^2 of forest in the Taita Hills (Brooks *et al*. 1998). Records for the Udzungwa partridge are confined to two localities in the Udzungwas and one in Rubeho (Baker & Baker 2002). Amongst some invertebrates (linyphiid spiders, opilionids and carabid beetles), single site endemism exceeds 80 percent (Scharff *et al*. 1981; Scharff 1992, 1993; Burgess *et al.* 1998).

Using a subset of 239 species endemic and near-endemic to the Eastern Arc Mountains, the East Usambaras emerge as the most important site in terms of numbers of endemics, while the Ulugurus rank top for density of endemics (Burgess *et al.* 2001). As expected, the big forest blocks (Usambaras, Ulugurus and Udzungwas) are more species-rich than the smaller blocks (e.g., North Pare, South Pare, Ukaguru and Mahenge). Most of the endemic taxa are not only forest dependent; they are dependent on primary forest. The low-elevation forests are rich in endemics and total numbers of species, but are very limited in overall area, having suffered extensive clearance for agriculture. The uniqueness of the biodiversity in the Eastern Arc Mountains is attributable to both relictual and recently evolved species (Burgess *et al*. 1998c; Roy *et al*. 1997). Biogeographical affinities indicate ancient connections to Madagascar (45 species of bryophytes shared) (Pocs 1998), West Africa (many birds and plant genera) (Lovett 1998b; Burgess *et al.* 1998c) and even Southeast Asia (where close relatives of the Udzungwa forest partridge and the African tailorbird are found) (Dinesen *et al*. 1994).

Biodiversity in the Coastal Forests

The pattern of endemism in the Coastal Forest Mosaic is complex, reflecting the wide range of habitats and heterogeneous forest types, a high degree of turnover of local species between adjacent forest patches and many disjunct distributions (Burgess 2000; WWF-US 2003b). The ecoregion, which includes the islands of Zanzibar and Pemba, is a mosaic of forest patches, savanna woodlands, bushlands, thickets and farmland. The highest biodiversity is found in the various kinds of closed canopy forest vegetation: dry forest, scrub forest, *Brachystegia* (*miombo*) forest, riverine forest, groundwater forest, swamp forest and coastal/afromontane transition forest

(Clarke 2000; WWF-US 2003b). Closed canopy forests, however, makes up only 1 percent of the total area of the Coastal Forest Mosaic.

Overall, there are more than 4,500 plant species and 1,050 plant genera (WWF-US 2003b), with around 3,000 species and 750 genera occurring in forest. At least 400 plant species are endemic to the forest patches and about another 500 are endemic to the intervening habitats that make up 99 percent of the ecoregion area (WWF-US 2003b). The majority of these species are woody but there are also endemic climbers, shrubs, herbs, grasses and sedges (Clarke *et al.* 2000). A substantial proportion of the endemic plants are confined to a single forest (for example, Rondo Forest, Tanzania, has 60 strict endemics and Shimba Hills, Kenya, has 12) (Clarke *et al.* 2000). The flora as a whole has affinities with that of West Africa, suggesting an ancient connection with the Guineo-Congolian lowland forests (Lovett 1993). Endemism is primarily relictual rather than recently evolved (Clarke *et al*. 2000; Burgess *et al*. 1998c).

Faunal endemism rates have been estimated for forest species in the Swahelian Regional Centre of Endemism (including the transition zone in Mozambique). These are highest in the invertebrate groups such as millipedes (80 percent of all the forest species), molluscs (68 percent) and forest butterflies (19 percent) (Burgess 2000). Amongst the vertebrates, 7 percent of forest mammals, 10 percent of forest birds, 57 percent of forest reptiles and 36 percent of forest amphibians are endemic (Burgess 2000). If Mozambique is excluded, endemics include 14 species of birds (including four on Pemba Island), eight mammals, 36 reptiles and five amphibians (WWF-EARPO 2002).

In terms of species richness, there are at least 158 species of mammals (17 percent of all Afrotropical species), 94 reptiles and 1200 molluscs (WWF-US 2003b). As with the plants, endemism is primarily relictual (Burgess *et al*. 1998c) and single site endemism and disjunct distributions are common. This makes it extremely difficult to prioritise the forests in terms of their biodiversity. Burgess (2000) made a preliminary analysis on the basis of species richness and endemism, using vascular plants, birds, mammals, reptiles and amphibians. This showed that different forests are important for different groups. For example, while Arabuko-Sokoke is top for endemic birds and for mammal species richness, it barely makes it into the top ten for plants. Overall, the five most important forests are Rondo (plants and birds), lowland East Usambaras and Arabuko-Sokoke (birds, mammals and reptiles), Shimba (plants and birds) and Pugu Hills (birds and mammals). Pemba Island, with an area of only 101400 ha, is extraordinarily important for birds with four endemic species (Baker & Baker, 2002) while Zanzibar has six endemic mammals and three endemic birds (Siex, pers. comm.).

Levels of Protection

Forests in this hotspot are located in two countries and fall under multiple management regimes. Figure 2 shows the major protected areas in and around the hotspot.

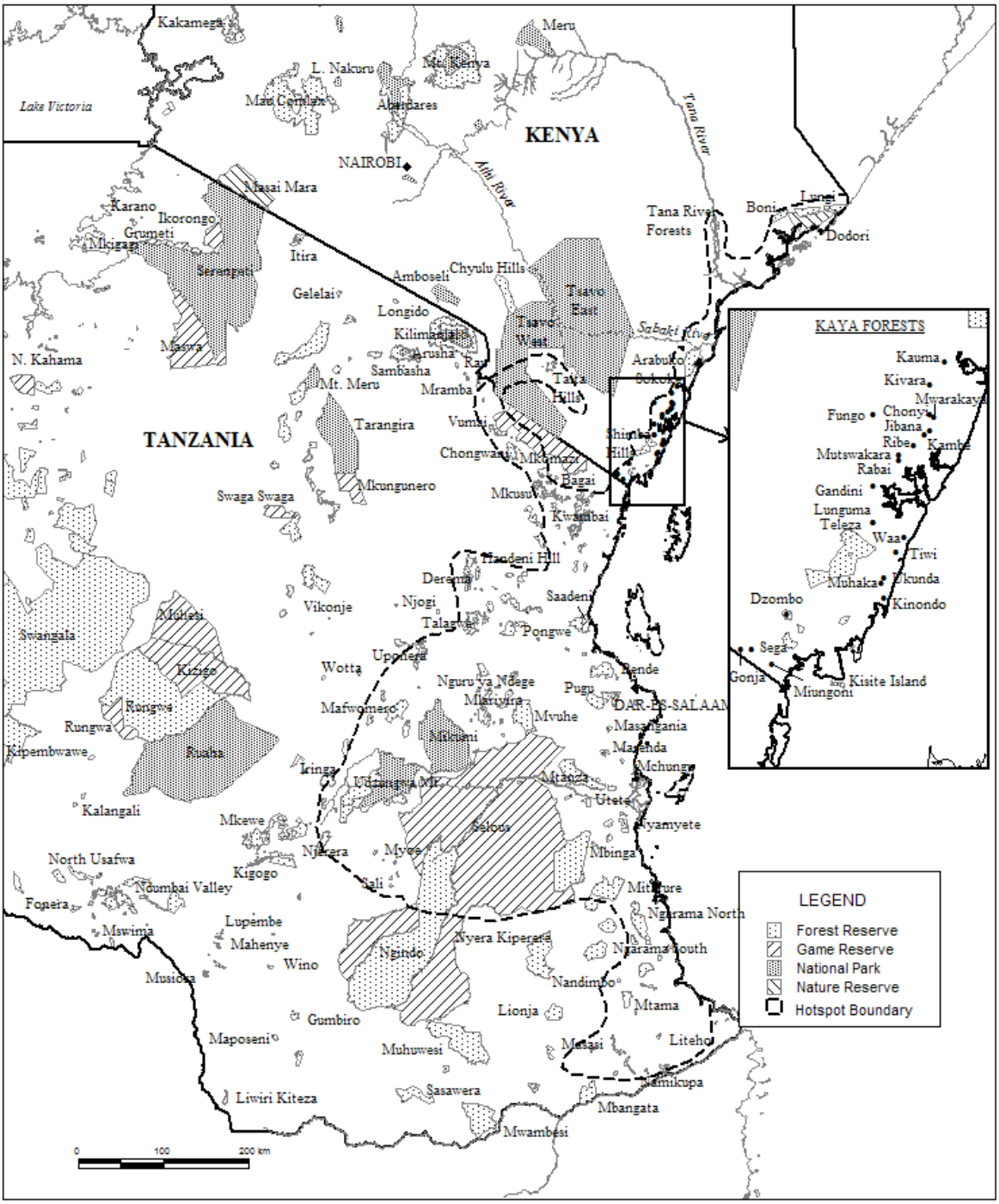
In Kenya, the protected area network at national level consists of national parks, national reserves, forest reserves, nature reserves and national monuments (Bennun & Njoroge 1999). Many of the national monuments on the coast are sacred forests called *Kaya* Forests. At a lower level, many forests are located on trust lands and fall under the control of County and Municipal councils. In Tanzania, the protected area network at national level consists of national parks,

game reserves, government catchment forests, game controlled areas, forest reserves and nature reserves (Baker & Baker 2002). Below the national level a large number of forests, particularly in the coastal forest belt, fall under local authorities, owned and managed by the villagers. In both countries, no exploitation is allowed in national parks and protection levels are generally high (but see below for an exception in Kenya). In both countries, confusing and overlapping legislation on the environment and natural resources is being rationalized through the enactment of new polices.

Within the Kenyan area of the hotspot, there is one national park, a 6 km^2 area to the northwest of Arabuko-Sokoke Forest. This park is, however, somewhat of an anomaly, as it contains no closed forest and exists only on paper. There are four national reserves (Shimba, Tana River, Boni and Dodori) (WWF-EARPO 2002). These fall under the jurisdiction of the Kenya Wildlife Service (KWS). The Shimba Hills were gazetted as National Forest in 1903 and then double-gazetted (with the exception of two small areas that remained as forest reserves under the control of the Forest Department) in 1968 as the Shimba Hills National Reserve (Bennun & Njoroge 1999). Protection levels are higher in the area controlled by KWS, as they have armed rangers and a clearer institutional mandate for conservation. The Tana River Primate National Reserve contains 16 out of the 70 patches of riverine forest found along the lower Tana River (Butynski & Mwangi 1994). There forests have suffered severe damage during the past three decades from farmers clearing land for agriculture and possibly from the construction of several dams up-river that have reduced the incidence of flooding (Butynski & Mwangi 1994, Wieczkowski & Mbora 1999-2000). The biodiversity in Boni and Dodori is poorly known because security problems have prevented biological surveys.

The largest of the Kenyan forest reserves is Arabuko Sokoke (417 km^2). For the last 10 years this forest has been under multi-institutional management (KWS, the Forest Department, Kenya Forestry Research Institute (KEFRI) and the National Museums of Kenya, (NMK)) (Arabuko-Sokoke Forest Management Team 2002). This arrangement has been taken as a model for other indigenous forests in Kenya but has been rarely implemented. Protection levels suffer from the proximity of the tourist resorts of Malindi and Watamu and the resultant demand for carving wood and timber. The effectiveness of management has been variable over time, being subject to the commitment of the personnel on the ground, the working relationships between KWS and the Forest Department and the level of resources available. Generally, however, management has been more effective than in the other 17 forest reserves (WWF-EARPO 2002) within the Kenyan coastal forest belt. In the fragmented forests of the Kenyan portion of the Eastern Arc Mountains (Taita Hills), some patches, including plantation, have been gazetted as forest reserve. Others are on trust land administered by the local county council, some of which have been recommended for gazettement as forest reserves (Bennun & Njoroge 1999).

Figure 2. Location of the major protected areas in and around the Eastern Arc Mountains and Coastal Forests hotspot



National monument status has been given to 39 out of nearly 50 of the sacred *Kaya* forests (WWF-EARPO 2002), but the level of protection gained from this status is below that of the

forest reserves. An additional national monument at Gede Ruins is not a *Kaya*, but it includes a fenced 350 ha coral rag forest that is in good condition and very well protected. There are numerous Local Government or County Council Forests. Unfortunately, protection of these forests is virtually non-existent, to the point where local councillors have sold forest plots for agricultural settlement (e.g., at Madunguni and Mangea Hill). A large proportion (nearly 40 percent) of the Kenyan coastal forests fall into this category or is totally unprotected (data from WWF-EARPO 2002).

In the Tanzanian portion of the Eastern Arc Mountains, there are two national parks (Udzungwa Mountains National Park, gazetted in 1992, 1,960 km^2; and Mikumi National Park, 3,230 km^2), two game reserves (Selous and Mkomazi) and a nature reserve (Amani Nature Reserve, gazetted in 1997, 83.8 km^2) (GEF 2002; Roe *et al*. 2002). However, more than 90 percent of the total forest area in the Tanzanian portion of the Eastern Arc Mountains and almost 75 percent of the total forests are gazetted as government catchment forest reserves (Burgess pers. com.). These range in area from more than 557,000 ha (Ngindo) to less than 10 ha and include all the larger forests in the Kilimanajaro (e.g., Chome), Tanga (e.g., Nguru North, Shume Magambe) and Morogoro (e.g., Uluguru, Nguru South) regions. Most of the remainder are local authority forests, ranging in size from 57,300 ha (Mbalwe/Mfukulembe) to less than 10 ha, although there are a few private forests, mainly on tea estates (e.g. Ambangulu Tea Estate) and some of which have been covenanted for conservation. In the national park, protection levels are high, but elsewhere they are highly variable. The important catchment forest reserves are, in general, better protected than the local authority forests (Burgess *et al.* 1998).

In the Tanzanian coastal forests, management regimes are more complicated. Most are either forest reserves (80) or are on public land (20) with no protection status (WWF-EARPO 2002). Four are private forest reserves (Magotwe, Kichi Hills, Mlungui and Magoroto). Only three are entirely managed by the district government as local authority forest reserves, although some have double status (two overlapping with forest reserves and two more with private forest reserves). There are two catchment forest reserves (Mselezi, Ziwani) (Burgess and Clarke 2000; WWF-EARPO 2002) managed by the Central Government Forest and Beekeeping Division. Two others, Zaraninge and the former Mkwaja ranch, are being incorporated into the new Sadaani National Park (WWF-EARPO 2002). Some patches are also found in the Selous Game Reserve and others in Mafia Island Marine Park. Offshore protected areas are also found in Zanzibar (Jozani Forest Reserve) and Pemba (Ngezi Forest Reserve). There are also smaller areas in Zanzibar that are important for water catchment (e.g. Masingi) and for endemic species (e.g. Unguja Ukuu Forest Plantation). There is a proposal to upgrade the Jozani Reserve in Zanzibar (now known as the Jozani-Chakwa Bay Conservation Area) to a national park.

Management and protection of most of the forests throughout the hotspot have suffered from inadequate stakeholder involvement, conflicts of interest and corruption. Where forests are gazetted, the boundaries tend to be respected but the forests themselves suffer steady degradation. The levels of protection achieved on the ground are strongly dependent on local factors such as proximity to urban areas, pressure for land, ease of access, presence of valuable timber and the capacity and morale of the local forestry officers (WWF-US 2003a). There is a general move toward various forms of participatory forest management (PFM), in the hope that an exchange of forest user rights for community management responsibilities and ownership

(where appropriate) will lead to better protection by the people who often know best what is going on in the forests. Although this hope is widely held, it has not yet been scientifically tested within the hotspot. The alternative strategies of direct payments and easements are being explored, but have not yet been implemented.

CONSERVATION OUTCOMES

This ecosystem profile, together with profiles under development for other regions at this time, includes a new commitment and emphasis on using conservation outcomes—targets against which the success of investments can be measured—as the scientific underpinning for determining CEPF's geographic and thematic focus for investment.

Conservation outcomes are the full set of quantitative and justifiable conservation targets in a hotspot that need to be achieved in order to prevent biodiversity loss. These targets are defined at three levels: species (extinctions avoided), sites (areas protected) and landscapes (corridors created). As conservation in the field succeeds in achieving these targets, these targets become demonstrable results or outcomes. While CEPF cannot achieve all of the outcomes identified for a region on its own, the partnership is trying to ensure that its conservation investments are working toward preventing biodiversity loss and that its success can be monitored and measured. CI's Center for Applied Biodiversity Science (CABS) is facilitating the definition of conservation outcomes across the 25 global hotspots, representing the benchmarks against which the global conservation community can gauge the success of conservation measures.

Overview of Conservation Outcomes

Conservation outcomes focus on biodiversity across a hierarchical continuum of ecological scales. This continuum can be condensed into the three levels: species, sites and landscapes. The three levels interlock geographically through the presence of species in sites and of sites in landscapes. They are also logically connected. If species are to be conserved, the sites on which they live must be protected and the landscapes must continue to sustain the ecological services on which the sites and the species depend. At the landscape level, conservation corridors (within which sites are nested) can sometimes be defined and investments can be targeted at increasing the amount of habitat with ecological and biodiversity value within these corridors. Given threats to biodiversity at each of the three levels, quantifiable targets for conservation can be set in terms of extinctions avoided, sites protected and, where appropriate, conservation corridors created or preserved. This can only be done when accurate and comprehensive data are available on the distribution of threatened species across sites and landscapes.

Defining conservation outcomes is therefore a bottom-up process through which species-level targets are defined first and based on the species information, site-level conservation targets are identified. Landscape-level targets are delineated subsequently, if appropriate for the region. The process requires knowledge on the conservation status of individual species. This information has been accumulating in the Red Lists of Threatened Species developed by IUCN and partners. The Red List is based on quantitative, globally applicable criteria under which the probability of extinction is estimated for each species. Species outcomes in the hotspot include those species that are globally threatened (Vulnerable, Endangered and Critically Endangered) according to *The 2002 IUCN Red List of Threatened Species*. Outcome definition is a fluid process and, as data become available, species-level outcomes will be expanded to include other taxonomic

groups that previously had not been assessed, as well as restricted-range species. Avoiding extinctions means conserving globally threatened species to make sure that their Red List status improves or at least stabilizes. This in turn means that data are needed on population trends; for most of the threatened species, there are no such data.

Recognizing that most species are best conserved through the protection of the sites in which they occur, site outcomes are defined for each target species. Site outcomes are focused on physically and/or socioeconomically discrete areas of land that harbour populations of at least one globally threatened species. These sites need to be protected from ecological transformation to conserve the target species. Sites are scale-independent and, ideally, should be manageable as single units.

Corridor outcomes are focused on landscapes that need to be conserved to allow the persistence of biodiversity over time. Species and site outcomes are nested within corridors. The goal of corridors is to preserve ecological and evolutionary processes, as well as enhance connectivity between important conservation sites by effectively increasing the amount of habitat with biodiversity value near them. Unlike species and site outcomes, the criteria for determining corridor outcomes are being defined and this is presently an important research front. CABS will make the data on conservation outcomes publicly available on CEPF's Web site, www.cepf.net.

Species Outcomes

To define the species outcomes for this hotspot, all globally threatened species in *The 2002 Red List of Threatened Species* that are found in the Eastern Arc Mountains and Coastal Forests hotspot were identified. Data were compiled for each species on its conservation status and known distribution. Site outcomes were determined by identifying all sites that are important for each globally threatened species. Following a review of the species and site outcomes and expert consultations, corridor outcomes were not defined for this hotspot. Conservation corridors (landscape conservation units consisting of core sites and the surrounding matrix) did not make sense in this naturally fragmented, relatively small hotspot. However, it will be important to reconnect forest patches that have only become isolated in recent decades as a result of human activities. Failure to reconnect forest patches within a formerly continuous site will inevitably mean the extinction of numerous species as the habitat patches fall to sizes that can no longer sustain their biodiversity due to island biogeography effects (Newmark 1991, 2002; Brooks *et al.* 2002).

The definition of the conservation outcomes drew heavily on the research findings of a large number of scientists who have worked intensively in this hotspot over the last three decades and who have contributed to various compilations of primary field data (Lovett & Wasser 1993; Burgess *et al*. 1998, Burgess & Clarke 2000; Newmark 2002; WWF-EARPO 2002; WWF-US 2003a,b). The key sources of data on threatened plants included the Flora of Tropical East Africa (see Beentje & Smith [2001] for details of publication), the TROPICOS database (MBG 2003) and a database compiled by Q. Luke. Data on faunal species distributions in Tanzania were drawn from the University of Dar es Salaam biodiversity database (Howell & Msuya 2003). The work to define national Important Bird Areas (IBAs) was also an important source of data. The IBA process in Kenya and Tanzania (coordinated by Nature Kenya and the Wildlife Conservation Society of Tanzania as the BirdLife International partners for these countries) had

already compiled data for threatened and restricted-range birds and their key sites (IBAs). These data were already in the World Bird Database at BirdLife International. The IBAs provided a starting point for including other aspects of the biodiversity of this hotspot to identify key biodiversity areas, or site level conservation outcomes.

The results of the outcome definition indicate that 333 globally threatened (Red List) species occur in the hotspot, with 105 species being represented in Kenya and 307 in Tanzania (Table 1). The globally threatened flora and fauna in the hotspot are represented by 236 plant species, 29 mammal species, 28 bird species, 33 amphibian species and seven gastropod species. Of the 333 globally threatened species in the hotspot, 241 are Vulnerable, 68 are Endangered and 24 are Critically Endangered.

The full list of species outcomes is provided in Appendix 1. The species outcomes are based on the 2002 IUCN Red List, which is quite good for several taxonomic groups. However, Red List data for plants is badly in need of updating. The 2002 Red List includes some widespread plant species in this hotspot, others that are in far greater danger of extinction because their restricted

Table 1. Numbers of Critically Endangered, Endangered and Vulnerable species in five major taxonomic groups in the Eastern Arc Mountains and Coastal Forests hotspot

	Degree of Threat				Country	
Taxonomic Group	**CR**	**EN**	**VU**	**Total**	**Tanzania**	**Kenya**
Mammals	5	8	16	29	27	9
Birds	3	10	15	28	24	10
Amphibians	4	11	18	33	31	3
Gastropods	3	3	1	7	4	3
Plants	9	36	191	236	221	80
Total	**24**	**68**	**241**	**333**	**307**	**105**

CR = Critically Endangered, **EN** = Endangered, **VU** = Vulnerable

ranges have not yet been assessed (Q. Luke & R. Gereau pers. comm.). Gereau and Luke (2003) estimate the total number of globally threatened plant species in the hotspot is probably 1,200 or more, including 973 taxa that are not in the 2002 IUCN Red List and that urgently need to be assessed for degree of threat status.

Noticeably absent from the species outcomes are reptiles, freshwater fish and nearly all the invertebrates. None of the reptiles or fish within this hotspot is currently on the IUCN Red List. This is a result of either (1) a lack of information on these species or simply (2) because nobody has yet made the required "assessment" for possible inclusion in the Red List. Among invertebrates, information was only available for gastropods. It is expected that many more invertebrate species (as well as plants and reptiles) will prove to be threatened once they are assessed using updated IUCN criteria. A list of potentially threatened dragonflies has also been compiled by Viola Clausnitzer of the University of Marburg, Germany.

Table 2 lists the 24 Critically Endangered species in this hotspot (five mammals, three birds, four amphibians, three gastropods and nine plants). Of these 24 species, 12 occur in Tanzania, seven in Kenya and five in both Kenya and Tanzania. If extinctions are to be avoided, the full set of these Critically Endangered species, together with the sites they depend on, must be ranked high among any priorities for conservation action. For example, 17 of the 24 Critically Endangered species in this hotspot are each restricted to a single site. This result is important for the site prioritization process.

There are other species in the hotspot, currently listed as Endangered, which should be re-assessed for threat status. These include the Zanzibar red colobus monkey (*Procolobus kirkii)* (less than 2,000, mostly in Jozani Forest Reserve) and Aders' duiker (probably less than 800 in a very restricted range with a 50 percent decline within last 15-20 years) (Struhsaker pers. comm.). Two other Endangered species—African Elephant and African Wild Dog—were identified as "landscape species," indicating that they will likely not be conserved through a site-based approach alone.

Site Outcomes

The definition of site outcomes produced 160 Key Biodiversity Areas for the Eastern Arc Mountains and Coastal Forests hotspot (Appendix 2, Table 3). Among these, 41 sites are important for mammals, 29 for birds, 19 for amphibians, four for gastropods and 140 for plants. In the hotspot, 26 sites are home to 10 or more globally threatened species, 53 sites have two to nine globally threatened species and 73 are important for at least one globally threatened species among the considered taxonomic groups. Nine more sites are included in Appendix 2, not because they host globally threatened species, but because they are IBAs with restricted-range bird species and globally significant congregations of birds. The full description of site outcomes and the species that occur in them is presented in Appendix 3. Figure 3 shows the location and distribution of the site outcomes in Kenya and Tanzania. The sites were overlaid with other existing geographical information including national boundaries, protected areas, rivers and topography to show their distribution in relation to other features.

Further analysis of the composition of the site outcomes (Appendix 2 and 3) indicates that 51 of the 160 sites are IBAs (Bennun & Njoroge 1999; Baker & Baker 2002). Some sites have high numbers of threatened species. These sites include: East Usambara Mountains, Uluguru Mountains, Udzungwa Mountains National Park, West Usambara Mountains, Udzungwa Mountains, Shimba Hills, Lindi District Coastal Forests, Nguru Mountains, Taita Hills, South Pare Mountains and Kisarawe District Coastal Forests. When the sites are ranked according to the number of threatened species that they contain, 23 of the top 25 sites are IBAs. This suggests that the IBA process succeeds in identifying the key sites for conserving species of global concern, at least on a broad scale.

Table 2. Critically Endangered species and the sites where they occur in the Eastern Arc Mountains and Coastal Forests hotspot

Taxonomic Group	Scientific Name	Country	Number of Sites	Name of Site(s)
Mammals	*Crocidura desperate*	Tanzania	1	Udzungwa Mountains
	Crocidura telfordi	Tanzania	2	Udzungwa Mountains, Uluguru Mountains
	Diceros bicornis	Tanzania,	2	Selous Game Reserve Udzungwa Mountains
	Procolobus rufomitratus	Kenya	1	Lower Tana River forests
	Pteropus voeltzkowi	Tanzania	1	Pemba Island
Birds	*Apalis fuscigularis*	Kenya	1	Taita Hills forest
	Orthotomus moreaui	Tanzania	1	East Usambara Mountains
	Turdus helleri	Kenya	1	Taita Hills forest
Amphibians	*Churamiti maridadi*	Tanzania	1	Ukaguru Mountains
	Nectophrynoides asperginis	Tanzania	1	Udzungwa Mountains
	Nectophrynoides wendyae	Tanzania	1	Udzungwa Mountains
	Parhoplophryne usambarica	Tanzania	1	East Usambara Mountains
Gastropods	*Gulella taitensis*	Kenya	1	Taita Hills forest
	Thapsia buraensis	Kenya	1	Taita Hills forest
	Zingis radiolata	Kenya	1	Taita Hills forest
Plants	*Calodendrum eickii*	Tanzania	1	West Usambara Mountains
	Combretum tenuipetiolatum	Tanzania, Kenya	3	Kaya Rabai, Nzovuni River, West Usambara Mountains
	Cynometra filifera	Tanzania	2	Lindi, Lindi creek
	Cynometra gillmanii	Tanzania	1	Kilwa District coastal forests
	Euphorbia tanaensis	Kenya	1	Witu forest reserve
	Ficus faulkneriana	Tanzania, Kenya	7	Dzirihini, East Usambara Mountains, Msambweni, near Buda Forest Reserve, Pangani (Mwera), Pangani District coastal forests, Shimba Hills
	Karomia gigas	Tanzania, Kenya	2	Kaya Mwarakaya, Kilwa District coastal forests
	Platypterocarpus tanganyikensis	Tanzania	1	West Usambara Mountains
	Sorindeia calantha	Tanzania, Kenya	4	Mount Kasigau, Nguru Mountains, South Pare Mountains, Udzungwa Mountains National Park

Table 3. Numbers of sites with Critically Endangered, Endangered and Vulnerable species in five major taxonomic groups in the Eastern Arc Mountains and Coastal Forests hotspot

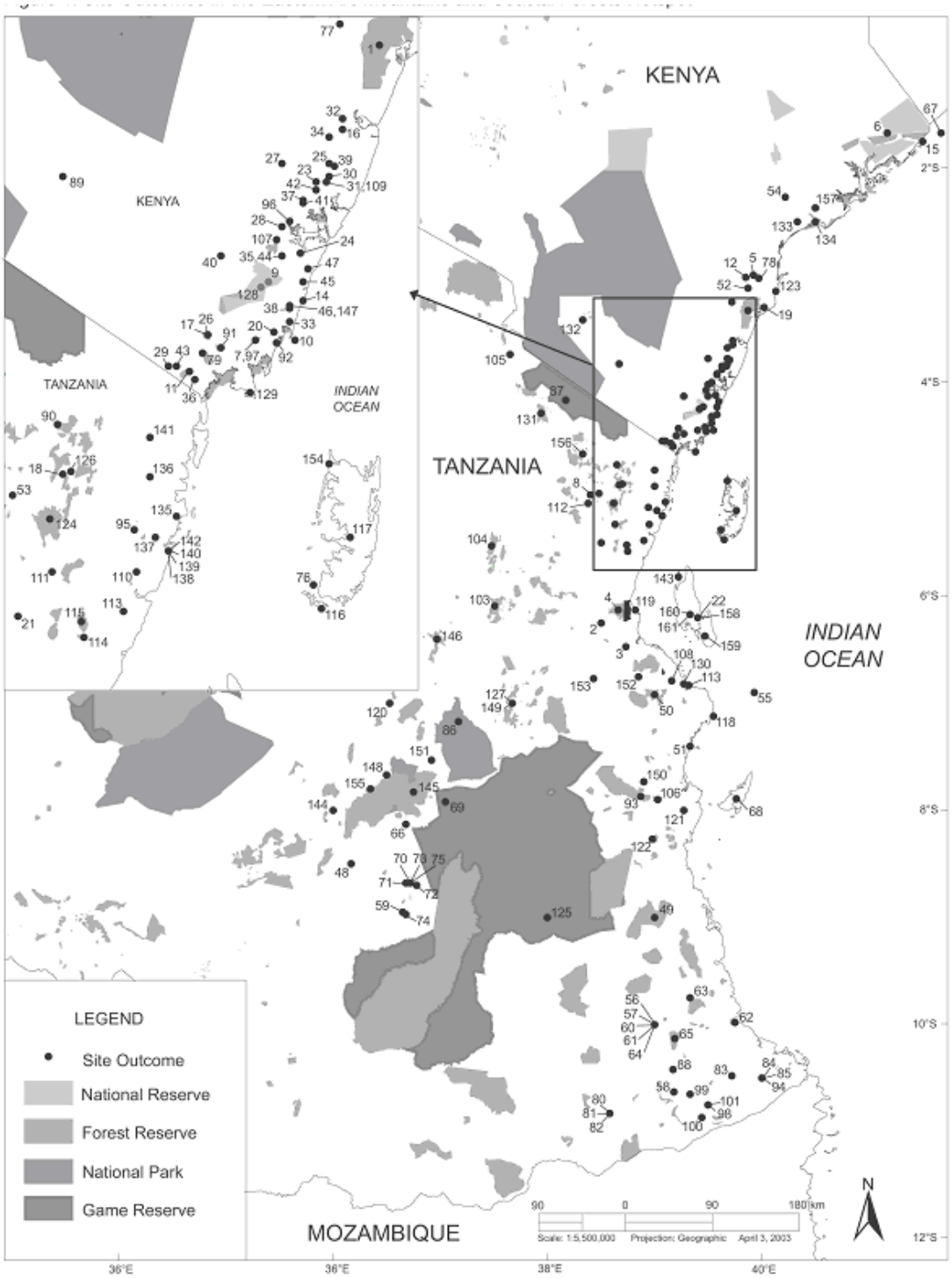
	Number of Sites*		Total
Taxonomic Group	**Kenya**	**Tanzania**	**Sites**
Mammals	14	26	**40**
Birds	10	19	**29**
Amphibians	2	17	**19**
Gastropods	1	3	**4**
Plants	52	87	**140**

*The total number of site outcomes is 160.

An alternative to a simple threatened species richness ranking is to examine the site data for complementarity and to determine: 1) the minimum set of sites that contain all globally threatened species at least once; and 2) those sites that contain a species that occurs nowhere else (i.e. are irreplaceable, even if they only have one species). A preliminary analysis (Rodrigues and Langhammer pers. comm.) indicates that the minimum set consists of 35 sites and that, of these, 26 are irreplaceable. If the sites are ranked by species richness, the top 33 sites contain 97 percent of all threatened species (although it takes 129 sites to capture 100 percent). This means that, except for a few species, the selection of sites by a simple threatened species richness ranking is not a bad prioritization strategy compared with the complementarity set. Among the top 20 sites by species richness, only two (Bagomoya District Forests and North Pare Mountains) fail to make it into the complementarity set and only three are not irreplaceable (Bagomoya District Forests, North Pare Mountains and Mafia Island).

It must be understood, however, that neither strategy should be applied exclusively. There are many reasons for this. First, the survival of a threatened species is likely to require conservation interventions at more than one site. For example, the best known population of Clarke's weaver is in Arabuko-Sokoke Forest, but it doesn't breed there. Second, a species found in several sites may only have viable populations in one or two of them and these critical sites may not be captured by complementarity, or rank highly for species richness. Third, variation in the raw data (numbers of threatened species per site) can be partly accounted for by large site differences in area (over five orders of magnitude: Appendix 3) and/or research investment. Fourth, the outcome analysis is based on a small number of taxonomic groups and in some of these groups (especially the plants) the Red Lists are in serious need of re-assessment. Fifth, prioritizing sites must take into account not only their relative biological importance, but also the degrees of threat to them and the current investments in them.

Figure 3. Location and distribution of site outcomes for the Eastern Arc Mountains and Coastal Forests hotspot



Key to Figure 3

1 Arabuko-Sokoke forest
2 Bagamoyo
3 Bagamoyo (Kikoka forest reserve)
4 Bagamoyo District coastal forests
5 Baricho near Arabuko Sokoke
6 Boni forest
7 Buda forest reserve
8 Bungu
9 Cha Simba
10 Chale Island
11 Chuna forest
12 Dakatcha woodland
13 Dar es Salaam coast
14 Diani forest
15 Dodori forest
16 Dzitzoni
17 Dzombo hill forest
18 East Usambara mountains
19 Gede Ruins National Monument
20 Gongoni forest reserve
21 Handeni District coastal forests
22 Jozani forest reserve, Zanzibar
23 Kambe Rocks
24 Kaya Bombo
25 Kaya Chonyi
26 Kaya Dzombo
27 Kaya Fungo
28 Kaya Gandini
29 Kaya Gonja
30 Kaya Jibana
31 Kaya Kambe
32 Kaya Kauma
33 Kaya Kinondo
34 Kaya Kivara
35 Kaya Lunguma
36 Kaya Miungoni
37 Kaya Mtswakara
38 Kaya Muhaka
39 Kaya Mwarakaya
40 Kaya Puma
41 Kaya Rabai
42 Kaya Ribe
43 Kaya Sega
44 Kaya Teleza
45 Kaya Tiwi
46 Kaya Ukunda
47 Kaya Waa
48 Kilombero valley
49 Kilwa District coastal forests
50 Kisarawe District coastal forests
51 Kisiju
52 Kisimani wa Ngoa
53 Korogwe (Kwashemshi Sisal Estate)
54 Lango ya simba

* Please refer to Appendix 3 for more information on each site.

55 Latham Island
56 Lindi
57 Lindi (Kengedi)
58 Lindi (Mkindani)
59 Lindi (Ngongo)
60 Lindi (Nondora)
61 Lindi (Nyangao River)
62 Lindi (Ras Rungi)
63 Lindi (Tendaguru)
64 Lindi creek
65 Lindi District coastal forests
66 Lukoga forest reserve
67 Lunghi forest
68 Mafia Island
69 Magombera forest reserve
70 Mahenge
71 Mahenge (Kwiro forest)
72 Mahenge (Liondo)
73 Mahenge (Lipindi)
74 Mahenge (Sali)
75 Mahenge Scarp forest reserve
76 Makongwe Island
77 Mangea Hill
78 Marafa
79 Marenji forest
80 Masasi
81 Masasi (Nyengedi)
82 Masasi East
83 Mikindani (Mnima)
84 Mikindani (Mtwara inland)
85 Mikindani District (Mtwara-Mikindani)
86 Mikumi National Park
87 Mkomazi game reserve
88 Mnazi Bay
89 Mount Kasigau
90 Mpanga village forest reserve
91 Mrima Hill forest
92 Msambweni
93 Mtanza forest reserve
94 Mtwara
95 Muheza District coastal forests
96 Mwache forest reserve
97 near Buda forest reserve
98 Newala (Kitama)
99 Newala (Kitangari)
100 Newala (Mahuta)
101 Newala District coastal forests
102 Nguru mountains
103 Nguu mountains
104 North Pare Mountains
105 Nyumburuni forest reserve
106 Nzovuni River
107 Pande and Dodwe coastal forests

108 Pangani
19 Pangani (Bushiri)
110 Pangani (Hale-Makinjumbe)
111 Pangani (Mauri)
112 Pangani (Mwera)
113 Pangani Dam
114 Pangani District coastal forests
115 Panza Island
116 Pemba Island
117 Ras Kituani
118 River Wami
119 Rubeho Mountains
120 Rufiji Delta
121 Rufiji District coastal forests
122 Sabaki River Mouth
123 Sangerawe
124 Selous game reserve
125 Semdoe
126 Shikurufumi forest reserve
127 Shimba Hills
128 Shimoni forests
129 Sinza River-near University of Dar
130 South Pare mountains
131 Taita Hills forests
132 Tana River Delta
133 Tana River forests
134 Tanga (Duga)
135 Tanga (Gombero forest reserve)
136 Tanga (Morongo)
137 Tanga (Nyamaku)
138 Tanga (Pangani)
139 Tanga (Sigi River)
140 Tanga North-Kibo Salt Pans
141 Tanga South
142 Tumbatu Island
143 Udzungwa mountains
144 Udzungwa National Park
145 Ukaguru mountains

146 Ukunda
147 Ukwama forest reserve
148 Uluguru mountains
149 Utete (Kibiti)
150 Uvidunda mountains
151 Uzaramo (Dar to Morogoro)
152 Uzaramo (Msua)
153 Verani South West
154 Vigola
155 West Usambara mountains
156 Witu forest reserve
157 Zanzibar (Kituani)
158 Zanzibar (Muyuni)
159 Zanzibar Island-East Coast
160 Zanzibar Island-South Coast

With this background, there is no present justification for the exclusion of any of the 160 site outcomes from possible CEPF funding. Conversely, it would be a waste of the available data not to recognize that some particularly important sites should be targeted. A mixed strategy for site prioritization is therefore recommended.

CEPF investments cannot achieve all of the conservation outcomes identified in this profile, but, by defining these outcomes on the basis of globally threatened species, CEPF can ensure that all its projects in this hotspot will be targeted toward globally significant biodiversity conservation. The outcome definition also means that CEPF and other donors, as well as conservation organizations in general, can track the success of their investments and interventions, by measuring extinctions avoided and sites protected. This is particularly important for a global program like CEPF, which has a responsibility to use resources in ways that achieve biodiversity conservation most effectively at a global scale.

SOCIOECONOMIC FEATURES

Humans evolved in Africa and have inhabited its landscapes for hundreds of thousands of years. Their power to change these landscapes has grown through the successive discoveries of fire, agriculture, technology, trade and fossil fuels. The use of fire in East Africa dates back at least 60,000 years and the ability to smelt iron at least 2,000 years. Charcoal layers and earthenware have been discovered in the soils under good canopy forest in East Usambaras (Rodgers 1998). But it has been the ability of humans to tap the energy locked up in fossil fuels that has most transformed the planet. The population growth that this has enabled means that nearly all conservation problems today involve people and their needs and that socioeconomic considerations must be part of the solutions.

Institutional Framework

In both Tanzania and Kenya, the institutional frameworks that structure the interactions of people and forests are largely an inheritance from the colonial governments. Both countries have a Civil Service structure that includes ministries, permanent secretaries and national institutions (divisions, departments) dealing with different sectors of society and the economy. In Tanzania, the Ministry of Natural Resources and Tourism (MNRT) oversees four divisions (Wildlife (WD), Forest and Beekeeping (FBD), Fisheries and Tourism) and supervises five parastatal wildlife organizations including Tanzania National Parks Authority (TANAPA), Tanzania Forestry Research Institute (TAFORI) and the Tanzania Wildlife Research Institute (TAWIRI). An important function of TAWIRI is to issue research permits for all ecological and biological fieldwork in the country. In Zanzibar, the Zanzibar Department of Commercial Crops, Fruits and Forestry (DCCFF), under the Ministry of Agriculture, Lands and Natural Resources, administers forest resources and the area proposed to become the Jozani-Chwaka Bay National Park. Research permits to work in Zanzibar and Pemba have to go through the Zanzibar authorities.

In Kenya the forests are mostly under the Forest Department, within the Ministry of Environment and Natural Resources. Other forest stakeholder institutions include the Kenya Wildlife Service (KWS), Kenya Forestry Research Institute (KEFRI) and the National Museums of Kenya (NMK). In addition there are a large number of NGOs with interests in environment and conservation in the hotspot.

Government Institutional Framework for Forestry in Tanzania
In Tanzania, the FBD is accountable to the permanent secretary in the Ministry of Natural Resources and Tourism (MNRT) and is responsible for the protection of forests and the productive use of forest lands to meet demands for wood products. Until relatively recently, protection focused on watersheds rather than biodiversity and production involved harvesting of indigenous hardwoods and the establishment of industrial plantations of pine and cypress. Now there is official recognition of the biodiversity values of the indigenous forest reserves within FBD and the harvesting of indigenous hardwoods has been banned in conservation areas, including the Eastern Arc and Coastal Forests. The Government Catchment Forests (mainly in the Uluguru and East Usambara Mountains) and the nature reserves have remained under government control, administered by an FBD staff of eight forest officers and 57 assistant forest officers (GEF 2002). Because of a national policy of decentralization, most of the remaining forests are managed at the district level under a variety of regimes. There are at least six categories of management status: Forest Reserves, Local Authority Forest Reserves, Monuments, Village Forest Reserves, Private Forest Reserves and Public Lands/Public Forest (WWF-EARPO 2002b).

There are three additional management categories in the Eastern Arc Mountains, which are outside the FBD/District level framework for forests: National Parks, Game Reserves and Nature Reserves. There are two national parks (Udzungwa Mountains National Park and Mikumi National Park) managed by the Tanzanian National Park Authority based in Arusha. There are two game reserves (Selous and Mkomazi) and one nature reserve (Amani) managed by the Wildlife Division and the Tanzanian Wildlife Research Institute (TAWIRI). Nature Reserves enjoy a higher level of protection than Forest Reserves.

A number of problems have been identified with the administrative framework of FBD, some of which are exacerbated by the decentralized structure for forest management in Tanzania (GEF 2002). These include:

- emphasis on regulation and enforcement rather than on service delivery;
- weak oversight on forest management, poor accountability and supervision.
- ineffective fiscal procedures in terms of meeting objectives and delivering services;
- poor revenue collection;
- no institutional mechanisms for biodiversity conservation;
- no scope for the public financing of biodiversity conservation;
- no institutional recognition of the needs of local communities; and
- diverse and complex tenure systems.

These and other institutional problems are being addressed by major reforms in the Tanzanian forest sector. A proposed $62.2 million dollar project (Forest Conservation and Management Project) funded by GEF, World Bank and the IDA would implement the reforms. A major output of this project would be the establishment of the Tanzania Forest Service (TFS), which would be responsible for the implementation of the National Forest Programme (see below).

Government Institutional Framework for Forestry in Kenya
In Kenya, there is a great deal of overlap in the institutional planning, implementation, management and monitoring of environmental policies and legislation. In 1992, the National

Biodiversity Unit included no less than 38 government ministries, departments and parastatal institutions dealing with biodiversity issues. There are four government institutions that are directly involved in forest management and conservation: the Forest Department, KWS, the Kenya Forestry Research Institute and the National Museums of Kenya. At a few sites, all four are represented in multi-institutional management teams (e.g. the Arabuko-Sokoke Forest Management Team at Arabuko-Sokoke Forest).

The Forest Department has the major mandate. It falls under the Ministry of Environment and Natural Resources (MENR) and is responsible for:

- formulation of policies for management and conservation of forests;
- preparation and implementation of management plans;
- management and protection of Kenya's gazetted forests;
- establishment and management of forest plantations;
- promotion of on-farm forestry; and
- promotion of environmental awareness.

The Forest Department operates some 160 forest stations, reporting to 65 District Forest Offices which in turn report to eight Provincial Forest Offices. In the past the department has concentrated on industrial forestry, but is now giving greater attention to afforestation on smallholder farm land and the conservation of natural forests. The department has many of the same problems as the FBD in Tanzania, although its administration does not suffer from the fragmentary effects of decentralization. Resources are limited and staffing levels are inadequate for keeping the department fully operational. A high percentage of the department's total budget goes to salaries and allowances. There are plans for transforming the department into a new body called the Kenya Forest Service. These plans are less advanced than those in Tanzania but they have the same goals.

The KWS is a parastatal and is responsible for the protection of the nation's wildlife. On December 5th 1991, the directors of KWS and the Forest Department signed a memorandum of understanding (MoU), covering the management of selected indigenous forest reserves. Within this MoU, the major responsibilities of KWS are the management of tourism, problem animals and wildlife protection.

The National Museums of Kenya (NMK) was subsequently included in the MoU under an addendum that recognized its role in cataloguing, researching and conserving forest biodiversity. NMK has also been responsible for the surveying and gazetting of sacred coastal forests as national monuments, through the Coastal Forest Conservation Unit (CFCU).

The Kenya Forestry Research Institute (KEFRI) was established in 1986. Its mission is to enhance the social and economic welfare of Kenyans through user-oriented research for sustainable development of forests and allied natural resources. In 2002, it had 94 university graduate research scientists at PhD, MSc and BSc level, in 17 research centres in various ecological zones of Kenya. The Gede Regional Research Centre is responsible for research in the coastal forests.

Nongovernmental Organizations
East Africa has a plethora of environmental and conservation NGOs, many of which have been or are involved in forestry-related activities in the hotspot. It is impossible to do much more than list them in the present context and to highlight a few issues of particular importance. Their interventions have complemented on-going government conservation and development initiatives in the hotspot and have greatly assisted the Forest Department and FBD during periods when donor funding was difficult to get for government departments.

NGOs can provide significant complementarity to government institutions:

- They are able to speak out without adhering to governmental policies and to lobby the government on environmental policies and decisions.
- They have demonstrated accountability to donors because they need to be accountable to survive.
- They can quickly raise and access funding, take decisions and act in response to emergencies or changing circumstances.
- They are often closer to the grassroots and have a stronger relationship with communities.
- Their members are often motivated by strong convictions and are therefore highly committed.
- They are increasingly part of a supportive international network, which can quickly share knowledge and experience on environmental issues and which has a global voice.

They have one fundamental disadvantage: they do not have the national mandates to manage forests and wildlife areas and while they can contribute to park, forest or wildlife management they do not have ultimate authority. This means that their ability to solve problems on the ground in forest reserves or national parks is limited. NGO project management is often challenging and it requires technical, managerial, political and interpersonal skills. High turnover in project managers is not uncommon.

International environmental and conservation NGOs working in East Africa include African Wildlife Foundation (AWF), African Conservation Centre (ACC), BirdLife International, CARE International and CARE Tanzania, Environmental Liaison Centre International, Friends of Conservation (FoC), the IUCN East Africa Regional Office (IUCN-EARO), TRAFFIC and WWF-EARPO. IUCN, WWF, TRAFFIC, BirdLife International and CARE International are global organizations with regional and national offices in Dar es Salaam and/or Nairobi. AWF, ACC and FoC operate throughout Africa, but are linked with parent institutions abroad. All of these well-known organizations have carried out significant activities within the hotspot. WWF-EARPO is spearheading the Eastern Africa Coastal Forest Programme in Kenya, Tanzania and Mozambique.

The East African Wild Life Society (EAWLS) and the East Africa Natural History Society (EANHS) operate only in East Africa, although their membership is international. The EANHS is composed of two partner NGOs: Nature Kenya (NK) and Nature Uganda (NU), both of which are the national partners of BirdLife International in Kenya and Uganda. NK was one of the implementers for BirdLife's IBA project and it published the IBA book for Kenya (Bennun & Njoroge 1999). It has been particularly active in Arabuko-Sokoke Forest. The EAWLS is host to

the Kenya Forests Working Group (KFWG), which is a coalition of NGOs and of anyone interested in forests and which has been an extremely important focus for civil society action against government policies that have threatened Kenyan forests. The EAWLS has also been very active in the Taita Hills.

National NGOs in Kenya include A Rocha Kenya (ARK) in Watamu and the Forest Action Network (FAN) in Nairobi. In Tanzania, national NGOs include TFCG; Frontier-Tanzania; Journalist Environmental Association of Tanzania (JET); the Lawyers Environmental Association of Tanzania (LEAT); and Wildlife Conservation Society of Tanzania (WCST). FAN has been particularly active on policy matters in Kenya and in stimulating networking on Participatory Forest Management. ARK is a Christian conservation organization that is active in bird monitoring and conservation education on the north coast of Kenya. Frontier-Tanzania has been responsible for much of the scientific research in the Eastern Arc Mountains, working together with the University of Dar es Salaam and visiting scientists. The TFCG has a considerable track record of conservation initiatives on the Tanzanian side of the hotspot, particularly in working with local communities and in participatory forest management. The WCST is the BirdLife national partner for Tanzania and has produced the Tanzanian IBA book (Baker & Baker, 2002). LEAT provides important legal support on conservation issues in Tanzania, while JET is invaluable in awareness raising and advocacy.

Among the community-based organizations are the Arabuko-Sokoke Forest-Adjacent Dwellers Association; the Arabuko-Sokoke Forest Guides Association; and the Shimba Hills Support Group. In Tanzania these organizations include the Korogwe Development Environmental Protection Association; Morogoro Environmental Conservation Action Group; Sigi River Conservation Society - Tanga and Usambara Environment Conservation Organization - Lushoto. Many of these are relatively new and need testing and capacity building, but they have the virtues of being on-site and being rooted mostly in the local communities, where support is badly needed.

Policy and Legislation

Both Kenya and Tanzania have recently updated, or are in the process of updating, their policies and legislation on forests and the environment. In both countries, this is opening up new opportunities for conservation interventions.

Kenya

Policy

An updated Kenya Forest Policy has been developed and is in the process of being officially approved. Kenya's Forest Policy has evolved from the Kenya Forestry Master Plan (Forest Department 1994), which was a joint venture of the Ministry of Environment and Natural Resources (MENR) and FINNIDA. The policy contains seven major objectives:

1. Increase the forest and tree cover of the country, in order to ensure an increasing supply of forest products and services, for meeting the basic needs of the present and future generations and for enhancing the role of forestry in socioeconomic development.
2. Conserve the remaining natural habitats and the wildlife therein, rehabilitate them and conserve their biodiversity.
3. Contribute to sustainable agriculture by conserving the soil and water resources by tree planting and appropriate forest management.

4. Support the government policy of alleviating poverty and promoting rural development, by income based on forest and tree resources, by providing employment and by promoting equity and participation by local communities.
5. Fulfil the agreed national obligations under international environmental and other forestry related conventions and principles.
6. Manage the forest resource, assigned for productive use, efficiently for the maximum sustainable benefit, taking into account all direct and indirect economic and environmental impacts and including a review of the ways in which forest and trees are valued, in order to facilitate management decisions.
7. Recognize and maximize the benefits of a viable and efficient forest industry for the national economy and development.

The proposed forest policy on indigenous forest states: "All gazetted indigenous forests; woodlands, bushlands and mangroves should remain reserved. They will be managed by state-approved agencies which will allocate them primarily for: (1) regulated multi-purpose forestry, using zoning concepts which do not endanger the conservation functions of the forest; (2) preservation of biodiversity; (3) conservation of soil and water; and (4) providing products and services mainly locally on a subsistence basis, by community participation where appropriate."

In the general management principles, the policy states: "The rationale of forest management depends on local conditions set by climate, soil and tree species and on the actual forest related needs of the people, which incorporate both social and cultural aspects. In all circumstances, the forest resources will be managed in a sustainable manner with due regard to environmental conservation. Reliable information on forest resources and their utilisation should be ensured. This information should include forest-health monitoring."

Up to the end of 2002, the new forest policy had not been implemented on the ground. In 2001 the Government gazetted the excision of 67,185 ha of forest reserves, mainly for settlement, further decreasing the country's forest cover. There was strong protest from civil society against these excisions. Two court cases were brought against the government's action and these cases are ongoing. The replanting of harvested plantations, which was also recommended under the new policy, had fallen years behind, but was revived in 2002. On the positive side, joint management of certain forests with communities and environmental NGOs was undertaken on a pilot basis. Since the new government took office at the end of 2002, official statements have indicated that the new forest policy and legislation will soon be approved and put into effect and that the issue of the 2001 excisions will be revisited.

Legislation

The Forestry Department operates through the Forest Act Cap 385 of the Laws of Kenya. However the act is outdated and does not address the current issues, realities and expectations. To address this, a new Forest Bill 2000 was prepared. The bill has gone through all stages of development, but is awaiting tabling in Parliament to become law. The bill is much more comprehensive than the act it will replace and covers issues of community participation and multiple stakeholders in forestry. The bill proposes the establishment of a corporate body called the Kenya Forest Service. Among its responsibilities, this body will:

(a) formulate policies for the management, conservation and utilization of all types of forest;

(b) manage the use and conservation of all indigenous state forests;
(c) monitor and enforce compliance with the provisions of this act in respect of all forests in Kenya; and
(d) advise the government on all matters pertaining to the establishment, development, conservation and utilization of forests in Kenya.

In addition to the Forest Act, there are about 77 statutes that deal with environmental legislation. Until 1999, there was no environmental legislation framework. Parliament passed the Environmental Management and Coordination Bill, 1999, into law on 15 December 1999. The Environmental Management and Coordination Act (EMCA) came into force on 14th January 2000 and takes priority over all pre-existing legislation. The EMCA establishes national environmental principles and provides guidance and coherence to good environmental management. It also deals with cross-sectional issues such as overall environmental policy formulation, environmental planning, protection and conservation of the environment, environmental impact assessment, environmental audit and monitoring, environmental quality standards, environmental protection orders, institutional coordination and conflict resolution. Owing to financial and bureaucratic constraints, the act has taken several years to become operational. Once fully operational, the act will have impacts on other legislation dealing with environment such as land tenure and land use legislation, forestry legislation, wildlife legislation, water laws and agriculture legislation. The act provides a good avenue for environmental protection and the establishment of an operational framework under the National Environment Management Authority (NEMA).

Tanzania

Policy

The Forest Policy of Tanzania (United Republic of Tanzania 1998) gives the responsibility of managing forest resources to the forest sector in collaboration with key stakeholders. Among the main features of the policy are participatory forest management, decentralization and privatization. These are radical divergences from the earlier policy and legislation, which restricted management to the state authorities and had a different approach to preservation and controlled utilization. These reforms are a result of emerging macroeconomic policies and local and global environmental management trends. They also recognize the rights of the communities and roles of the private sector in managing these resources. The overall goal and objectives are presented in Box 1.

The Forest Policy is implemented through the National Forest Programme (Ministry of Natural Resources and Tourism, 2001). The key challenges for this program are ensuring sustainable utilization of forest produce and meeting the national demand for forest produce such as wood fuel, sawn timber, non-timber forest products and other forest produce. The dependence on forest products by the majority of the rural communities for their livelihoods enables forests to contribute to poverty reduction.

Box 1 National Forest Policy goal and objectives

The overall goal:
"To enhance the contribution of the forest sector to the sustainable development of Tanzania and the conservation and management of her natural resources for the benefit of present and future generations".

The objectives are:
- ensured sustainable supply of forest products and services by maintaining sufficient forest area under effective management;
- increased employment and foreign exchange earnings through sustainable forest-based industrial development and trade;
- ensured ecosystem stability through conservation of forest biodiversity, water catchments and soil fertility; and
- enhanced national capacity to manage and develop the forest sector in collaboration with other stakeholders.

The program aims to reduce poverty through: (1) increased employment in forest industry and related activities by 25 percent by 2010; and (2) increased income generation from forest resources and services to local communities by 20 percent by 2010. The anticipated major benefits resulting from increased community and private sector participation in the management and sustainable utilization of forests are:

- better recognition of the needs and aspirations of local communities as stakeholders and joint forest owners in natural and plantation forests where land pressure is an issue (e.g., Kilimanjaro, Tanga, Morogoro and Iringa Districts);
- poverty reduction through increased income generation in the most deprived areas (i.e., Lindi, Kigoma and Coast Regions); and
- greater certainty of tenure and supply of forest products and services to encourage investment in forestry and forest industries.

Legislation

Existing legislation pertaining to forest management in Tanzania is the Forest Ordinance CAP 389 of 1957, which was operational from 1959. Basically, this ordinance focuses on restrictive use and, more so, on preservation of forests. The ordinance, to a large extent, has excluded local communities from involvement in management of these resources and recognises them only as beneficiaries. This law governs conservation and management of forests and forest produce. This ordinance, like many others developed during the colonial era, focused on preservation of natural forests. This classical conservation was based on the belief that proper management could be implemented through protection from human interference and exclusion from human use. This exclusion did not, of course, apply to the Government Forestry and Bee-keeping Division and a great deal of natural forest destruction and replacement by plantations, continued under licence after independence.

The main focus in the ordinance is gazettement of forests as reserves. For instance, Part II, Sections 5 to 9 of the ordinance provide for the declaration of central government forest reserves and restrictions over the use of and/or occupation of such areas. The ordinance further provides for the declaration of local authority forest reserves. The requirements for such declarations include: (1) recording of rights preceding such declarations; (2) restrictions on the creation of new rights subsequent to declaration, in respect of unreserved land, of "reserved trees"; and (3)

the granting of licenses for any of the purposes of the ordinance. There was clearly great inconsistency between the ordinance and the new National Forest Policy. Taking account of the weaknesses in the existing ordinance, a Forest Bill, which revised the outdated Forests Ordinance CAP 389 of 1957, was developed to correspond with the National Forest Policy. The bill sought to address the inadequacies of the Forests Ordinance and provided a legal framework to enable the new National Forest Policy to be effectively implemented. The revised Forest Act bestows management rights under respective instruments, including:

- development of collaborative forest management arrangements and management plans for National and Local Authority, Community, Village and Private Forests; and
- development of by-laws and other local instruments to facilitate forest development at the local level.

The Forest Act (approved by the Parliament in April 2002) recognizes such initiatives and the roles of different stakeholders are acknowledged and supported, including allocation of management responsibilities, rights and duties. The act also addresses compliance with international initiatives toward sustainable forest management, including support for bioprospecting that benefits indigenous communities. Development of the Forest Act also recognizes related legislation, which include the Land Act (United Republic of Tanzania 1999a), Village Land Act (United Republic of Tanzania 1999b).

National Forest Programme

In January 2000, the Forestry and Beekeeping Division began developing a National Forest Programme (NFP). The objective of the NFP is to: (1) enhance the contribution of the forest and beekeeping sector to sustainable development of Tanzania; and (2) to enhance the conservation of natural resources for the benefit of present and future generations. The NFP was formulated as an instrument for implementation of the National Forest Policy (United Republic of Tanzania 1998). The NFP is also meant to improve the design and implementation of forest management interventions. This includes streamlining financing in the sector and fostering implementation of international processes towards Sustainable Forest Management (SFM).

The formulation of the NFP included identification of issues through reviews and consultations at national and local levels, their prioritization based on scope, resources and capacity requirements for their implementation. Strategies for implementation were identified and development programmes designed.

In May 2001, the draft NFP was submitted to the government for endorsement. The NFP has four development programmes, namely:

(a) Forest Resources Conservation and Management Programme that focuses on promoting stakeholders' participation in the management of natural and plantation forests, ecosystems/biodiversity conservation and sustainable utilization of forest resources.

(b) Institutions and Human Resources Development Programme that addresses strengthening institutional set up, coordination of forest management, establishing sustainable forest sector funding, improvement in research, extension services and capacity building.

(c) Legal and Regulatory Framework Programme that focuses on development of regulatory frameworks that include Forest Act, rules, regulations and guidelines to facilitate, among other things, operations of the private sector and participatory management.

(d) Forestry Based Industries and Products Programme that attempts to enhance forest industry development, through promoting private sector investment and improving productivity and efficiency.

Program formulation was completed in June 2001. Implementation arrangements are now being developed through partnerships with the main stakeholders, including local communities, the private sector and local governments.

Economic Situation

National Statistics

Both Kenya and Tanzania are grouped among the poorest nations in the world. Three of the major economic indicators from 2001 for these two countries deserve particular attention: the low per capita incomes ($271 in Kenya, $260 in Tanzania); the percentages of the populations earning less than one dollar a day (43 percent in Kenya, 50 percent in Tanzania) and; the economic growth rates (1.2 percent in Kenya, 5.6 percent in Tanzania). The post-independence histories of the economies in these two countries have been quite different.

After independence, Kenya built up a strong economic lead over its neighbours in Eastern Africa through the encouragement of market-oriented policies, smallholder agricultural production, public investment, tourism and incentives for private industrial investment. Over a 10-year period from 1963-1973, Gross Domestic Product (GDP) grew by an average of 6.6 percent a year (US State Department Country Reports, 2002a). By 1997 it had dropped to 2.3 percent, then to 1.8 percent in 1999 and became negative (0.4 percent) in 2000 (USAID 2000). A variety of factors were responsible for the long decline. These included unfavourable terms of trade (increased oil prices, decreased tea and coffee prices), government invasion of the private sector, declining tourism, political uncertainties, corruption and sheer bad governance (leading to the suspension of bilateral and multilateral aid in 1991) (USAID 2000). Were it not for vigorous growth in the cut flower and horticultural export industries and the entrepreneurial skills of its people, Kenya would have been in a much worse situation by 2000. A new government was democratically elected at the end of 2002 and there are considerable expectations that the economy will improve.

Tanzania was a one-party state with a socialist mode of development from independence in 1961 until the mid-1980s. Despite a substantial influx of foreign aid, the economy did not prosper. Beginning in 1986, the government began to liberalize its control of the economy and to encourage participation in the private sector. In 1996, a three-year Enhanced Structural Adjustment Facility was agreed between the IMF and the Tanzanian Government. Over the next four years, economic growth averaged around 4 percent, rising to 4.9 percent in 2000 and to 5.6 percent in 2001 (USAID 2002). Economic growth is most evident in Dar es Salaam. Although the figures look good, Tanzania's economy is overwhelmingly donor-dependent, with the external debt at more than $8 billion and debt servicing absorbing 40 percent of government expenditure (USAID 2002b).

Economic Activities on the Coast

The economic situation on the Kenyan and Tanzanian coasts has worsened during the last decade because of declines in the tourism, textiles and cashew nut industries. Coast tourism is going through particularly bad times, having suffered successive blows from health scares, gulf wars, competition with other tourist destinations (especially South Africa), ethnic clashes (in Kenya) and terrorist activities (both Kenya and Tanzania). Currently there is severe over-capacity in the hotel and tourism service industry. In June 2003, hotel staff in Kenya received reduced pay following the suspension of British Airways flights because of terrorist threats.

In the early 1990s, textile manufacturing was the leading industrial category in coastal Kenya in terms of the numbers of registered companies (24 out of 159: UNEP 1998). Several of these firms have since collapsed as a result of massive importation of cheap second hand clothing (*mitimbu*). The cashew nut industry, which used to be a significant contributor to rural livelihoods, has also suffered severely from competition with India and from internal problems. A cashew nut processing factory at Kilifi, on the north coast of Kenya, finally closed down in the late 1990s after years of proa blems. As a result of the declines in the tourism, textiles and cashew nut industries, many people have lost jobs and livelihoods, with significant effects to the local economy. Some of the strain has been borne by the forests, which play an important role in mitigating poverty. For example, more than 40 percent of household consumption in the Eastern Arc Mountains is forest-derived (GEF 2002).

Other industrial activities, many of them based on the coast because of maritime access to imports and exports, have been more robust. These include: cement, lime and quarrying; steel rolling mills and iron smelting; oil refining; manufacture of paints, plastics, rubber, chemical and metal products; wood processing (paper, pulp, board and timber); light processing for export of agricultural crops (coffee, groundnuts, cotton and sisal); and food and beverage industries. As elsewhere in the world there has been considerable growth in information technology-based services, although these have been constrained by poor landline facilities, high telephone charges and poor connectivity. There has also been increasing South African investment in the coastal economy, particularly in Tanzania.

Industries outside the major cities and towns are mostly based on mineral resources, especially sand, salt and limestone. Sand for building is mined in many localities along the coast, notably at Mazeras near Mombasa. Silica sand for glass manufacture was formerly mined in Arabuko-Sokoke Forest. (Ironically, the old sand quarries have since become a distinctive biodiversity site within the forest, especially for frogs and birds). Extensive salt works have been established at various sites (e.g. in Tanga District in Tanzania and at Ngomeni, Gongoni and Kurawa in Kenya), where they have been responsible for local destruction of mangrove forests. Limestone deposits are abundant along the coast. They form a 4-8 km band, parallel to the coast and about 70 m thick from across the Kenya-Tanzanian border north to Malindi. All along the coast, coral limestone is quarried as building blocks, but there is local variation in limestone quality, affecting its potential use. In Tiwi on the south Kenyan coast it is used for lime manufacture. In the Bamburi area just north of Mombasa, limestone is quarried on a large scale for cement manufacture by a subsidiary of La Farge, a French-based multinational. This site at Bamburi has become famous for its ecological restoration of quarries and La Farge has recently entered into a partnership agreement with WWF (WWF-EARPO 2002).

Other coastal mineral resources of minor local importance include barites, galena, iron ore, gypsum and rubies. However all of these may be dwarfed by the development of titanium mining in Kenya. There are vast titanium reserves in the Magarini Sands belt, which stretches from Shimoni in the south coast to Mambrui in the north. Titanium has traditionally been used to make a white pigment for paint, plastic and paper, but is increasingly in demand for applications in the armaments and space industries. Since 1995, a Canadian-based company (Tiomin Resources Inc.) has been negotiating an agreement with the Kenyan government to mine titanium. Tiomin hopes to start its activities in the Kwale District and expects to generate around $47 million in annual cash flow.

For the vast majority of people in the rural areas the major economic activity is subsistence farming, supplemented by tree crops and fishing. There are large sisal plantations (e.g. Vipingo in Kenya) and tea estates (e.g. in Iringa and Kagera in Tanzania), which provide limited and poorly paid jobs, but employment opportunities are few and the landless are in desperate straits. Cassava is the major agricultural crop, followed by maize, citrus, coconuts, mangoes and bananas (UNEP 1998). Cassava and maize are the staples everywhere and coconuts yield a variety of products from roofing material to palm wine. Other crops are locally important (e.g. coffee in Kwale District in Kenya). The fishing industry is constrained by the small area of the continental shelf next to the East African coast, the Southeast Monsoon (which restricts the activities of small canoes) and low productivity due to nutrient deficient currents (UNEP 1998). Food security is not a problem within and around the high rainfall areas in the Eastern Arc Mountains, but farmers to the north and north-west of Mombasa need emergency food supplies whenever the rainfall is poor. Complaints of declining soil fertility are widespread.

Other minor but widespread livelihoods are earned from artisan activities (wood carving, furniture making, boat building and handicrafts), service provision (e.g. kiosks for small scale trading, sewing, electronic and other repairs) and the informal *jua kali* (Kiswahili for "fierce sun") sector, which includes tin smiths, second hand clothing and cobblers.

Infrastructure and Regional Development

There are two large cities within the hotspot, each of which has grown around an important and ancient deep-water seaport on the Indian Ocean. Mombasa is Kenya's second largest city, with a population of more than 700,000. Despite deteriorating equipment and problems with inefficiency and corruption, it remains one of the most modern ports in Africa. It has 21 berths, two bulk oil jetties and dry bulk wharves and handles all sizes of ships and cargo. It also has large warehousing (including bonded warehousing) and cold storage facilities. It is connected to Nairobi and thence inland to the land locked countries of Uganda, Rwanda, Burundi and the Democratic Republic of Congo by both road and rail. In the mid-to-late 1990s, the Mombasa-Nairobi road was in a very poor state but it is now mostly in good condition. Other roads from Mombasa, south to the border and north past Malindi are paved but have rough stretches. The railway connects Mombasa to Nairobi and to Kisumu on Lake Victoria, but it has suffered from poor maintenance. There is an excellent international airport in Mombasa (Moi International Airport) and domestic air services to Malindi on the north coast and Diani on the south coast.

Dar es Salaam is the largest city of Tanzania with a population of around three million. It is increasingly competitive with Mombasa as the most important seaport in the region. It has eight deep-water berths for general cargo, three berths for container vessels, eight anchorages, a grain terminal, an oil jetty and onshore mooring for supertankers. It underwent major rehabilitation starting in 1997 at a cost of about $24 million. In addition to Uganda, Rwanda, Burundi and the Democratic Republic of Congo, it also serves Malawi and Zambia. Freight is largely carried by trains and heavy-duty vehicles. Most primary roads (e.g. from Dar north to Tanga and inland to Dodoma, Arusha and Morogoro) are in good condition, but rural and feeder roads are bad and can be impassable in the rains. Major road development and the construction of a bridge over the Rufiji are ongoing and will open up access from Dar es Salaam to the South. The Tanzania Zambia Railway Authority maintains good rail links between Dar es Salaam and Zambia. There are also train services to Tanga on the north coast and to Arusha via Moshi and Mwanza via Morogoro. The Dar-es Salaam International Airport has daily flights to national, regional and international destinations. In addition there are daily ferryboats to Zanzibar and sea transport to other destinations on the Tanzanian coast (Mtwara, Tanga, Kilwa, Lindi and Mafia Island).

Both cities and most of the larger towns in the hotspot have unreliable water supplies and electricity services, but most villages have neither piped water nor electricity, unless they are on the main roads. In Kenya, more than 65 percent of the population depend on pit latrines or the bush (UNEP 1998). Because of a heavy investment in coastal tourism, there are a large number of comfortable hotels along the coast in Kenya and a smaller number on the Tanzanian coast. Good private hospitals are available in Mombasa and Dar es Salaam, but are expensive. Government hospitals and clinics are severely under-resourced. Telephone landlines in Tanzania and Kenya are unreliable, but new mobile phone networks have hugely improved communication in both countries.

Demography and Social Trends

The demographic and social trends in Tanzania and Kenya are similar. The annual population growth rate has slowed down in both countries, but remains high at 2.8 percent in Tanzania (Mariki *et al*. 2003) and 2.7 percent in Kenya (Bennun & Njoroge 1999). At these rates populations will double over the next 25 years. Total populations are about 37.4 million in Tanzania and 30.7 million in Kenya (World Bank 2001). Average population densities are 40 (Tanzania) and 53 (Kenya) persons per km^2 (calculated from data in USAID 2002a, b), with most people concentrated in areas of high rainfall and good soils. For example, an estimated four million people live within 10 km of one of the Eastern Arc Mountain ranges (GEF 2002). In Kenya, only 18 percent of the land is arable, with another 9 percent marginal and the rest arid or semi-arid (NRI 1996).

Social services in both countries are rudimentary, especially in the rural areas. Only 74 percent (Tanzania) and 73 percent (Kenya) of children attend primary school (USAID 2002a, b). In Kenya in 2003, the incoming government made primary education free of charge, but it is not yet clear whether it will be able to provide the extra resources required by this new policy. The major health problems are malaria and HIV/AIDS. Largely because of the latter, life expectancies have dropped to 50 years (Tanzania) and 49 years (Kenya) and infant mortality rates have increased to 115 (Kenya) and 98 (Tanzania) per 1,000 births (USAID 2002a, b).

The major social trend in both countries is urbanization. Africa's cities are growing faster with lower economic growth than any other region of the world (USAID 2000). Between 1975 and 2000, the percentage of the population living in urban areas in Tanzania increased from 15 percent to 25 percent (Mariki *et al.* 2003). In Kenya this percentage was estimated at 33 percent in 2000 and is projected to reach 48 percent in 2020 (USAID 2000). The population of Nairobi has grown by 600 percent since 1950 and is currently around 4.5 million although it was originally designed for a population of 1 million (USAID 2000). Poor immigrants to the city are forced to live in slum areas, where there is little sanitation or fresh water and where rents are absurdly high for the quality of accommodation that is provided. The fact that urbanisation is nonetheless proceeding at such a high rate indicates that people (particularly the younger generation) see little future for themselves in the rural areas. A major social consequence of urbanisation is the weakening of traditional customs and obligations, including those associated with the extended family. City life also leads to later marriages and less traditional lifestyles among the youth.

Religion is extremely important in the lives of both urban and rural Kenyans and Tanzanians. In Tanzania 45 percent are Muslims and 45 percent are Christians, with 10 percent having indigenous beliefs. In Kenya, the majority (40 percent) are Protestant, 30 percent are Catholic, 20 percent are Muslim and an estimated 10 percent hold indigenous beliefs (USAID 2002a, b). In both countries the proportion of Muslims is much higher on the coast. Even in recent times, there has been tolerance between faiths and the few religious clashes that are reported arise from intra-denominational struggles.

Both Kenya and Tanzania are ethnically diverse with more than 120 different local languages in Tanzania and more than 40 in Kenya (USAID 2002a, b). Ethnic differences have played a large role in Kenyan political and economic alliances, but this has not been the case in Tanzania. This is mainly because of a more even spread of ethnic origins in Tanzania, which prevented any one tribe from dominating national affairs. In both countries, ethnic differences are less important to the younger than the older generations. The official language is Kiswahili in Tanzania and English in Kenya, but both languages are widely understood in both countries. In Kenya, Kiswahili is the predominant language of the coast. Literacy rates for the official languages are 67 percent (Tanzania) and 59 percent (Kenya) (USAIDa, b).

SYNOPSIS OF CURRENT THREATS

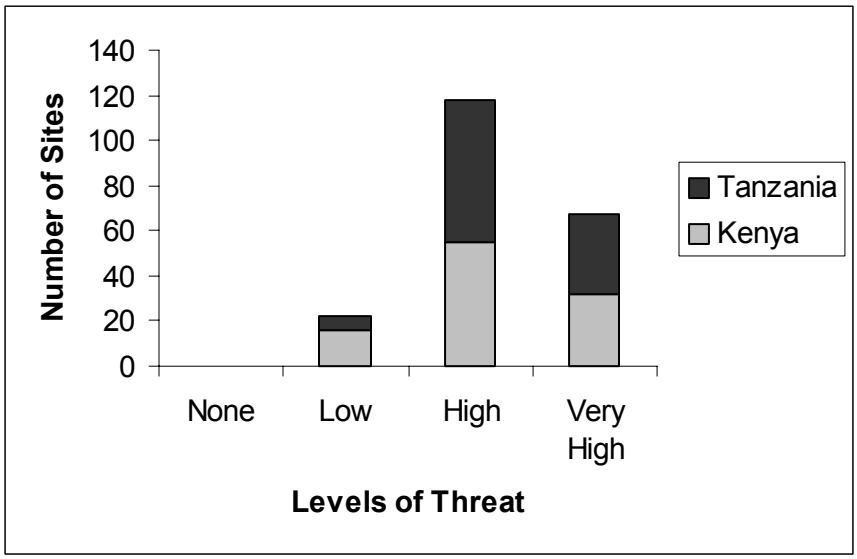
The overriding problem facing the Eastern Arc Mountains and Coastal Forests hotspot is degradation, fragmentation and loss of the only remaining habitat for many known (and unknown) globally threatened species. This is the result of many factors, such as growing human population exerting pressure on forest resources and land; poverty leading to unsustainable use of forest resources; under-resourced government institutions; a legacy of outdated environmental policies and legislation; and lack of political will. The hotspot is dominated by a large and expanding economically impoverished human population. Despite the high biological importance, legal protection for important areas in the hotspot is either weak, lacking altogether or poorly enforced. Most sites lack strategic management and action plans. On the positive side, these problems are widely recognized and various initiatives (including institutional, policy and legislative reforms) have been launched to address them.

Levels of Threat

Over three-quarters of forests in this hotspot are highly or very highly threatened. In the Eastern Arc, 75 percent of the major sites are ranked as highly threatened (South Pare, West Usambara and Mahenge) or very highly threatened (Taita, North Pare, Ukaguru, Rubeho, Uluguru and the lower slopes of the Udzungwas) (GEF 2002: derived from Burgess *et al*. 2001). East Usambara, Nguru and the higher altitudes of the Udzungwas are considered to be under medium threat.

Site-specific levels of threat have also been assessed for 101 coastal forests in Kenya and 103 coastal forests in Tanzania (Figure 4) (data from WWF-EARPO 2002). All of these forests are under some threat and almost 80 percent are judged to be highly (57 percent) or very highly (32 percent) threatened. The levels of threat are very similar in the two countries.

Figure 4. Threat levels for sites in the Coastal Forests of Tanzania and Kenya (Data from WWF-EARPO 2002).



Main Threats

Major threats were identified for the Eastern Arc Mountains as part of the GEF PDF Block B process (GEF 2002) and for the Coastal Forest Mosaic by the WWF-EARPO workshop in 2002 (Table 3). Threats were identified, categorized and analyzed differently by GEF and WWF-EARPO, so caution is necessary in comparing the results. For example, recognition of the distinction between ultimate (e.g. human population growth and negative value systems) and proximate threats (over-exploitation) was inconsistent. A general treatment of the threats follows, amalgamating and re-arranging the categories in Table 3 to facilitate presentation. Table 4 elaborates these threats (e.g.pressure on forest resources) and gives local examples.

Table 3. Major threats in the Eastern Arc Mountains and Coastal Forests hotspot

Main Threats	
Eastern Arc Mountains (GEF 2002)	**Coastal Forests (WWF-EARPO 2002)**
Commercial agriculture	Pressure on forest resources
Subsistence agriculture	Agriculture
Commercial timber	Settlement
Domestic timber	Urbanization
Intentional fires	Lack of legal protection
Household use	Wildlife-human conflicts (elephants)

Agriculture

Historically, commercial agriculture has been responsible for some clearance and fragmentation of forest. There are large tea estates in Iringa, Tanga and Kagera on land that was formerly forested. Some patches of forest in these estates have been preserved, e.g. at Ambangulu. In the lowlands, sisal estates also cleared large areas of forest, especially around the East Usambaras in Tanzania. The largest current threats, however, come from the commercial cultivation of vegetables, which are sold in the local markets and from the growing of cardamom and other spices under forest cover.

These activities result in forest clearance and the destruction of undergrowth in the forest. They are an important contributor to rural livelihoods and therefore pose a real problem for forest conservation as the population and the demand for arable land grows.

Over the past 100 years, subsistence agriculture (mostly for maize) has been responsible for the disappearance of most areas of unprotected forest. Forest is cleared for farm land, as it has better growing potential, but, after a few years, the soils are exhausted and yields reduce to those of other nearby non-forest agricultural lands. Inappropriate farming practices (shifting cultivation with short fallow periods, slash and burn, cultivation on steep slopes in Eastern Arc Mountains) are common. The inevitable result, which is exacerbated by population growth, is increased demand for land, leading to encroachment on forests. In the absence of expanding urban employment and livelihood opportunities, these problems are certain to increase in the hotspot. Effective agricultural extension, promoting more sustainable and productive farming methods, can help in mitigating this threat, but price incentives, combined with strong controls or constraints on agricultural expansion, are a more potent weapon.

Table 4. Main categories, components and examples of threats in the Eastern Arc Mountains and Coastal Forests hotspot

Categories	Components	Examples
Agriculture	Cultivation	Mainly maize, vegetables and cooking bananas: Ruvu South, Nyumburuni (Tz. Coast); cardamom under forest cover in the Nguru South Mountains; Kaya Kinondo (Ke. Coast).
	Encroachment	Mang'alisa FR in Rubeho Mountains, Kazimzumbi FR (Tz. Coast); Mangea Hill (Ke. Coast).
	Fire	Usually set deliberately to clear bush or encourage fresh grass for grazing: Amani Nature Reserve and Bombo East in E. Usambaras, Pande GR & Rondo FR (Tz. Coast); Taita Hills.
	Grazing	Mgambo and Mlinga FRs in E. Usambaras, Pangani Falls, Tongwe FR (Tz. Coast).
Pressure on Forest Resources	Timber	Lutali in S. Udzungwas, Mogoroto Forest in E. Usambaras, Kimbozo FR (Tz. Coast); Dakatcha woodlands & Shimba Hills NR (Ke. Coast).
	Polewood	Sagara FR in W.Usambaras, Nyangamara & KoleKole FR (Tz. Coast); Arabuko-Sokoke FR (Ke coast).
	Fuelwood	Uluguru Mountain Forests, Litopo & Ndimba FRs, (Tz. Coast); Jozani Forest (Zanzibar); Taita Hills (Ke. Eastern Arc)
	Charcoal	Near urban centres: Uzigua & Kazizumbi FRs (Tz. Coast); Jozani Forest (Zanzibar); Madunguni (Ke. Coast).
	Carving wood	Forests in Tanga District (Tz. coast) e.g.Kilulu Hills, & Tongwe FR, believed to be exported to Kenya's wood carving trade; Arabuko Sokoke FR (Ke. Coast).
	Hunting	New Dabaga/ Ulangambi & W. Kilombero FR in Udzungwa Mountains, Pagale Hill (Tz. Coast); Arabuko-Sokoke FR (Ke. Coast).
	Tourism	Coast only: Kiwenga (Zanzibar) & Ngezi FR (Pemba); Kaya Diani & Kaya Kinondo (Ke. Coast).
	Salt	Coast only: Coastal forests, especially mangroves, in Tanga District, Pangani Falls, Tongwe (Tz coast); Ngomeni, Gongoni, Kurawa (Ke. Coast)
	Mining	Pugu, ruby mining in Ruvu FR (Tz. Coast); titanium mining in Kwale District (Ke. Coast).
Development	Settlement	In unprotected forests, e. g. Maforonya Forest, Pangani Falls & Tongwe FR (Tz. Coast); also in Local Council Forests, e.g. Madunguni Forest (Ke. Coast).
	Urbanization	Ras Kiuyu (Pemba); Kaya Kinondo (Ke. coast).
	Roads	New road to Dar opening access to Kitope, Rondo, & Ngarama FRs, road through Katundu FR (Tz coast).

Commercial Timber Extraction

There have been national moratoriums on commercial logging in high forests in Tanzania since the early 1990s and in indigenous forests in Kenya since the late 1990s, but enforcement and monitoring have been erratic in both countries. In Tanzania, where the local district forest officers (DFOs) report to the local district authorities rather than to FBD headquarters, the command structure is compromised and local pressure on DFOs to ignore illegal logging can be strong. In Kenya, high-level political connections enabled certain large timber companies to continue to extract indigenous trees despite the moratorium, although their activities have mainly focused on other areas of the country (e. g. Mount Elgon). Throughout both Kenya and Tanzania, the threats are greatest to forests where high value timber like camphor (*Ocotea usambarensis*) or mvule (*Milicia excelsa*) is present.

In practice, the government system of obtaining licenses to log trees from forest reserves is often ignored and the majority of logging being undertaken in the reserves is illegal. There is a great deal of commercial timber extraction by small-scale poachers, responding to the demands of urbanization and tourism development. Very little of the value of this timber goes back to the poachers, who are usually at the bottom end of an exploitative network of foresters, middlemen and contractors. Forests close to tourist areas, such as Arabuko-Sokoke Forest near Malindi and Watamu in Kenya, suffer from the high demand for carving wood (*Brachylaena huillensis*) and timber for the construction of hotels, private residences and tourist attractions. The carving wood industry is much bigger in Kenya than in Tanzania and poaching of carving wood trees is most common in Tanzania near the Kenya/Tanzania border.

Other Forest Resource Extraction

Commercial fuelwood extraction and charcoal production are a problem near urban centres, with Dar es Salaam and Mombasa and the Stone City in Zanzibar as major markets. Fuelwood is also commercially harvested from Udzungwa Mountain National Park for local brewing. As roads are improved, more forests become at risk because of increased access for fuelwood and charcoal merchants. For example, Rondo and Kitope Forest Reserve are threatened by the development of a new road to Dar es Salaam.

Most timber for local construction in the villages close to the forests comes from the forests themselves, mainly in the form of poles of young trees. For larger buildings, doors and window frames planked timber is obtained from pitsawing groups working in the forests. As most of these teams are either operating in areas where logging is not permitted or they lack the licenses for the trees that they are cutting, the majority of timber being used in local construction is illegal. Most of this timber is sold and hence is, in reality, a commercial use of the forests, only to supply the local market.

A range of other products is extracted for various household uses, like medicinal plants, edible fruits, wild honey, grass and fodder for livestock and bamboo collection for tomato basket weaving. These activities can cause local problems, especially where extraction methods are destructive such as careless debarking of medicinal trees. Targeted species are already scarce.

Hunting is historically responsible for the absence of several large mammals (buffalo, rhino, elephant, leopard, bushbuck) from large areas in the hotspot where they used to roam. The local

bushmeat trade threatens the smaller mammals. Although this trade is not on the scale found in West and Central Africa, local consumption of game meat can threaten rare wildlife. For example, the endangered Aders' duiker has been reduced to very low population levels by local hunters in Arabuko-Sokoke Forest, (FitzGibbon *et al.* 1995; Kanga 1996) and also in Jozani Forest in Zanzibar (Struhsaker & Siex, pers. comm.).

Mining

Mining within forests is currently a minor threat, but (as noted earlier) this may change: large reserves of titanium have been discovered on Kenya's coast, from Kwale to Malindi District and underneath Arabuko-Sokoke Forest. Tiomin Resources Inc. plans to strip mine four areas in coastal Kenya, starting with an area of 64 km^2 in Kwale District, which will be mined for at least 14 years. All vegetation and physical structures will be removed and mineral deposits will be exposed to a depth of more than 30 m. Tiomin has promised to compensate the original landowners and to rehabilitate and return the land to them, but agreement has not yet been reached on its operations. There is considerable public concern about environmental impacts and the distribution of economic benefits, and the new Kenyan government appears to be taking a stricter line with Tiomin on these issues (Reuters 2003).

Fires

Fires are commonly used by rural farmers to clear fields prior to planting. Where population densities are high, vegetation from the fields to be farmed that season is cleared into piles and burned on the site. In general, few of these fires spread into forest margins or montane grasslands. Within the forests, fires are started for forest clearance for cultivation and these can get out of control and burn larger areas. Sometimes, wild honey harvesters start forest fires when they smoke the bees to get their honey. Fires are sometimes started deliberately for political reasons (e.g. in UMNP in 2000 during the election). Where human population density is lower, there is a much higher tendency for the slopes of Eastern Arc Mountains to be subject to wildfires that can have a number of causes and once started will spread up the slope in an uncontrolled fashion. Occasionally, these fires reach the forests and during dry years they can enter the forest and cause considerable damage. They also burn huge areas of upland grass in the Eastern Arc Mountains.

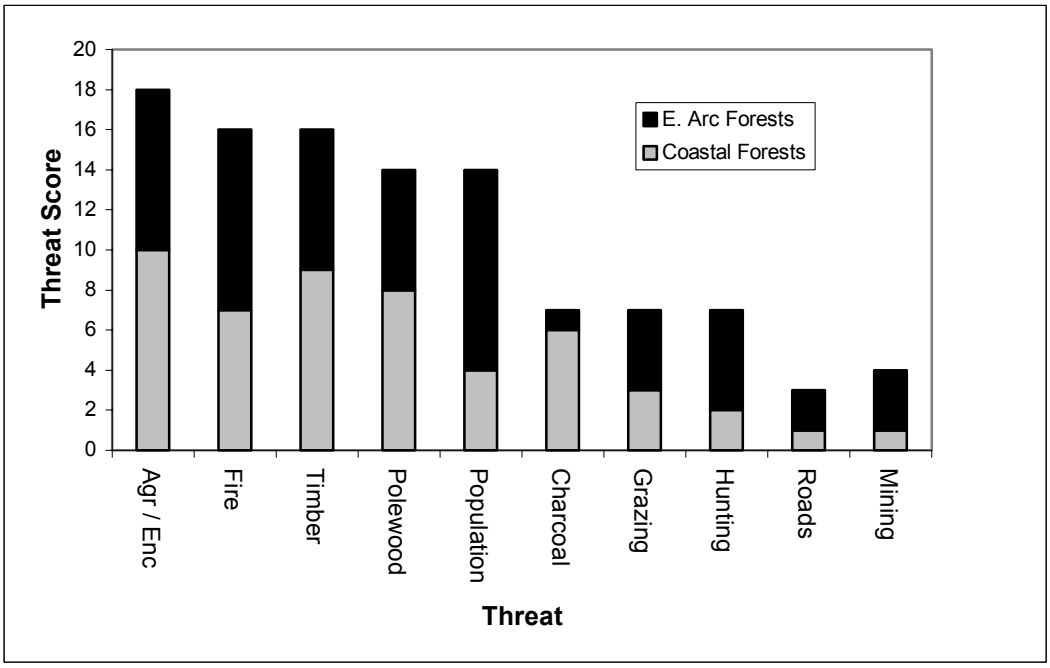
Ranking of Threats in Tanzania

Because of the different ways in which threats have been identified and analyzed in different portions of the hotspot, it is difficult to include all the data in an overall ranking of threats in the hotspot. The most compatible datasets come from site-by-site analyses of threats for 114 sites in the Tanzanian Coastal Forests (WWF-EARPO 2002) and for 136 sites in the Tanzanian Eastern Arc Mountains (data from Neil Burgess). Figure 5 summarizes this data in ranked form for the top 10 threats common to both datasets.

The top 10 overall threats (in ranked order) are agriculture and encroachment, fire, timber extraction, polewood cutting, population growth, charcoal production, grazing, hunting, mining and roads. Population growth was included as a threat in both datasets, although it may be better considered as an ultimate factor, driving the other proximate threats. Two additional threats were identified only for the Eastern Arc Mountains Forests (corruption and medicinal plants) and another seven only for the Coastal Forests (settlement, urbanisation, fuelwood, carving wood, salt, tourism and open access). Of these additional threats, three (carving wood, salt and tourism) may be genuinely restricted to the coastal forests. The apparent restriction of the other additional threats to either the Coastal Forests or the Eastern Arc Mountains is almost certainly an artefact of the different analyses used. For example, corruption and fuelwood extraction are a problem in both ecoregions.

Despite these problems and the exclusion of the Kenyan data, Figure 5 provides a reasonable picture of the relative importance of the overall threats in the hotspot.

Figure 5. Ranking of threats in the Eastern Arc Mountains (136 forests) and Coastal Forests (108 forests)



Population growth, hunting, grazing and mining rank higher in the Eastern Arc Mountains. Agriculture and encroachment, timber extraction, polewood cutting and especially charcoal rank higher in the Coastal Forests. Some of these differences in ranking may result from different degrees of legal protection in the two countries. In both, the most important threats arise from the immediate needs of people, rather than from any large-scale developmental projects or corporate ventures.

Analysis of Root Causes

Root causes of threats in the hotspot were analyzed in workshops during proposal preparation both by GEF and WWF-EARPO (GEF 2002; WWF-EARPO 2003). Table 5 is adapted from the GEF analysis, which broadly captures the root causes identified by WWF-EARPO and lists some of their manifestations. The order of presentation of these root causes is not a ranking of their importance.

Table 5. Summary of root causes of threats to the Eastern Arc Mountains and Coastal Forests hotspot

Root Cause	Manifestation
Population growth	• Drives increased demand for resources at all levels.
Poverty	• Overexploitation of "free" forest resources (timber, polewood, etc). • Lack of opportunity to think beyond immediate needs. • Vulnerability to corruption • Involvement in illegal activities
Inefficient land-use practices	• Low agricultural yields • Declining soil fertility • Increased demand for land • Agricultural encroachment and clearing of forests
Negative value systems re conservation and lack of environmental awareness	• Absence of local constituencies for conservation. • Ignorance of consequences of damage to environment. • Low motivation to conserve biodiversity
Lack of experience and incentives to develop alternative livelihoods	• Little opportunity to change environmentally damaging lifestyles
Lack of fora for communal exchange and networking	• No transfer of lessons learned • No sharing of common problems • Opportunities for engaging in conservation not communicated
Lack of local mechanisms for controlling forest exploitation	• Absence or breakdown of traditional conservation practices • Local communities overexploit forest resources • Exploitation of forest resources by outsiders is unchecked • Unprotected forests are lost
Limited ecosystem-wide strategic focus	• Piecemeal conservation efforts • Short-term projects • Lack of continuity in conservation activities • Lack of co-ordination among different projects • Landscape issues not tackled
Weak forest governance	• Inadequate stakeholder involvement

	• Decision-makers inadequately informed • Lack of monitoring
Inadequate and poorly targeted fiscal resources	• Inadequate budgets for authorities managing forests • Most money spent on salaries with little for operational costs • Poor morale among staff managing forests
Limited effectiveness of protection regimes	• High levels of illegal activities in forests • Forest degradation and biodiversity loss • Corrupt practices facilitated • Low morale among forest guards

In the likely absence of positive macro-economic changes and of large-scale industrialization in the continent, the next generation of rural farmers in Africa will continue to depend heavily on the free resources that that they can extract from their surroundings. The first three root causes in Table 5 (population growth, poverty and inefficient land use) will, therefore, continue to generate threats to forests and forest lands for some time to come. What is less clear is how much conservation organizations can do about these problems and what proportion of their limited resources should be invested in the attempt. Development agencies have been active in Africa with far more resources for many decades, yet rural poverty persists. Another difficulty is that the path to development often involves the massive ecological transformation of landscapes and it is precisely this process that is destroying tropical forests. This is what makes conservationists and development practitioners such awkward partners (Struhsaker 1997; Oates 1999; Terborgh 1999).

The fourth root cause in Table 5 is negative value systems re conservation and lack of environmental awareness. A variety of innovative approaches to raising conservation awareness have been developed during the last 50 years and international conservation organizations have succeeded in putting biodiversity issues firmly on global agendas. The hotspot focus of CEPF and the resources it commands, is a good example of this, but the need to reach the rural poor is what is implied in Table 5. This is as urgent as ever, but all too often it generates contradictory messages. Unless awareness can be linked to incentive, only the contradictions are seen. In the absence of material incentives for conservation, it is difficult to change value systems, particularly when poverty gives little opportunity to think beyond short-term needs. The most promising approach in parts of this hotspot may be through innovative awareness raising of water catchment values of the Eastern Arc Mountains.

Many conservation projects have tackled the issues of alternative livelihoods and of communal exchange and networking. The creation of alternative livelihoods is a useful local approach for civil society, especially when combined with good law enforcement by those institutions responsible for forest management. This combination is more rare than it ought to be. The problems of communal exchange and networking are now much less serious than they were, thanks to the growth of communications technology and to the increasing effectiveness of workshop and community outreach techniques. Nonetheless, it is worth noting that the CEPF workshop organized as part of producing this profile was the first time that people working in the Eastern Arc Mountains and the Coastal Forests of Kenya and Tanzania had met to discuss common problems. It is also still true that exchange and networking is much more common among people working in NGOs and government institutions than at the community level.

Workshops and meetings are expensive and they lose value when the same faces repeatedly appear.

The lack of local mechanisms for controlling forest exploitation reflects both a breakdown in cultural traditions and how the Tanzanian and Kenyan governments took such matters out of the hands of the local people sometime ago. That so little forest remains, outside forest and local authority reserves suggests that the government interventions were well advised. Where there has been continuity in forest protection by local communities, as in the case of some of the *Kaya* forests in coastal Kenya, there has been real success and the prospects for replication with other sacred forests in Tanzania are good. Where the continuity is lacking, the prospects are weaker. This is a serious issue for Participatory Forest Management initiatives in the hotspot. Sound technical advice on sustainable offtake is also, obviously, essential. Good networking on these problems should help.

The need for an ecosystem-wide strategic focus has long been recognized in efforts to conserve major water catchments such as the Ulugurus, which supply 3 million people in Dar es Salaam with water. In biodiversity conservation, the lack of such a focus has been the impetus for major conservation investments such as the big GEF project for the Eastern Arc Mountains. The CEPF approach of defining species, sites and corridor outcomes within the context of landscape level hotspots is also a systematic attempt to deal with this difficulty.

Weak forest governance is pervasive in the hotspot and is being increasingly addressed by involving more stakeholders, particularly among the local communities and civil society. Forest management is a multi-stakeholder business. As described in the section on policy and legislation, reform in both Kenya and Tanzania is directly tackling this issue. This reform is creating opportunities for both the private sector and for local communities to become involved in forest management. To date, most conservation organizations have paid far more attention to the latter than the former.

The issue of inadequate and poorly directed fiscal resources afflicts nearly every government department in Kenya and Tanzania. A good example in the hotspot is provided by Arabuko-Sokoke Forest. In the 1998-99 financial year, the Forest Department spent $106,497 on this 41,700 ha forest (Muriithi & Kenyon 2002), out of which 98 percent ($104,536) was used to pay salaries. This left only $2,114 for operational costs. In 1998, $7,536 was raised from this forest from fines, rents, timber royalties and sales of fuelwood, polewood and Christmas trees. The best that can be said for such a situation is that it is easy to persuade local communities that they have more to gain from their own enterprises than from sharing in official Forest Department revenues. Although the budget for Arabuko-Sokoke is obviously inadequate, it is nonetheless higher than those for most forests in Kenya and Tanzania. It works out at roughly $.2.5 per hectare, compared to overall estimates of $ 1.08 (Kenya) and $ 1.01 (Tanzania) per hectare for public expenditure on forestry (Whiteman 2003).

With funding like this, it is surprising that there is any protection at all. It is hard for Forest Department officers to do a good job in such circumstances, particularly when corruption comes from the top (as in the recent past in Kenya) and where the resource is valuable (e.g. carving wood at Arabuko-Sokoke). This problem can only be effectively tackled by a combination of

long-term funding and institutional reforms (GEF 2002) in the context of good governance at national level. Site level interventions (training of guards, provision of uniforms and boots, etc.) are helpful, but their positive effects are at best short-lived unless the larger problem is tackled. Solving the larger problem is also necessary if community partnerships in management are to improve protection. In the absence of better governance from the top, participatory management may simply lengthen the food chain for illegally harvested forest produce.

SYNOPSIS OF CURRENT INVESTMENT

Information was compiled on the projects operational in the Eastern Arc Mountains and Coastal Forest Mosaic as of February 2003. All data from projects that had already finished or that were to be completed in early 2003 were excluded from the study. Data were available for both Tanzania and Kenya, although there were some gaps in the information for both countries.

Data were collected by organization, type of organisation, by two subsets of sites: first, IBA and second, priority site (IBAs and non-IBA sites). The IBAs were selected as a subset because they had already been recognized as sites with global biodiversity values (Bennun & Njoroge 1999; Baker & Baker 2002). The second subset was based on the 20 sites with the greatest numbers of globally threatened species, as determined by this profile.

Although the most important sources of external and government funding for conservation in this hotspot have been captured, some caveats are necessary. There are some gaps in the data and some budget allocations are split between several implementing partners, which made calculations of funding allocations problematic (e.g. Misitu Yetu in Tanzania implemented by the NGOs WCST, TFCG and CARE and the Tanzania Government, with funding from CARE Austria and NORAD). Finally, details of the government budget allocated to conservation activities in this hotspot were hard to come by, although as most sites are managed as reserves by the government their inputs are important. Hence this analysis is biased towards the externally provided funds from various types of agencies.

Levels of Funding

Overall in 2003, more than $19 million is planned for investment in conservation of the Eastern Arc Mountains and Coastal Forests of Tanzania and Kenya, almost exclusively within forest reserves, national parks or other forms of government managed/controlled land.

Eastern Arc Mountains

Within the Eastern Arc Mountains, the majority of the funding (about $15 million per annum) currently comes from the multilateral donors GEF and World Bank. Much of this is allocated to the restructuring of the Forestry Division in Tanzania and perhaps $5 million will be spent on activities broadly classed as forest conservation within the hotspot (including the Tanzanian coastal forests) during 2003. The next largest allocation of funding comes from bilateral donors, particularly those from Scandinavia who provide well in excess of $2 million per annum. Most of this relates to direct conservation activities. NGOs and the Tanzania and Kenya governments provide significantly less funding and most of the funds utilized from NGOs actually come from the bilateral donors. Hence, both the governments and NGOs use less than $1 million per annum of their own funding in the Eastern Arc Mountains (excluding government salaries).

Coastal Forest Mosaic
Within the Coastal Forest Mosaic, about $4 million per annum is spent currently on conservation or related development activities, or about 30 percent of that used in the Eastern Arc portion. Conversely to the Eastern Arc, no multilateral funding comes to the coastal forests. The allocation of funding from NGOs appears as the largest single source of funds for these forests, although in actuality most of this funding comes from bilateral donors to the NGOs. Hence the bilateral donors are probably the largest single source of funding for this part of the hotspot. Government funding for implementation is small in the coastal forests, as it is in the Eastern Arc Mountains. Most government funding is allocated to salary support and little remains for investment in conservation activities on the ground. Private investment for conservation in the coastal forests is also small, although hard to quantify.

Types of Project Interventions
The major categories of project intervention were examined against eight possible groupings ranging from research through to capacity building. Overall there is a fairly even spread of interventions, with no one category appearing markedly more preferred amongst the existing projects. In the Eastern Arc Mountains, research (mainly biodiversity) was the most commonly reported activity and, as the data ignored the activities of visiting university scientists, this is an underestimate of the effort put into research. In the coastal forests the highest-ranking activity was livelihood enhancement, which also ranks highly in the Eastern Arc – reflecting the focus of development agencies that fund much of the conservation work in these areas on poverty alleviation. Interventions such as direct conservation payments, purchase of land for conservation or a focus on corridors had zero scores as there were none of these kinds of interventions in the area.

Numbers of IBAs with Project Interventions
The number of IBA sites that have been the attention of conservation projects during the past five years gives an indication of the spread of conservation effort.

Tanzania
Across the range of organizations undertaking different kinds of projects in the hotspot, the Government Forestry Division has the widest coverage, as it manages the forest reserves that comprise the bulk of the IBA sites. After the Forestry Department, the research program of Frontier Tanzania (collaboration between the Society for Environmental Exploration and the University of Dar es Salaam) has worked in the most IBA sites. This is followed by the bilateral agency NORAD (Norwegian aid) and the World Bank (starting activities at the current time). Of the NGOs, the Tanzania Forest Conservation Group and WWF Tanzania have undertaken the most projects in the hotspot. When combined, the NGO sector had undertaken the largest number of projects at IBA sites in Tanzania, followed by the Tanzanian government, the bilateral donors and the multilateral donors.

Kenya
In Kenya a number of different agencies undertake conservation projects in the IBA sites. According to the information provided, the Kenyan Forest Department and the National Museums of Kenya have covered the largest number of sites during the past five years. WWF-EARPO also used to support several forest sites, but their activities are much reduced in recent

years due to a lack of funding. Other major players in Kenyan IBA conservation in this hotspot are the National Museums of Kenya (Kaya sites in particular) and the Government Forestry Division (Forest Reserves). BirdLife International and Nature Kenya provide very significant funding to one IBA site—Arabuko-Sokoke—which is also the largest coastal forest in the hotspot.

Spread of Conservation Attention Across Different IBAs

The conservation attention received by the IBA sites from different agencies was examined as a preliminary indication of gaps in project coverage. Secondary stages in such an analysis would need to consider other factors such as biological value, integrity and size, threats and even feasibility of operating in the area.

Tanzania

A ranked assessment of the degree of conservation attention that different IBA sites have received during the past five years illustrates that the Udzungwa Mountains have received the most conservation attention throughout this period. Conservation efforts have also focused on the East and West Usambaras and the Ulugurus. These are all Eastern Arc Mountains blocks. Eastern Arc IBAs that have received far less attention are Ukaguru, Nguru, Nguu, Rubeho and Uvidundwa. Within the coastal forests the IBAs of Kilwa and Rufiji Districts have had the most conservation projects and IBAs such as those in Newala District have received the least attention.

Kenya

An assessment of the coverage of IBA sites by conservation projects in Kenya shows that Arabuko-Sokoke and the Taita Hills receive the largest attention from conservation projects. The Shimba Hills, Diani and the Tana River Primate Reserve follow these sites in terms of attention they receive. Three IBAs have no conservation projects in recent times: Tana River Delta, Dakacha Woodlands and Dzombo Hills.

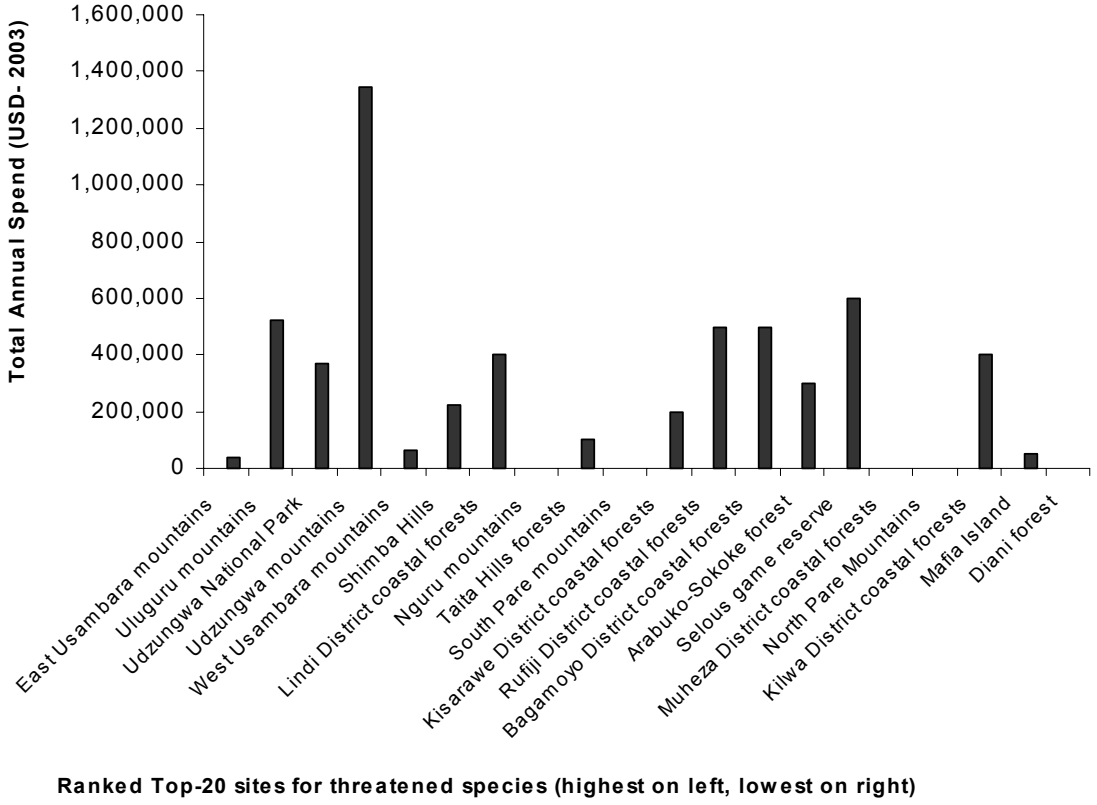
Funding Allocation Against Biological Priority

Figure 6 assesses the match between funding allocation and biological priority. The 20 sites containing the largest numbers of globally threatened species (Appendix 2) vary considerably in the amount of external donor funding they are expected to receive during 2003. This funding excludes the funds that the Tanzanian and Kenyan governments provide to the management of national parks, national reserves and forest reserves and national monuments – which may be significant in some places and very small in others.

Eighty percent of the 20 sites containing the most globally threatened species from this hotspot are in Tanzania. Given that 90 percent of the total forest area in the hotspot is in Tanzania, this is to be expected. Two factors, however, have affected the site ranking. The first is research effort. Tanzanian forests have generally received much less biological study than those in the Kenyan part of the hotspot, with some of the Eastern Arc blocks (e.g., the Rubehos and Nguus and Uvidundwas) and some coastal forests (e.g., those of Newala District) remaining practically unknown. This means that the importance of the Tanzanian sites may be underestimated. The second factor is related to the way in which the sites are defined. In Kenya every small patch of

forest has been assigned to its own site, whereas in Tanzania, many of the sites are amalgamations of several forest

Figure 6. Funding allocation from external agencies for conservation activities during 2003 in the 20 sites containing the most Red List species (Appendix 2) in the Eastern Arc Mountains and Coastal Forests hotspot



patches. In some cases, these forest patches are scattered over a wide area and encompassing a wide range of altitudes and climatic conditions. This tends to elevate the importance of the Tanzanian sites in terms of their numbers of threatened species.

Secondly, it is clear that funding is not evenly spread across these sites. The best-funded site in 2003 is the Udzungwa Mountains (although some of this funding is only for the Kihansi Dam area), followed by the Ulugurus. The Selous Game Reserve also receives significant funding but this is mainly to conserve its large mammals, not forests. Also the Selous Game Reserve covers an enormous area.

Thirdly, some sites receiving little external funding in 2003 have received significant funding over long periods in the past. The East Usambaras, which contain the most globally threatened species, is set to receive few funds during 2003. This site benefited from significant investment ($1 million per annum) during the past 10 years, but that funding has since ceased and the future is unclear. The South and North Pare Mountains also lack funding but until recently had received

GEF-UNDP or GTZ support, as did the West Usambaras which had 10 years of GTZ funding. Should funding stop completely, then much of the progress with forest conservation achieved in these sites over the last 10 years could be jeopardized.

Fourthly, other important sites in Figure 6 have not had any external funding for decades. Most important amongst these is the Nguru Mountains, which has never had an externally funded project intervention and is also relatively poorly known biologically. Within the coastal forests, those of Muheza District have no external support and yet contain important biological values, especially close to the East Usambara Mountains.

Lastly, some sites do not appear in Figure 6 because there is inadequate knowledge of their biodiversity values. These include the Nguu and Rubeho Mountains in Tanzania (which are difficult to access) and Boni and Dodori Forests in Kenya (where there are security problems). They will receive no external conservation support in 2003 and have never received conservation support in the past. Such sites should rank highly as priorities for investment, both in terms of biological study and conservation action.

CEPF NICHE FOR INVESTMENT

The CEPF niche for investment was determined through analysis of the species and site outcomes, threats and current investments and through a participatory workshop involving 48 local, national and international experts on the hotspot. Although the workshop did not prioritize sites for investment, certain sites have been selected for immediate attention under two of the five strategic directions recommended in this profile. This has been done to avoid diluting the impacts of crucial investments by spreading them across too large an area.

The species outcomes define the CEPF niche in terms of global imperatives for biodiversity conservation. The primary focus of the niche for this hotspot is the 333 species, which are most threatened with extinction according to *The 2002 IUCN Red Lists* (Appendix 1). The ultimate test of the success of global conservation investments in the hotspot is the number of these threatened species that survive in the long term. It follows that: (1) only those projects that contribute to the survival of these species should be funded by CEPF and (2) that monitoring the survival of these species is, in itself, an important component of the CEPF investment niche. It must also be recognized that the number of globally threatened species is dynamic and will greatly increase as the IUCN Red List is updated and becomes more comprehensive. The species outcomes will, therefore, need to be updated from time to time.

The site outcomes define the CEPF niche in terms of geographical locations. The 333 globally threatened species identified in Appendix 1 are found in the top 152 sites listed in Appendix 2. An additional nine sites are included in Appendix 2 (making the overall total of 160 sites) because they are IBAs with restricted-range bird species and globally significant congregations of birds. Projects funded by CEPF must be expected to have positive impacts on biodiversity conservation in at least one of these 160 sites. If these impacts are to be measured, site-level monitoring must also be an important part of the niche.

As noted earlier, conservation corridor outcomes were not identified in this hotspot because of the small size of the hotspot and the degree of natural fragmentation that exists, without which

much of the biodiversity would never have evolved in the first place. In other hotspots, the definition of conservation corridors restricts site investments largely to those sites within the corridors. Since no conservation corridors have been defined in this profile, there are no corridor restrictions on site investment in this hotspot. Similarly there are no overall restrictions on site investments arising from prioritization. Nonetheless, some concentration of effort is required. Within the full set of 160 sites, five have been identified for particular attention for two of the strategic funding directions (Table 6). The five were selected on the basis of biological importance, irreplaceability, current investment, partnership potential and the recommendations of experts who are familiar with the sites and their suitability for the interventions proposed in this profile. Under the remaining three strategic funding directions, all 160 sites qualify for CEPF investment.

Although corridor outcomes have not been defined in this profile, there are issues of connectivity between forest patches within large sites. Many bird species in the Eastern Arc Mountains are known to move seasonally from the montane forest to the lowland, and altitudinal forest corridors are necessary for this to occur. This issue particularly relates to maintaining montane to lowland forest transitions in the Eastern Arc Mountains part of the hotspot and is important in the context of global warming. A number of forest patches are also recently isolated from each other, causing the local extinction of species, as habitat patches become too small to support them (see below). Such sites deserve particular attention.

Within the limits of these species and site outcomes, the CEPF niche was further defined by the thematic areas for investment as identified during the March 2003 workshop and by subsequent expert review. The workshop discussion of potential investment themes was guided by the assessments of biological importance, threats and current investments, as well as by the considerable experience of the workshop participants in the hotspot. Nine investment themes were presented to the workshop by the ecosystem profile team and partipants added a further three. The themes were prioritized through group work and the results were amalgamated in a plenary session. Although the different groups had different priorities, there was a good consensus in the plenary on the final ranking. This ranking was as follows:

1) increase the ability of local populations in the hotspot to benefit from and contribute to biodiversity conservation
2) restore and increase connectivity among fragmented forest patches in the hotspot
3) improve knowledge of biodiversity in the hotspot;
4) improve management of conservation units in the hotspot;
5) improve awareness and education about the importance of this hotspot;
6) improve coordination among all partners in the hotspot in order to maximize investments;
7) engage private sector towards conservation in the hotspot;
8) catalyze effective implementation of government policies (National Biodiversity Strategic Action Plans) that affect biodiversity in the hotspot;
9) hotspot-wide research and conservation of endangered and critically endangered species;
10) monitoring and evaluation of the status of the sites in the hotspot;
11) economic evaluation of the goods and services performed by the sites in the hotspot; and
12) increase ability to generate long-term funding for conservation in this hotspot.

During the group and plenary discussions it was noted that there were overlaps in these themes and that some could be usefully embedded within others (e. g., themes 5, 9 and 10 with theme 1, themes 9 and 4 with 2). With this understanding, the thematic niche for CEPF investment was defined by themes 1-3 above.

CEPF INVESTMENT STRATEGY AND PRIORITIES

Program Focus

The CEPF program focus is firmly on reducing the extinction risk for the 333 globally threatened species in the hotspot and on improving the protection of the 152 sites in which these species are found (plus the additional nine IBAs). This focus necessarily involves both people and science. Underlying all the threats to the biodiversity in this hotspot is pressure from rapidly increasing and impoverished human populations. These populations have little sympathy or incentive for species and habitat conservation and limited awareness of the importance of maintaining ecosystem services and functions. The CEPF program, therefore, focuses on actions that will address this issue. If these actions are to be effective, they must be grounded in good science. Interventions must be targeted on the most important sites and must be based on scientifically tested best practices. As such, the program also focuses on improving biological knowledge in the hotspot and on practical applications of conservation science. This focus on people and science builds on over three decades of research and conservation effort in the Eastern Arc Mountains and Coastal Forests of Tanzania and Kenya.

Strategic Directions

Five strategic directions for the CEPF investment strategy were developed. These were based on the workshop documents, presentations and discussions and on subsequent expert review. The documents and presentations included background on CEPF and its goals, site and species outcomes and the assessments of threats and current investment. The strategic directions are summarised in Table 6, together with investment priorities and are described in more detail below. The order of presentation should not be interpreted as a rank order of importance.

Table 6. CEPF strategic funding directions and investment priorities in the Eastern Arc Mountains and Coastal Forests hotspot (2003-2008)

Strategic Funding Directions	Investment Priorities
1. Increase the ability of local populations to benefit from and contribute to biodiversity conservation, especially in and around: 1. Lower Tana River Forests 2. Taita Hills 3. East Usambaras/Tanga 4. Udzungwas 5. Jozani Forest	1.1 Evaluate community-based forest management initiatives in the hotspot to determine best practices 1.2 Promote nature-based, sustainable businesses that benefit local populations in the hotspot 1.3 Explore possibilities for direct payments and easements (Conservation Concessions) for biodiversity conservation in the hotspot and support where appropriate 1.4 Build the capacity of community-based organizations in the hotspot for advocacy in support of biodiversity conservation at all levels 1.5 Support cultural practices that benefit biodiversity in the hotspot.

	1.6 Research and promote eco-agricultural options for the local populations of the hotspot
2. Restore and increase connectivity among fragmented forest patches in the hotspot, especially in: 1. Lower Tana River Forests 2. Taita Hills 3. East Usambaras/Tanga 4. Udzungwas	2.1 Assess potential sites in the hotspot for connectivity interventions 2.2 Support initiatives that maintain or restore connectivity in the hotspot 2.3 Monitor and evaluate initiatives that maintain or restore connectivity in the hotspot 2.4 Support best practices for restoring connectivity in ways that also benefit people
3. Improve biological knowledge in the hotspot (all 160 sites eligible)	3.1 Refine and implement a standardized monitoring program across the 160 eligible sites 3.2 Support research in the less studied of the 160 eligible sites in the hotspot 3.3 Monitor populations of Critically Endangered and Endangered Species in the hotspot 3.4 Support research in the hotspot to facilitate Red List assessments and re-assessments for plants, reptiles, invertebrates and other taxa. 3.5 Compile and document indigenous knowledge on hotspot sites and species 3.6 Support awareness programs that increase public knowledge of biodiversity values of the hotspot
4. Establish a small grants program in the hotspot (all 160 sites eligible) that focuses on critically endangered species and small-scale efforts to increase connectivity of biologically important habitat patches	4.2 Support targeted efforts to increase connectivity of biologically important habitat patches 4.3.Support efforts to increase biological knowledge of the sites and to conserve critically endangered species
5. Develop and support efforts for further fundraising for the hotspot	5.1 Establish a professional resource mobilization unit, within an appropriate local partner institution, for raising long-term funds and resources for the hotspot 5.2 Utilize high-level corporate contacts to secure funding from the private sector for the hotspot 5.3 Train local NGOs and community-based organizations in fundraising and proposal writing

1. **Increase the ability of local populations in the hotspot to benefit from and contribute to biodiversity conservation, especially in and around Lower Tana River Forests, Taita Hills, East Usambaras/Tanga, Udzungwas and Jozani Forest**

These sites were selected based on current lack of investment, assessment of opportunities for success and biological prioritization. The paradigm, which links poverty to environmental degradation and biodiversity loss, has driven much of the conservation effort in this hotspot for two decades and it inevitably emerged as a dominant theme in the workshop. CEPF should

concentrate on synergistic and direct linkages between people and biodiversity conservation. There is a rich field here for interventions and the piloting of new approaches, while building on previous conservation efforts in the hotspot. There are opportunities to promote agricultural practices that improve production and enhance biodiversity. These practices include both old and new techniques. They have been brought together under the umbrella term "ecoagriculture" by McNeely and Scherr (2003). There are also opportunities to exploit synergies between different investment priorities. The following investment priorities were identified under this strategic direction.

1.1 Evaluate community-based forest management initiatives in the hotspot to determine best practices. Community-based conservation initiatives include efforts to involve and capacitate local communities in the management of biodiversity sites (mainly forests) in the hotspot. Both in Kenya and Tanzania, new policies are promoting various forms of community participation in forest management (joint forest management, community-based forest management and participatory forest management). There are at least 32 such initiatives in the hotspot. Under these arrangements, community user rights are negotiated in return for responsibilities such as self-policing, with extraction rates based on estimates of sustainability. The effects on community livelihoods, law enforcement and biodiversity protection are all routinely expected to be positive, but a scientific consensus on this expectation is yet to be reached. Strong opinions are much commoner than hard data. Scientific testing of participatory management strategies in the hotspot is badly needed. CEPF will prioritize research and analysis rather than financing applied projects under this investment priority.

1.2 Promote nature-based businesses that benefit local populations. Experience within the hotspot has shown that nature-based businesses that benefit local populations can build significant constituencies for conservation. Because of extreme poverty, even small incomes from such businesses can make real differences in local attitudes towards conservation, provided that the linkage between revenue and the continued existence of the biodiversity resource is direct and obvious. It follows that revenues must be reasonably reliable and that any resource use must be sustainable. Examples include beekeeping, tourism, butterfly farming (Gordon & Ayiemba 2003), cultivation for essential oil extraction and domestication of medicinal plants.

1.3 Explore possibilities for direct payments and easements (conservation concessions) for biodiversity conservation in the hotspot and support where appropriate. Recent reviews (e.g., Ferraro & Kiss 2002) argue that direct payments for conservation are more cost-effective and provide more benefits to biodiversity than community-based interventions such as Integrated Conservation and Development Projects. Under direct payments and easements, communities/land owners are paid directly for the right to manage the site for conservation purposes under leasehold or alternative arrangements. This eliminates the expenditures that so often inflate project costs to no good end and the net benefits that reach the communities are commensurably greater. Running costs become the responsibility of the organization/corporation/individual that makes the payments. Direct payments and easements are relatively untried in Africa, so any attempt at their implementation would need to be on a pilot basis. CEPF could facilitate advice on the appropriateness of this approach in this hotspot and fund training and assistance for local organisations to act as honest brokers in the negotiation of any such arrangement, but could not provide the resources for the direct payments. These

negotiations could include raising funds from the local corporate and private sector, which benefit from the ecological services (water and hydropower) provided by the Eastern Arc Mountains. It should be noted that CEPF cannot capitalize conservation concessions, nor can it purchase land for conservation.

1.4 Build the capacity of community-based organizations in the hotspot for advocacy in support of biodiversity conservation at all levels. Grassroots advocacy for conservation can help to prevent theft/invasion/encroachment/ development of sites with biodiversity value (Gordon & Ayiemba 2003). Many excisions have in recent years been made in the name of squatters or of the local community, while the land was subsequently allocated to the well connected. In such situations, community protests can be more effective than the lobbying of city-based NGOs. Local communities are also effective watchdogs, since they live next to biodiversity sites and know most about what is going on in them. Local communities often include retired senior civil servants and others with relatives in corridors of power and, therefore, have more leverage than may at first be apparent. In Tanzania there are forest and wildlife committees within the village/ward structures that could be supported.

1.5 Support cultural practices that benefit biodiversity in the hotspot. Sacred forests are known from all over Africa, but the protection they have enjoyed for centuries is being rapidly eroded by factors such as cultural change and greatly increased land demand. There are a great number of traditionally protected forests in Tanzania (Mwihomeke *et al.* 1998), but the most well known examples within the hotspot are the *Kaya* Forests of coastal Kenya. These forests contain a high diversity of plants including significant numbers of endemics (Robertson 1987; Robertson & Luke 1993) and Red List plant species (Appendix 2). According to local traditions, the forests historically sheltered small fortified villages. The sites of the original settlements (often marked by forest clearings) were maintained by the communities (led by the elders) as sacred places of ritual and burial grounds. Destruction of vegetation around these sites was prohibited so as to preserve the surrounding '*Kaya*' forest as a screen or buffering environment for the clearings. Since 1992, the Kenyan Government has gazetted a number of them as national monuments, with assistance from the well-known *Kaya* Project of the Coastal Forest Conservation Unit (CFCU) of The National Museums of Kenya. CEPF should support such initiatives throughout the hotspot, with a particular emphasis on contemporary validation of their historical, cultural and biodiversity values.

1.6 Research and promote ecoagricultural options for the local communities of the hotspot. McNeely and Scherr (2003) document 36 case studies where agricultural practices improve productivity and enhance biodiversity. In 25 cases the beneficiaries were subsistence farmers. McNeely and Scherr suggest that ecoagriculture could be usefully promoted around biodiversity hotspots surrounded by poor small-scale farmers. Ecoagriculture includes well-established agricultural practices such as agroforestry, medicinal plant domestication, bioprospecting and organic farming. There is a great deal of ecoagricultural expertise in East Africa, which could be put to use by the local communities in this hotspot. In view of the effectiveness of price incentives, introduction of high value crops (e.g. medicinal plants and plants containing essential oils) could be a good option, particularly if these also have positive biodiversity values and if controls on forest encroachment are adequately enforced.

2. Restore and increase connectivity among fragmented forest patches in the hotspot, especially in Lower Tana River Forests, Taita Hills, East Usambaras/Tanga and Udzungwas

It is a well-established principle in ecology that species richness is positively correlated with area. When a forest is fragmented, each fragment of forest contains fewer species than did the intact forest and large fragments contain more species than small fragments (Laurance *et al.* 2001 and references therein; Newmark 2002). Some species are lost immediately through sampling effects, while others are lost because they need large areas to sustain their populations.

Local extinctions continue well after the fragmentation event, as genetic diversity decreases and isolated populations become more inbred and vulnerable to diseases and random events. Some species disappear because they depend on others that are lost. Edge effects become more important as fragment size decreases, affecting microclimates, exposing trees to winds and other conditions that exceed their physiological tolerance and further reducing the amount of habitat favoured by forest-dependent species. Some species do well in such conditions and there may be local increases in biodiversity, with edge-tolerant species thriving and matrix species penetrating the forest fragments. But for most of the forest-dependent species and these include many of the Red List species in this hotspot, fragmentation further threatens their survival. For example, in the Taita Hills, fragmentation is associated with adverse effects on sex ratios and developmental stability in threatened bird species, including the Critically Endangered Taita thrush (Lens & Van Dogen 1999; Lens *et al.* 1998, 1999a, b, 2001, 2002).

Reconnecting recently fragmented forest patches can save species from extinction. Gene flow can be restored among isolated populations, locally extinct species can be reintroduced through immigration and ecologically complex processes that sustain diversity can be re-established. This is an important research front and the hotspot is an ideal location for such work. There are many opportunities for implementation and investigation in both conservation science and community conservation. Best practices could be replicated over larger areas. The hotspot is also a treasure house for evolutionary biology. A wide variety of taxa, at various levels of speciation, are available to examine issues of genetic divergence and isolation in relation to distance, mobility and vagility. The sites chosen for this strategic direction were assessed from a biological perspective and were determined to present the greatest opportunity for successful connectivity efforts.

2.1 Assess potential sites in the hotspot for connectivity interventions. Not all forest fragments should be reconnected. Where fragmentation is natural and long established, any negative effects will have already been expressed and, over evolutionary time, new subspecies and species will have evolved. There is little doubt that this process of fragmentation and isolation has been responsible, for example, for the extraordinary diversity of some of the invertebrates (millipedes, linyphiid spiders, opilionids and carabid beetles) in the Eastern Arc Mountains, where single site endemism exceeds 80 percent (Scharff *et al*. 1981; Scharff 1992, 1993; Hoffman 1993, 2000; Burgess *et al.* 1998). The most suitable sites for connectivity interventions are, therefore, those in which (1) fragmentation is relatively recent, where (2) detailed scientific background data are available, where (3) this is considered to be a priority conservation action and where (4) this is a realistic activity. It will also be important to identify altitudinal forest corridors, which are, or could be, used for seasonal altitudinal migration.

2.2 Support initiatives that maintain or restore connectivity in the hotspot. Where the establishment of biodiversity corridors makes ecological, conservation and practical sense, it should be supported. Examples of narrow gaps between formerly joined forests are numerous in this hotspot. Some of the most important opportunities for restoring connectivity are in the Taita Hills, Lower Tana River Forests, Uluguru Mountains, East Usambara Mountains and Udzungwa Mountains. In several of these sites, connectivity has a direct bearing on the conservation of globally threatened bird species.

2.3 Monitor and evaluate initiatives that maintain or restore connectivity in the hotspot. Baseline monitoring, before restoring connectivity, is essential and indicator species should be identified and monitored so as to track impacts. The choice of indicator species should reflect a wide spectrum of mobility ("from a slug to a bird") and the availability of background knowledge (e.g. on population genetics). Effects on Red List species should be studied in as much detail as funds and circumstances allow. Monitoring of altitudinal connectivity will be particularly interesting in the context of climate change.

2.4 Support best practices for restoring connectivity in ways that also benefit people. Lens *et al.* (2003) have drawn attention to the opportunities for benefiting people while establishing biodiversity corridors. These include allowing local farmers to harvest old and neglected plantations, paying them for nurturing regenerating forest and planting indigenous seedlings, improving water catchments and encouraging agroforestry on their farms. The Taita Hills and the East Usambara Mountains are particularly suitable for such activities.

2. Improve knowledge of biodiversity in the hotspot

This profile notes numerous gaps in biological knowledge in the hotspot. Many sites remain little studied and some of these sites are relatively large (e.g., the Nguru Mountains, Nguu Mountains, Rubeho Mountains, Boni Forest, Dodori Forest). Even the better-known sites continue to yield many new species. There has been an extraordinary amount of speciation amongst the invertebrates, yet data on the invertebrate biodiversity in the hotspot is meagre. Indigenous knowledge of the flora and fauna is inadequately documented and is fast being lost. Public awareness of the biodiversity values of this hotspot is very limited, both locally and internationally. Ultimately, our capacity to conserve depends on the range and depth of our knowledge. As such, improving knowledge must be a key element in the CEPF strategy for this hotspot.

3.1 Refine and implement a standardized monitoring program across sites. For the purpose of site monitoring, standardised, simple and cost-effective protocols must be established and implemented for selected species that are generalist indicators of habitat health. The number of taxa monitored should be minimal so as to economise on effort and expense. Suitable protocols already exist for a number of taxonomic groups and their systematic application across sites will create a data set with greatly added value. Standardised monitoring protocols are required to assess the impacts of conservation projects and to evaluate project success.

3.2 Support research in the less studied of the 160 eligible sites in the hotspot. Little known sites need more biodiversity surveys and other scientific investigations. The focus should be

compiling lists of species and assessing distribution and abundance, so that the necessary data are available for assessing the relative biological importance of sites and the degree of threat status of species.

3.3 Monitor populations of Critically Endangered and Endangered Species in the hotspot. Particular attention must be given to monitoring the 24 Critically Endangered and 68 Endangered species of this hotspot (Table 1, 2, Appendix 3). Their continued existence is the bottom line for CEPF interventions. This calls for a wise use of resources, as the monitoring of rare species can take much time and effort. Expert training of and support for, local field technicians may be one way to compensate for the short field visits of professional scientists. Special care will be necessary to ensure that monitoring activities do not expose endangered species to any added risks.

3.4 Support research in the hotspot to facilitate Red List Assessments and re-assessments for plants, reptiles and other taxa. The deficiencies of the 2002 Red Lists for this hotspot have already been noted. This is dramatically illustrated by the 973 plant taxa in the *List of Potentially Threatened Plants* (Gereau and Luke 2003) that is included in the Outcomes Database for the hotspot. The situation is scarcely any better for the reptiles, where none of the more than 50 endemic reptiles in this hotspot are included in the 2002 Red List. Red List assessments for invertebrates would probably add thousands more species to the conservation outcomes for this hotspot. Red List assessments must be an investment priority.

3.5 Compile and document indigenous knowledge on hotspot sites and species. The values of indigenous knowledge of biodiversity and the urgent need for its documentation are widely recognized. An enormous amount of knowledge on biodiversity and its uses has been accumulated among indigenous peoples in the hotspot and has been transferred orally across the generations. While much of this has been recorded, the literature is scattered and hard to find. It needs to be compiled in both hard copy and database form. In any research in this area, the recognition of Intellectual Property Rights must be a primary consideration and the sources of information must be meticulously recorded.

3.6 Support awareness programs that increase public knowledge and appreciation of biodiversity values in this hotspot. The usefulness of awareness programs in conservation is often questioned. One problem is that they are often limited in their impacts by short project lifecycles, whereas awareness needs to be continually re-enforced (as shown by commodity marketing). Another is that awareness of biodiversity is seldom linked to any real benefits for the target communities. Innovative approaches are needed that circumvent these difficulties. Ways need to be found to put a bright and constant spotlight on the ecological services provided by the hotspot's forests (particularly water catchment and hydropower). Current public awareness of the global biodiversity values of the hotspot also needs to be boosted at all levels.

4. Establish a Small Grants Program for all the 160 important sites identified for the hotspot, that focuses on critically endangered species and small scale efforts to increase connectivity of biologically important habitat patches

Experience, particularly in the GEF, shows that small grants can be cost effective. Small grants should be made available through CEPF for community-based organizations and NGOs working to save Critically Endangered species and threatened sites in this hotspot. The intention is not to duplicate or compete with existing small grants programs on conservation issues, but to seek synergies and leverage funds for NGOs, community-based organizations and institutions of learning. Small grants programs incur high administration costs (per grant dollar) because of the burden of dealing with several small projects at once. Costs are also incurred because the beneficiaries are usually less well established than those receiving large grants and require closer monitoring and guidance on the ground. CEPF will evaluate the possibility of partnering with an in-region organization to host its small (>10,000 per grant) grants program.

A focus on the threatened sites and species in this hotspot will be a mandatory criterion for funding and selection of proposals will be made on the strength of this focus and the likelihood of positive impacts. In order to ensure a wide distribution of the available funds over these sites and species, the ceiling on grants for any one proposal will be $10,000.

4.1 Support targeted efforts to increase connectivity of biologically important habitat patches in the hotspot. Community-based organizations should be encouraged to engage in efforts to increase small-scale connectivity. It is widely recognized that project ownership at the community level is a key factor in project sustainability. There may also be opportunities for the contribution of labor, for corridor establishment and maintenance, to be accepted as payment in kind for other community development projects. Any such arrangement will require that appropriate monitoring systems are in place to ensure that all obligations are met.

4.2 Support efforts to increase biological knowledge of the sites and efforts to conserve Critically Endangered Species in the hotspot. Small grants programs can be extremely useful and cost-effective in supporting low-cost research. There are a number of universities in Kenya and Tanzania with active postgraduate programmes in biology and conservation. Small grant support for field research by postgraduate students within the hotspot will bear dividends in terms of both capacity building and new knowledge. Small grant support should also be given to projects that directly reduce threats to Critically Endangered species.

5. Develop and support efforts for further fundraising for the hotspot

Although fundraising was not seen as a priority theme by the 12 March workshop in Dar es Salaam, it is prudent to plan ahead. Most of the larger grant-dependent institutions now have full time Resource Mobilization Units (RMUs) or Project Development Departments. These have been very successful in obtaining funds in an increasingly competitive environment and in preventing funding gaps for projects that need long-term financing. Efforts to secure long-term funding can be greatly enhanced through:

- coordinated, centralized and choreographed project marketing and improved investor relations;
- centralized information centres for resource mobilization and proposal development;
- training and institutional development in resource mobilization, proposal development and writing and project marketing; and
- strategically intertwined and targeted resource mobilization and public awareness.

CEPF will support efforts to raise further funds for this hotspot in partnership with an institution working in Tanzania or Kenya.

5.1 Establish a professional Resource Mobilization Unit, within an appropriate local partner institution, for raising funds and resources for the hotspot. An appropriate institution in Tanzania or Kenya should be identified to host or co-host an RMU for the Eastern Arc and Coastal Forests hotspot. Depending on the arrangements, this RMU could provide services to both that institution and CEPF or it could concentrate on hotspot funding alone.

5.2 Utilize high-level corporate contacts to secure funding from the private sector for the hotspot. There has been relatively little private sector involvement in the hotspot. In a few cases (notably with TFCG in Tanzania), private sector support has been obtained, but this has mostly been through local approaches to mid-level management and the funding obtained has been small-scale. Given the global importance of the hotspot and the interest this has stimulated, it is time to move up the corporate ladder and seek support from higher levels of management, particularly within the multinationals that have interests in East Africa. CEPF is in a good position to facilitate this process and a professional RMU would quickly follow up any opportunities that might arise.

5.3 Train local NGOs and community-based organizations in fundraising and proposal writing for the hotspot. Although many of the local NGOs and some community-based organizations have developed skills in fundraising and proposal writing, the standard is still low in the international context in which funding is being sought. The RMU could be of great assistance in raising this standard through workshops, publications, sharing databases and collaboration with local NGOs and community-based organizations in proposal development from the inception of an idea to the submission of the document.

SUSTAINABILITY

The issue of sustainability for conservation interventions is usually addressed by one or a combination of five strategies:

1. establishing sustainable funding mechanisms such as a Trust or Endowment Fund;
2. building local human capacity to manage conservation issues;
3. fostering private sector involvement in conservation;
4. establishing/assisting commercially viable conservation projects; and
5. leveraging further donor funding.

An Endowment Fund for the Eastern Arc Mountains is one of the outcomes for the big GEF project (GEF 2002). An alternative sustainable funding mechanism is suggested in this profile: a Resource Mobilization Unit. This unit will become self-sustaining through the funds it raises. Local human capacity will be built by 14 of the investment priorities. Fostering private sector involvement can be done through four of them. Commercially viable conservation projects are the outcome of two-three investment priorities. Leveraging of further donor funding is the only possible strategy for five of the investment priorities. It will also be necessary if the small grants are to continue and it should be pursued by the RMU for all priorities as opportunity arises.

CONCLUSION

The biological importance of the Eastern Arc Mountains and Coastal Forests of Tanzania and Kenya is well recognized. There have been a considerable number of biodiversity investigations and conservation efforts in this hotspot during the last three decades. Despite this investment, there are significant gaps in our biological knowledge. There are also important opportunities for the further application of conservation science, particularly with respect to forest fragmentation. The major threats to the hotspot arise from the needs of impoverished local people, rather than from any large-scale developmental projects or corporate ventures. These considerations have led to a definition of the CEPF niche that builds on previous work through a focus on people and science.

The people focus will be on the interface between biodiversity and development and will address ways in which local populations can benefit from and contribute to, biodiversity conservation in the hotspot. The science focus will be on opportunities for improving connectivity in fragmented forests and on gaps in our biological knowledge of the hotspot. In each case, projects funded by CEPF must have a positive effect on at least one of the 333 threatened species and/or the 160 sites identified in this profile. Building local human capacity is the major element in the sustainability strategy. No matter how global the world becomes, it will be local actions that will largely determine the future of biodiversity hotspots. The prospects for the hotspots will be greatly improved if these local actions are motivated by conservation concerns and guided by good science.

ABBREVIATIONS USED IN THE TEXT

ACC	African Conservation Centre
AWF	African Wildlife Foundation
BP	Before Present
CD-ROM	Compact Disc - Read Only Memory
CFCU	Coastal Forest Conservation Unit
CEPF	Critical Ecosystem Partnership Fund
CFCU	Coastal Forest Conservation Unit
CI	Conservation International
DANIDA	Danish International Development Agency
DFO	District Forest Officer
DRC	Democratic Republic of Congo
EAMCEF	Eastern Arc Mountains Endowment Fund
EANHS	East Africa Natural History Society
EAWLS	East African Wildlife Society
ELCI	Environmental Liaison Centre International
EMCA	Environmental Management and Coordination Act (Kenya)
FAN	Forest Action Network
FBD	Forestry and Beekeeping Division (Tanzania)
FD	Forest Department (Kenya)
FINNIDA	Finnish International Development Assistance Agency
FoC	Friends of Conservation
FR	Forest Reserve
GEF	Global Environment Facility
GEF/SGP	Global Environment Facility / Small Grants Programme
GDP	Gross Domestic Product
GIS	Geographic Information System
GTZ	German Agency for Technical Cooperation
HIV-AIDS	Human Imunodeficiency Virus - Acquired Immunodeficiency Syndrome
IBA	Important Bird Area (according to Birdlife International)
ICBP	International Council for Bird Preservation (now BirdLife International)
ICDP	Integrated Conservation and Development Project
IDA	International Development Assistance
IUCN	International Union for the Conservation of Nature (World Conservation Union)
IUCN-EARO	International Union for the Conservation of Nature - East African Regional Programme
JET	Journalist Environmental Association of Tanzania
KEFRI	Kenya Forestry Research Institute
KFWG	Kenya Forest Working Group
KWS	Kenya Wildlife Service
LEAT	Lawyers Environmental Association of Tanzania
MENR	Ministry of Environment and Natural Resources (Kenya)
MNRT	Ministry of Natural Resources and Tourism (Tanzania)

MoU	Memorandum of Understanding
NEMA	National Environment Management Authority (Kenya)
NEMC	National Environment Management Council (Tanzania)
NFP	National Forest Programme
NGO	Nongovernmental Organization
NK	Nature Kenya
NMK	National Museums of Kenya
NORAD	Norwegian Agency for Development Cooperation
NR	National Reserve
NRI	Natural Resources Institute
NU	Nature Uganda
PACT	Private Agencies Collaborating Together
PDF	Project Development Fund
PDF/B	Project Development Fund / Block B
PFM	Participatory Forest Management
RMU	Resource Management Unit
SFM	Sustainable Forest Management
TAFORI	Tanzania Forestry Research Institute
TANAPA	Tanzania National Parks Authority
TAWIRI	Tanzania Wildlife Research Institute
TFCG	Tanzania Forest Conservation Group
TFS	Tanzania Forest Service (to be established)
UMNP	Udzungwa Mountains National Park
UNDP	United Nations Development Programme
USAID	United States Agency for International Development
WCST	Wildlife Conservation Society of Tanzania
WD	Wildlife Department, Tanzania
WWF-EARPO	WWF Eastern African Regional Programme Office
WWF-US	WWF United States

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