

CHAPTER 5 FORESTS AND WOODLANDS



Introduction

Forests and woodlands contribute significantly to Kenya's economy. They provide multiple environmental, economic, social and cultural benefits which can provide opportunities for the poverty alleviation and economic development envisaged in Vision 2030. For instance, forests create significant employment and livelihood prospects in the country's rural and urban areas. They also play an invaluable role in meeting the cultural and spiritual needs of adjacent communities. Forests' indirect but important benefits include acting as carbon sinks, reservoirs of biodiversity and critical habitats for wildlife. In addition, they keep the land productive by conserving soil and water. They also serve as water catchments that recharge rivers and dams which supply water for domestic use and hydro electric power generation. The latter two are especially vital to the attainment of Vision 2030 which aims to provide safe drinking water for larger proportions of the country's population. In addition, the manufacturing sector, which is identified by Vision 2030 as one of the areas that is expected to deliver the 10 percent annual growth rate, is heavily dependent on hydro power.

The country's forests and woodlands are increasingly under pressure from the growing human population and many are shrinking as a result of human-induced deforestation. The enactment of the 2005 Forests Act has admittedly helped to revitalize the sector by giving local communities a stake in the management of state and local authority forests. Despite the new law however, a number of challenges remain. The low penalties for offences compared to the value of the resources in question, inconsistencies with other sectoral policies and laws, and lack of security of tenure for people living on government and trust lands has resulted in opportunistic exploitation of forest resources both by the local communities and government. In 2001 for example, government excised 67 000 of state forests predominantly in the Mau Forest Complex, Kenya's largest closed canopy forest and the largest of the country's five water towers. Further, forests are currently undervalued in terms of the goods and services and the socio-economic benefits they provide. The government needs to institute mechanisms to ensure strict enforcement of the logging ban and ensure that the contribution of forests to the national economy is properly accounted for.

Current status of forests and woodlands

Forests in a regional and global context

Africa's forests and woodlands can be classified into nine general categories including tropical rain forests, tropical moist forests, tropical dry forests, tropical shrub lands, tropical mountain forests, subtropical humid forests, subtropical dry forests, subtropical mountain forests and plantations. Mangrove forests cover a total area of 3 390 107 ha.

Only 32.5 million ha of forests and woodlands, or 5 percent of the total forest area, are formally protected. The forest sector in Africa plays an important role in the livelihoods of many communities and in the economic development of many countries. This is particularly so in Western, Central and Eastern Africa where there is considerable forest cover (UNEP 2006).

Africa has a high per capita forest cover of 0.8 ha per person compared to 0.6 ha globally. On average, forests account for 6 percent of GDP in Africa, which is the highest in the world. In Uganda, for example, forests and woodlands are now recognized as an important component of the nation's stock of economic assets and contribute in excess of US\$ 546.6 million to the economy through forestry, tourism, agriculture and energy (NEMA 2008). The state of Rwanda's forests and woodlands and their importance to the national economy is also well documented. Forests are designated as protected areas which host game parks and forest reserves and make contributions to the national economy by supplying renewable sources of energy in the form of wood fuel and charcoal. They also make an indirect contribution to sustainable agriculture and are sources of medicines, fodder, honey, essential oils, as well as handicraft and construction materials. However, they are also threatened with mining, fires and poaching (REMA 2009).

Forests and woodlands are central to the long-term social and economic development goals of NEPAD and will play an important role in meeting the MDG targets. They provide energy, food, timber and non-timber forest products and are important contributors to wealth and health at the household, community, national, sub-regional, regional and even global levels. Forests and woodlands still remain key components of the environment that provide essential services to African countries where they play a critical role in combating land degradation and climate change as well as conserving wetlands, coastal areas and freshwater systems.

In the East African region, policy issues in management of montane forests are deliberated upon under the umbrella of the East Africa Community which oversees the East African Treaty of 1999 (Better Globe 2009). The rivers flowing from the Mau Forest Complex in Kenya drain into five lakes, three of which are international water bodies: Lake Victoria (shared by Kenya, Uganda and Tanzania), Lake Natron (shared by Kenya and Tanzania) and Lake Turkana (shared by Kenya and Ethiopia). All the five rivers, which flow into Lake Victoria, form part of the Nile Basin. Increased sediment influx from these five rivers

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and from the Kagera River annually costs farmers in excess of US\$ 40 million worth of lost soil. Such a high sediment or nutrient load into the lake is a major contributor to the expansion of the areas covered by the water hyacinth, an invasive plant with a negative impact on fisheries and associated economic activities. The sediment load is particularly high during flash floods and can be mitigated by maintaining a good forest cover in the upper catchment areas (Better Globe 2009). In this regard, regional programmes such as the Nile Basin Initiative and others which focus on safeguarding common resources such as Lake Victoria should be facilitated to fulfil their mandates (UNEP 2007). On a broader level, the NEPAD programme on forests and woodlands is critical to the success of the other NEPAD programmes, including those on combating land degradation and climate change and on conserving wetlands, and coastal and freshwater resources.

The world's forests provide a range of ecosystem services. 80 percent of the planet's biodiversity is believed to depend on healthy ecosystems. Tropical forests, mostly found in developing countries, are especially vital for safeguarding global environmental goods and services. Nearly 2 000 indigenous cultures or more than one billion people depend on forests for their sustenance. Even though there is growing public recognition of the benefits of these ecosystems, they are increasingly under threat from deforestation and nearly 13 million ha are lost every year. Deforestation rates are particularly high in the tropical countries. It is estimated that some 1.8 billion m³ of wood are harvested annually for wood fuel, with women typically doing most of the work (GEF 2009). Protected areas are considered one of the most efficient and cost-effective options for conserving forests. The world's forests are estimated to contain about 80 percent of above-ground and 40 percent of below ground terrestrial carbon. At present, there is more carbon stored in forests than in the earth's atmosphere.

International agreements which touch on the conservation and management of forest resources include the CBD and the United Nations Framework Convention on Climate Change (UNFCCC), both of which have been in force since 1992. Kenya is a signatory to these and a number of other multilateral environmental agreements (MEAs), including the 1971 Ramsar Convention.

Forests and land use in Kenya

The distribution of Kenya's population closely follows rainfall distribution patterns. Only 20 percent of the country's total area has high rain-fed agricultural potential and most farmers are dependent on small-scale commercial agriculture (WRI 2007). This, coupled with the rapid population growth rate of nearly 1 million people per year over the past decade, has placed increased pressure on existing settlements. As a result, there is great demand for arable land and the per capita holding is continually shrinking (UNEP 2009a). Protected forests that are located in high potential areas are valued for their agricultural and human settlement potential. State forests are also subjected to illegal logging and cultivation by people seeking alternative means of livelihood. This demonstrates the need to upscale farm forestry across all the country's ecological zones (GoK 2009a).

Categories of land use type	Areas ('000 ha) in Year		Remarks
	2005	2008	
Indigenous closed canopy forests	1 165	1 165	Decreased forest cover (25 000 ha) due to human interference in Cherangani, Samburu and Mau forests
Mangroves	54	54	Located in Kilifi, Malindi, Lamu (coastal areas).
Industrial plantation forests	134	107	This is in addition to 16000 ha of the unplanted designated areas
Private plantation forests	83	90	Increasing trend due to accelerated commercial planting by private sector and farmers
Subtotal closed canopy forests	1 532	1 406	2.4 per cent of Kenya's total area
Woodlands	2 075	2 050	Spread mainly in the ASALs
Subtotal of forest areas	3 496	3 456	5.9 per cent of Kenya's total area
Bush-lands	24 570	24 510	In ASALs and medium rainfall areas
Grasslands	10 350	10 350	Mainly in the savannah
Settlements	8 152	8 202	
Tree on farmlands	10 320	10 385	Mainly in high and medium rainfall areas
Inland water bodies	1 123	1 123	
Total area	58 037	58 037	

Table 5.1: Changes in various types of land use in Kenya from 2005-2008

Source: KFS 2010

The remaining 80 percent of Kenya's total land is classified as arid or semi-arid lands (ASALs). These ASALs support pastoralist and agro-pastoralist lifestyles but their woodlands are also a major source of charcoal which is a commodity with a ready market for domestic energy in rural and urban settlements all over Kenya (Better Globe 2009). The charcoal industry, though robust and capable of earning the government much needed revenue in taxes only came under formal regulation with the gazettement of the charcoal regulations in December 2009. A deeper analysis however reveals that not enough has been done so far to put in place the necessary structures to support the enforcement of these regulations in order to ensure sustainable use of the country's forests and woodlands. It is therefore important that charcoal producers and the relevant enforcement agencies such as the Kenya Forest Service (KFS), Kenya Wildlife Service (KWS), the Kenya Police, local provincial administrators and judicial officers are sensitized on these rules. The country's civil society is already helping to educate the public on this important development. More however needs to be done by key institutions which are mandated to register and monitor the charcoal producer associations. Table 5.1 contains details of forest-related land use changes in Kenya over the 2005-2008 period.

Kenya's forest cover stands at 1.7 percent as shown in Figure 5.1. This is much lower than the recommended threshold of 10 percent. Gazetted reserves are under the jurisdiction of the Kenya Forest Service (KFS). Some of the closed canopy forests are managed as national parks and national reserves by the Kenya Wildlife Service (KWS). About 100 000 ha of the forests are under the authority of local governments although these are generally poorly managed. Natural woody vegetation covers a combined area of approximately 37.1 million ha.

Kenya's montane forests: The five water towers

Kenya's five 'water towers' namely; Mount Kenya, the Aberdares Range, the Mau Forest Complex, Mount Elgon and the Cherangani Hills—are montane forests and the largest forests in the country. They form the upper catchments of all the main rivers in Kenya (except the Tsavo

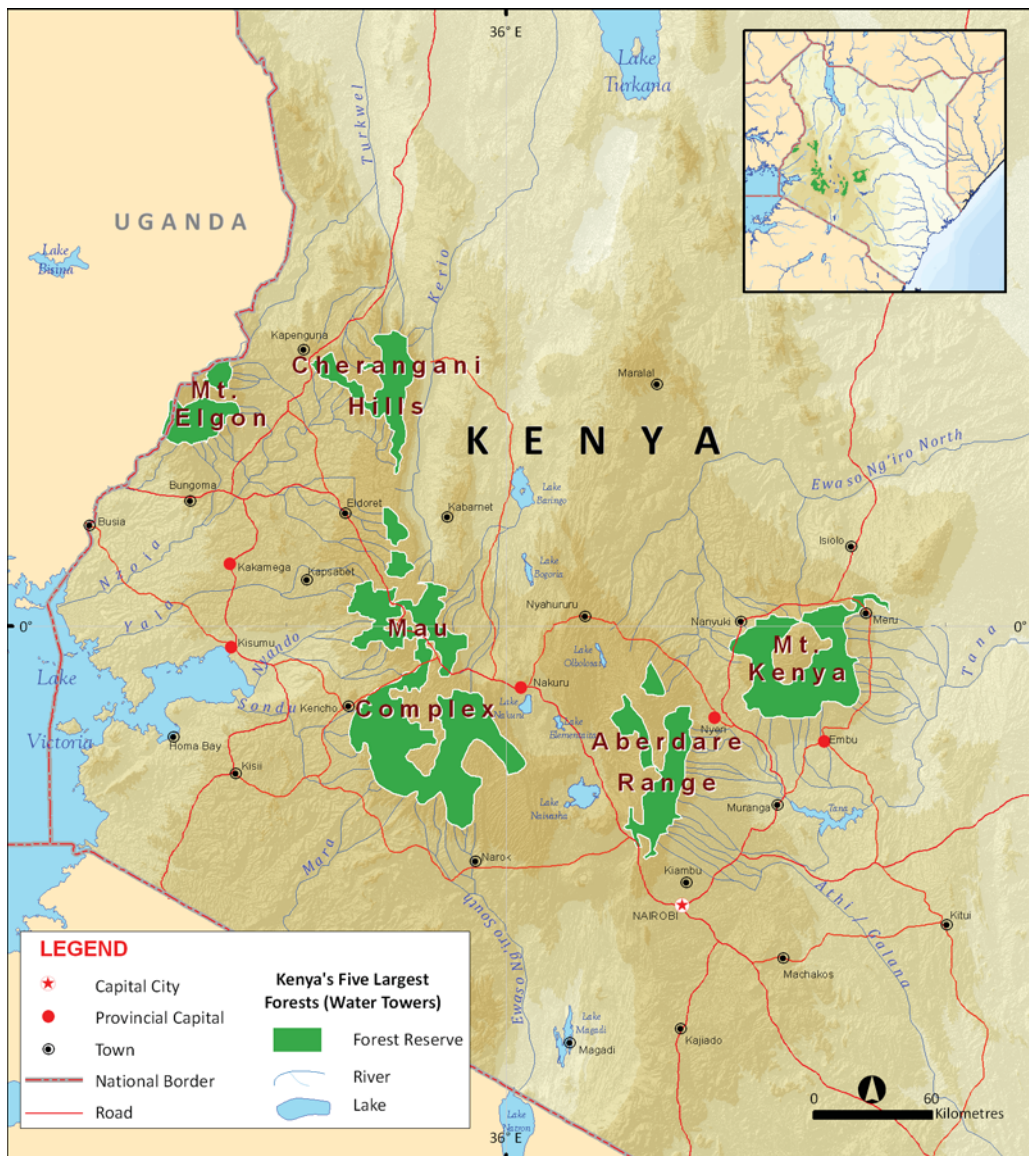


Figure 5.2: Location of the country's five largest forests which are also its water towers

Source: KFS 2010

River that originates from Mount Kilimanjaro). They are sources of water for irrigation, agriculture, industrial processes and for the installed hydro-power plants. These montane forests are also surrounded by the most densely populated areas because they provide sufficient water for intensive agriculture and urban settlement (Akotsi et al 2006). They also provide timber and non-timber products to forest-adjacent communities. However, their rampant destruction through extensive, irregular and ill-planned settlements and illegal forest resource extraction is a matter of national concern.

The following sections are case studies presenting the state of the country's five water towers. They describe their changing physical

conditions over time. Such assessments are important for safeguarding the livelihoods of millions of Kenyans and also for preserving the intrinsic beauty and richness of these landscapes. Figure 5.2 shows the location of these five forests.

The Mau Forest Complex

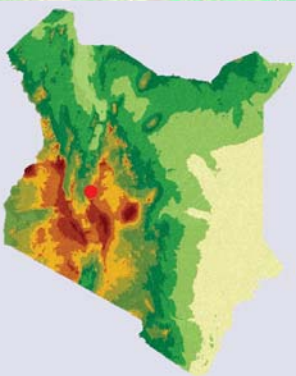
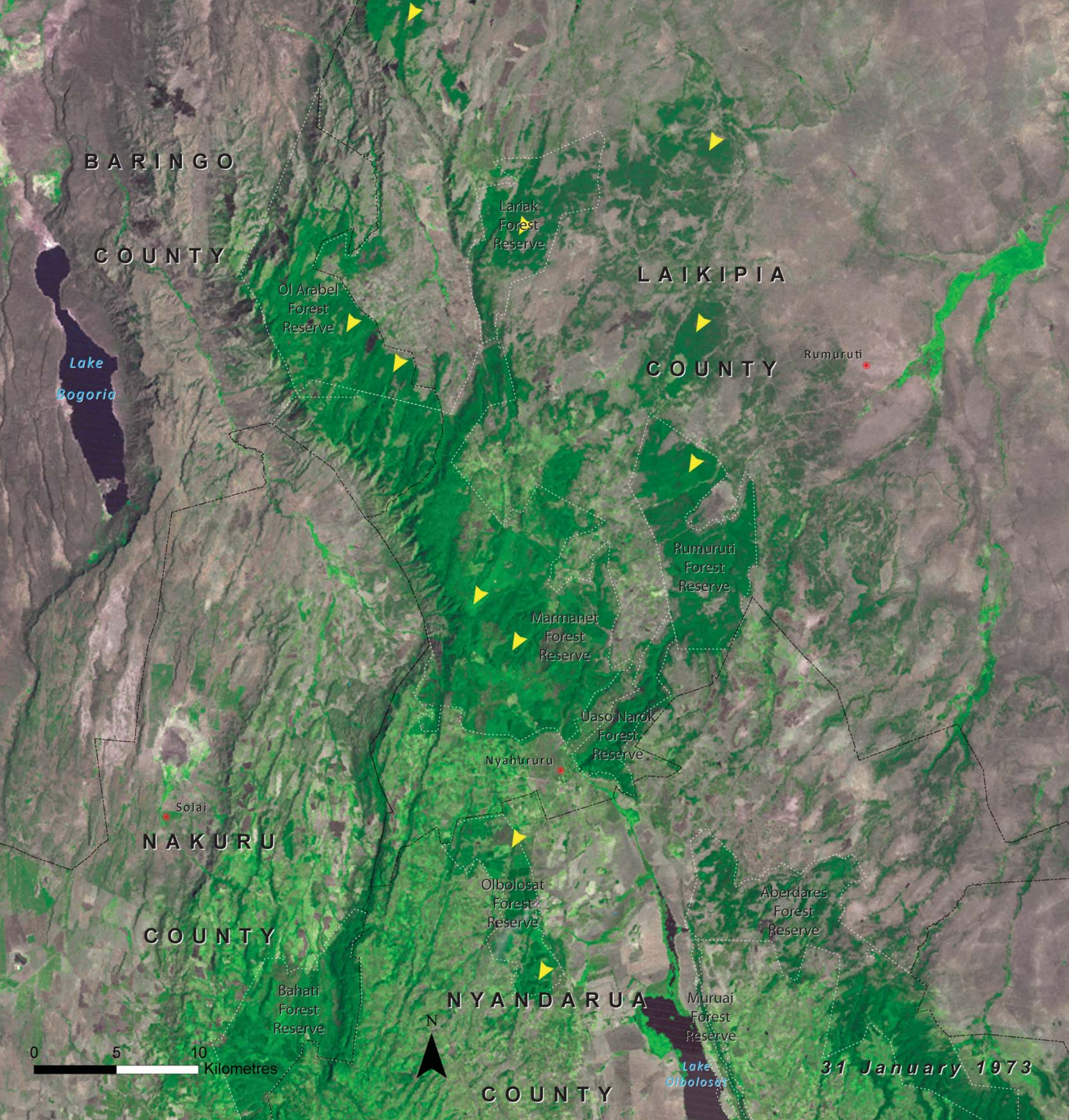
The Mau Forest Complex comprises 22 separate blocks and is the largest of the country's five water towers with a total forest cover of 403 775 ha. It feeds a range of the country's major water arteries that extend as far as Lakes Turkana, Natron and Victoria and supports critical economic activities including hydropower generation, tourism and agriculture. In spite of its national importance, many portions of the Mau Forest Complex have been deforested or degraded. Much of this damage has taken place in the past few decades. Excision of forest reserves and continuous widespread encroachment have led to the destruction of over 100 000 ha of forest since 2000, representing roughly one-quarter of the Mau Complex area (UNEP 2009a).

In 2001, a 61 023 ha parcel of the Mau Forest Complex was excised. This included over half of the Eastern Mau Forest Reserve, one quarter of South West Mau Forest Reserve as well as the Molo Forest Reserve. Between 1973 and 2005, Maasai Mau Forest lost over 8 214 ha of forest with almost 43 percent of that loss occurring in just two years (2003 to 2005). Just outside the gazetted boundaries of Maasai Mau Forest, nearly 32 000 ha were lost during the same time period. The eastern slopes of the Maasai Mau are a crucial catchment for the Ewaso Ng'iro River while the western slopes help to recharge the Mara River. Forest loss in critical catchment areas of the Sondu, Mara, Molo, Naishi, Makalia Nderit, and Njoro Rivers may result in ecological and hydrological changes which threaten the sustainable future of the downstream areas. In addition, people have encroached onto 43 700 ha of the Mau Forest Complex's remaining protected forests.

The suitability of many of these areas for agriculture attracts a rapidly growing population and has led to conversion of large areas

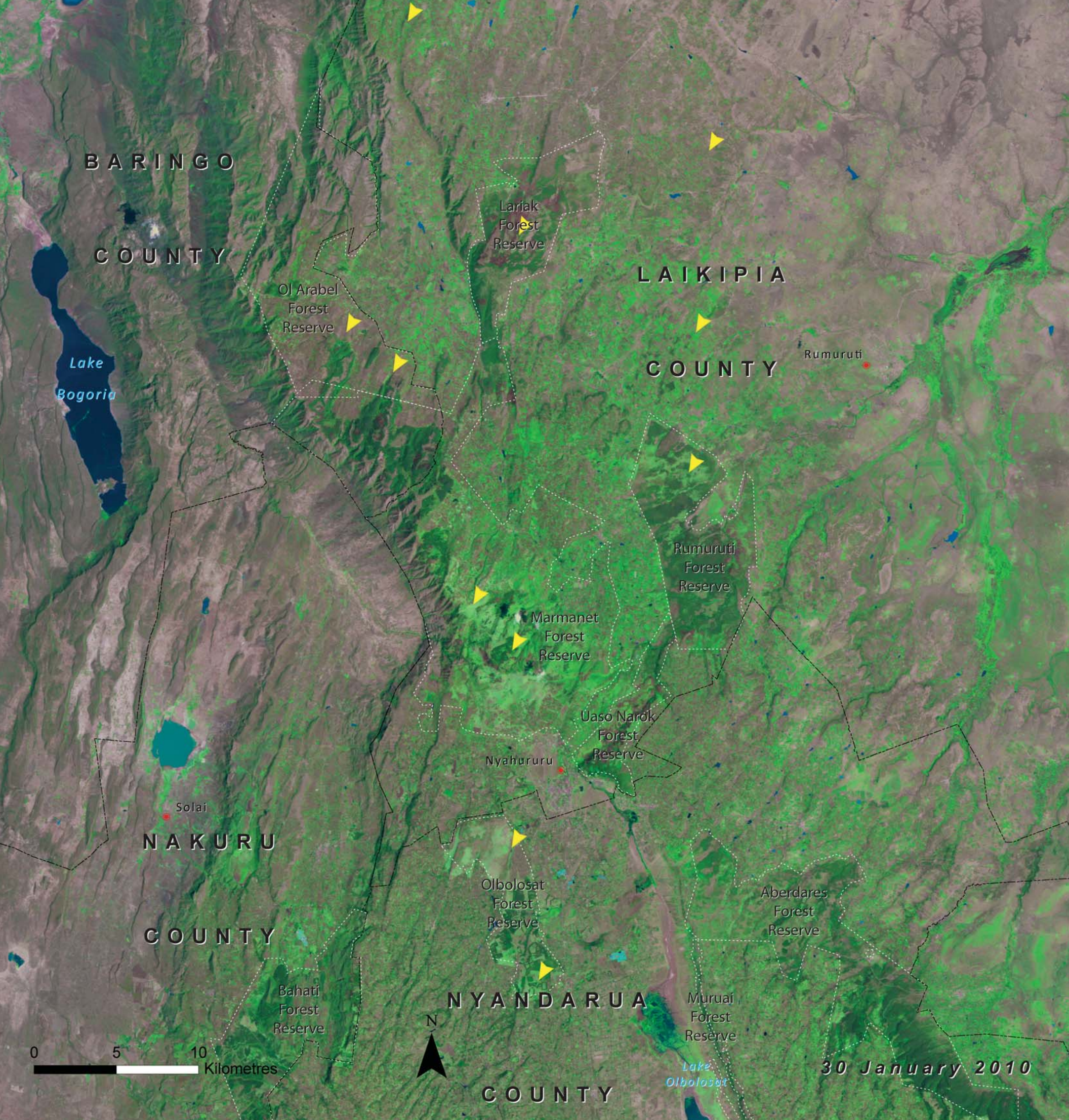
An aerial photo depicting the scale of the Mau Forest Complex's deforestation.





Forest Loss – Conversion of forested land to agricultural and other land uses has been a common occurrence in Kenya over several decades. This worrisome state of affairs is not only restricted to private land, but also to gazetted forests. Deforestation in Kenya is therefore

both attributable to illegal activities by private actors and government sanctioned forest excisions. In 1973, Ol Arabel, Lariak, Marmanet, Rumuruti, Aberdares, Olbolosat, Bahati, Uaso Narok, and Muruai forest reserves and their environs were covered with lush green forests



as depicted in the 1973 image. However, in the 2010 image, most of the forests have been cleared, leaving behind farms and barren land (yellow arrows). With Vision 2030 aiming to eventually raise the country's forest cover to 10 percent, policies need to be put in place to encourage

afforestation and reforestation and to also discourage deforestation by making trees more valuable when standing than felled. Furthermore, there is need for enhanced protection of the existing forest resources.

of forest to farmland. This explains why people with claims of land ownership inside the forest resist eviction and raises questions about the legality of title deeds issued for gazetted forest land. Long term land adjudication plans are needed to resolve these issues. Poor land management inevitably leads to increased dependence by the population on forest products. Loss of forest cover at an unsustainable rate threatens the future development of Kenya. Realizing the goals of Vision 2030 will thus depend on sustainable management of Kenya's critical natural assets including the Mau Forest Complex which is the largest of the country's closed canopy forests.

However the situation is not all gloomy as the Mau complex witnessed a number of positive developments between 2005 and 2007. First, only 63.06 ha of the entire Mau Complex were cleared. Second, 5 970 ha of the forest complex showed signs of regeneration. Third, a public-private sector partnership under the auspices of the 'Save the Mau Trust' has stepped up efforts to rehabilitate the degraded portions of the forest. The progress made in reclaiming the forest is captured in reports by an Inter-Ministerial Conservation Secretariat in the Prime Minister's office. Four phases of the rehabilitation programme have so far been completed and the initiative is currently in its fifth phase (KFWG personal communication).

Mount Kenya forest

This was designated as a UNESCO World Heritage Site in 1997 because of its remarkable ecosystems and natural beauty. It covers an area of 232 047 ha and has exceptional biodiversity, scenic, social and cultural values which justify its protected area status. Its wide range of altitude and rainfall gives rise to eight ecological zones ranging from a cultivated zone below 1 800m to the Afro-alpine (areas above 3 800m) and the Nival zone, found above most vegetation. The altitudinal gradient of Mount Kenya leads to an unusually varied range of plant and animal species in a relatively small area. The areas under forest are critical water catchments for Kenya, delivering an estimated 40 percent of the country's water needs. From the forest belt growing between 3 000 and 4 000m to the glacial summit at 5 199m, Mount Kenya receives over 2 000mm of precipitation annually. This water feeds the Ewaso Ng'iro and the Tana, Kenya's longest rivers with Mount Kenya providing roughly half the water needed for Tana River's crucial hydro-power plants.

From the 1960s to the 1990s, there was intense population growth around Mount Kenya, and large areas of indigenous forest were cleared to establish tree plantations. Unsustainable exploitation of forest resources was followed by extensive illegal logging of valuable species and small-scale illegal charcoal production, growing of marijuana and unauthorized farming, which degraded many areas of natural forest.

It is unclear whether law enforcement has improved since the Forests Act of 2005 became operative and whether this legislation is effective in significantly reducing threats. To fill gaps that may exist, it is necessary to resolve related conflicts arising from the fact that the Mount Kenya Forest is regarded on one hand, as a National Park under the management of Kenya Wildlife Service while on the other, it is recognized as a Forest Reserve under the jurisdiction of Kenya Forest Service (KFS) according to a 1943 gazette notice that remains in force. The process of developing a management plan for the Mount Kenya ecosystem has been very slow as a result of this conflict. Both institutions mandated with its management administratively fall under the Ministry

of Forestry and Wildlife making it easy to resolve the issue. The roles played by other partners with an interest in forest management should not be overlooked as it is through their efforts that resources have been mobilized for fencing of the forest and creation of wildlife corridors.

Between 2005 and 2007, probably as the result of the draft forest management plan that was put in place to conserve the Mount Kenya Forest, there were no significant changes reported in forest cover. This situation was confirmed in 2010 when the Department of Resource Surveys and Remote Sensing (DRSRS) of the Ministry of Environment and Mineral Resources made an aerial survey that produced no evidence of ongoing destruction in the forest and most of the forest sections are well stocked. Based on the survey, the South Imenti forest block which was depleted in 2000 appears to be firmly on the path to recovery with green vegetation dominating the whole forest. The forests of the southern, eastern and western sides of Mount Kenya also display a well vegetated condition. These are classified as moist highland forests of broadleaved tree species and show vigorous vegetative growth due to good rainfall. Ground surveys are nevertheless recommended to establish the current state of the forest. Indeed, KFWG's monthly reports indicate that selective destruction is still taking place in this region despite the logging ban.

Cultural and social values

Forests are traditionally important as sacred sites for cultural ceremonies by local communities. Specific tree species have distinct cultural values. The Mount Kenya forest plays an important religious role and is regarded as a sacred place by neighbouring communities. The Maasai who live in Ngare Ndare area ascribe significant cultural values to the forest while the Meru council of elders (Nchuri Ncheke) performs rites in it. A unique characteristic attributed to the forest by the Embu, Meru and Gikuyu people is that it is regarded as the traditional home of their God, Ngai Murungu, whose presence is strongly associated with the peaks of the mountain. In the past, these communities performed religious rituals while facing the mountain or in several sacred areas in the forest when faced with crises such as drought. The peaks were not visited except for traditional rituals and prayer (KWS 1996) which helped to conserve tree species such as the Mugumo tree (*Ficus natalensis*) and *Indigofera erecta*, which were considered sacred. Other species of cultural significance were those with medicinal qualities or food value.

Mount Kenya's biodiversity

Flora

Vegetation varies with altitude and rainfall with a rich alpine and sub-alpine flora. *Juniperus procera* and *Podocarpus sp.* are predominant in the drier parts of the lower zone (below 2 500 m) with rainfall ranging between 875 and 1 400 mm. *Cassipourea malosana* predominates in wetter areas in the south-west and north-east (where rainfall exceeds 2 200 mm per year). However, most of this lower altitude zone is not within the reserve and is now used for growing wheat. Higher altitudes (2 500-3 000 m) with rainfall ranging over 2 000 mm per year are dominated by bamboo *Arundinaria alpina* on south-eastern slopes; a mosaic of bamboo and *Podocarpus milanjanus* with bamboo at intermediate elevations (2 600-2 800 m); and *Podocarpus* at higher (2 800-3 000 m) and lower elevations (2 500-2 600 m). Towards the west and north of the mountain, the bamboo becomes progressively smaller



Christian Lambrecht/ANP

A view of the indigenous Mount Kenya forest.

and less dominant. *Hagenia abyssinica* and *H. revolutum* predominate in areas of maximum rainfall (2 000-3 500 m) with up to 2 400 mm of rainfall per year. Above 3 000 m, cold becomes an important factor, tree stature declines, and *Podocarpus* is replaced by *Hypericum sp.* A more open canopy results in a more developed understory. Grassy glades are common especially on ridges. The lower alpine or moorland zone (3 400-3 800 m) is characterized by high rainfall, a thick humus layer, low topographic diversity, and low species richness. Tussock grasses *Festuca pilgeri*, and sedges *Carex sp.* predominate. Between the tussocks there are *Alchemilla cyclophylla*, *A. johnstonii*, and *Geranium vagans*. The upper alpine zone (3 800-4 500 m) is more topographically diverse, and contains more varied flora, including the giant rosette plants *Lobelia telekii* and *L. keniensis*, *Senecio keniodendron*. *Carduus sp.* *Senecio brassica* is found in both the lower and upper alpine zone. There are a variety of grasses on well-drained ground and along the streams and river banks such as the megaphytic *Senecio battescombei* and *Helichrysum kilimanjari*. Continuous vegetation stops at about 4 500 m although isolated vascular plants have been found at over 5 000 m. 13 species considered endemic to Mount Kenya were recorded by Hedberg in 1951 and largely confirmed in Mount Kenya's 2010 biodiversity report as well as questionnaires completed pursuant to the Mount Kenya Ecosystem Integrated Management Plan 2010-2020 (Birdlife International 2010).



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Groundsel.

Fauna

In the lower forest and bamboo zone, mammals include the giant forest hog (*Hylochoerus meinertzhageni*), tree hyrax (*Dendrohyrax arboreus*), white-tailed mongoose (*Ichneumia albicauda*), elephant

(*Loxodonta africana*), black rhinoceros (*Diceros bicornis*), suni (*Neotragus moschatus*), black-fronted duiker (*Cephalophus nigrifrons*) and leopard (*Panthera pardus*) which has also been seen in the alpine zone. Moorland mammals include localized Mount Kenya mouse shrew (*Myosorex polulus*), hyrax (*Procavia johnstoni mackinderi*), and common duiker (*Sylvicapra grimmia altivallis*). There have also been reported sightings of the golden cat (*Felis aurata*). The endemic mole-rat (*Tachyoryctes splendens*) is common throughout the northern slopes and the Hinde Valley at elevations of up to 4 000 m.

Forest birds include the green ibis (*Mesembrinibis cayennensis*), Ayre's hawk eagle (*Hieraaetus dubius*), Abyssinian long-eared owl (*Asio abyssinicus*), scaly francolin (*Francolinus squamatus*), Ruppell's robin-chat (*Cossypha semirufa*), and numerous sunbirds (*Nectariniidae*). Other birds include scarlet-tufted malachite sunbird (*Nectarinia johnstoni*), montane francolin (*Francolinus psilolaemus*), Mackinder's eagle owl (*Bubo capensis mackinderi*), and the locally threatened scarce swift (*Schoutedenapus myioptilus*). The alpine swift (*Apus melba africanus*) and alpine meadow lizard (*Algyroides allenii*) are near endemic.

Birdlife International (2010), in its report on biodiversity, threat assessments, current investments, civil society stakeholders and policy review lists which of these mammals, reptiles, amphibians and insects are on the IUCN Red List.

Conservation management

The Mount Kenya National Park is managed by KWS on five-year management plan cycles. The main goal of such plans is to preserve:

- the afro-alpine ecosystem;
- the traditions, aesthetic and tourism values of a high mountain wilderness with this being especially important given the role tourism has been accorded in attaining Vision 2030;
- Mount Kenya's contribution to the country's environmental quality.

Rehabilitation efforts—roles played by community members in conservation

There are a number of groups contributing to the mountain's conservation efforts. The majority of them are formed on the basis of a common interest to conserve the Mount Kenya Biosphere Reserve as well as to improve the livelihoods of their members. They aim to do this by averting desertification through reforestation and establishing new forest lots within the Forest Reserve and also on their lands. Most of the communities living around the biosphere reserve act as

Box 5.1: Community Forest Associations (CFAs)

The 2005 Forests Act provides for community participation in forest management. The best opportunity to engage forest-adjacent communities in forest management in partnership with KFS lies in the formation of Community Forest Associations (CFAs). This provides an avenue for local communities to actively participate in the protection, conservation and management of particular forest areas. In return, they are entitled to a range of user rights such as collecting firewood, timber, herbal medicine, grass for roof thatching and grazing animals, recreational activities, scientific and educational activities. For the arrangement to make economic sense for the communities, CFAs should be entitled to broader business activities provided that these do not have adverse environmental effects. It may therefore be necessary to convert their registration as welfare entities into cooperatives and to strengthen the capacity of communities to engage in economic activities such as ecotourism and sustainable charcoal production.

watchdogs and report illegal activities such as charcoal burning, poaching and illegal grazing. In addition, they participate in conservation awareness campaigns mainly targeting community members and schools to make them conscious of a range of conservation issues. They have also contributed towards the construction of barriers, such as fencing (for example in Sagana) and moat digging (such as the 15km

stretch in Kangaitha, Embu). Their contributions are made in kind by contributing labour during construction, donating poles or carrying out maintenance activities that include clearing of invasive species in the forest. A case in point is the activities of the Kiangondu community in Chuka where fire fighting is mainly done by those community members who live next to the forest.

Communities could benefit much more in return for the protection of catchment areas by having access to forest products and being involved in ecotourism initiatives. While these are provided for by the 2005 Forests Act, an analysis of its implementation in 2010 indicated that these commitments have not been adhered to. As such, community forest associations (CFAs) have begun to lose faith in the institutions entrusted with approving forest management plans (Better Globe 2009). From the 351 CFAs registered countrywide, only 36 plans have been approved so far. Approval is followed by signing of Forest Management Agreements (FMAs) which are subject to availability of funds. The slow progress has caused a number of donor partners to despair and withdraw their financial support. Even with the gazettment of subsidiary rules in 2009, the FMA for Upper Imenti, for example, had not been signed by mid-2010, dampening CFA enthusiasm in jointly managing forests with government institutions. Moreover, few benefits have trickled down to the communities. The longstanding logging ban and the recent grazing ban in gazetted forests by NEMA have made it more difficult for communities to participate in management of forests as they do not derive any benefits from them. Box 5.1 describes community forest associations in greater detail.

The Aberdare forest range is characterized by a high diversity of forest types due to its wide altitudinal range.



Some farmers have established their own woodlots on farms, thereby reducing pressure on forest products. In addition, farmers remain committed to wildlife conservation. A solution to crop raiding by wildlife may lie in fencing off vital protected areas that host wildlife. This is gradually gaining acceptance in many parts of the country where human-wildlife conflicts are prevalent. Further, access gates to the country's protected areas are not always located in places where they best serve the interests of local communities.

The Aberdare Range

The Aberdare range forests are made up of 15 protected blocks covering 256 515 ha and are located on the eastern edge of the Rift Valley. The Aberdare Range spans the Equator west of Nairobi rising to over 4 000 m at its highest peak. Its western escarpments drop dramatically toward the Rift Valley and to the east it slopes gradually, carrying water into the Tana River and to the Seven Forks hydropower plants where over half of Kenya's hydropower is generated. On their way into the Tana, the Chania River flows into Sasumua Dam, and the Thika River into Ndakaini Dam, from which more than three million people in Nairobi obtain most of their drinking water. The Aberdares also form part of the upper catchments of the Athi, Ewaso Ng'iro and Malewa Rivers. The forest belt of the Aberdare Range includes Aberdares, Kikuyu Escarpment, Kijabe Hill, Kipipiri and Nyamweru. An area of 760 km² of the forest falls within the Aberdare National Park. The range is characterized by a high diversity of forest types due to the wide altitudinal range (1 800-3 600 m) and climatic differences between slopes. The forests are threatened by large-scale, uncontrolled, irregular or illegal human activities particularly charcoal production, logging, encroachment and settlement, cultivation of crops and livestock grazing. These challenges pose a great threat to Kenya's water security, biodiversity conservation and economic development, all of which are indispensable to realizing the social pillar goals of Vision 2030. Between 2005 and 2007, the Aberdare range forests showed no significant changes in forest cover (Akotsi et al 2009). This may be due to the fact that Kenya's pilot fencing and rehabilitation activities were pioneered here. As one of the impacts of this has been improved forest cover, fencing off the country's main forests should be scaled up and plans to replicate this in Mount Kenya with the assistance of the Rhino Ark are in advanced stages.

Mount Elgon Forest

This forest covers 102 695 ha and forms the upper catchment of the Nzoia and Turkwel rivers. It also provides water to Malakisi River that crosses farming areas south of the mountain before entering Uganda. Mount Elgon lies on the Kenya-Uganda border where protected areas on the Kenyan side include Mount Elgon National Park, Chepkitale National Reserve and Mount Elgon Forest Reserve. The latter contains globally threatened species some of which are endemic to the Afro-montane region while others are endemic to Mount Elgon. These features make Mount Elgon a major tourist attraction and the conservation of the area should therefore be prioritized for species conservation. A rapidly growing population of around two million people around the mountain places immense pressure on this unique ecosystem.

Authorized logging has been practised in Mount Elgon since the 1930s. A 1986 Presidential Decree banned all logging in Kenya's natural forests but excluded Mount Elgon where legal logging continues. In the 1970s, land was excised from the Mount Elgon Forest around



A road through the Mount Elgon forest, which is a transboundary forest shared with Uganda.

Chebyuk where 600 families were settled. Agricultural encroachment and charcoal production are degrading the forest in many areas as well. In several cases, the forest has been cleared for crop farming on slopes that are not suitable, making them susceptible to erosion and landslides. Continued degradation and forest loss on Mount Elgon threatens to undermine the area's crucial role as a water catchment for the surrounding region. A recent survey of Mount Elgon forests showed no significant changes in forest cover between 2005 and 2007 (Akotsi et al 2009) but this could be misleading given anecdotal evidence of the resurgence of unlicensed logging in this forest. This is in spite of the fact that the 2005 Forests Act provides for participatory forest management with this being a clear indication that the approach has not yet taken root in the country. As such, it could take time for the management plans for Mount Elgon Forest to be completed.

Continued good performance of this transboundary ecosystem requires regular monitoring on both the Kenyan and Ugandan sides. It is therefore an ideal candidate for joint management planning through the Nile Basin Initiative (NBI), a partnership initiated and led by the riparian states of the Nile River. NBI seeks to develop the river in a cooperative manner, share substantial socioeconomic benefits, and promote regional peace and security. Cooperative water resources management is complex in any international river basin. It is particularly difficult in the Nile Basin which is characterized by water scarcity, poverty, a long history of dispute and insecurity, and rapidly growing populations and demand for water. NBI initiated a participatory process of dialogue among the riparian countries that resulted in agreeing on a shared vision to 'achieve sustainable socioeconomic development through the equitable utilization of, and benefit from, the common Nile Basin water resources.' Efforts should be made to procure funding under the Nile Transboundary Environmental Action Project of the



A section of the Cherangani Hills forest that has been converted to farmland.

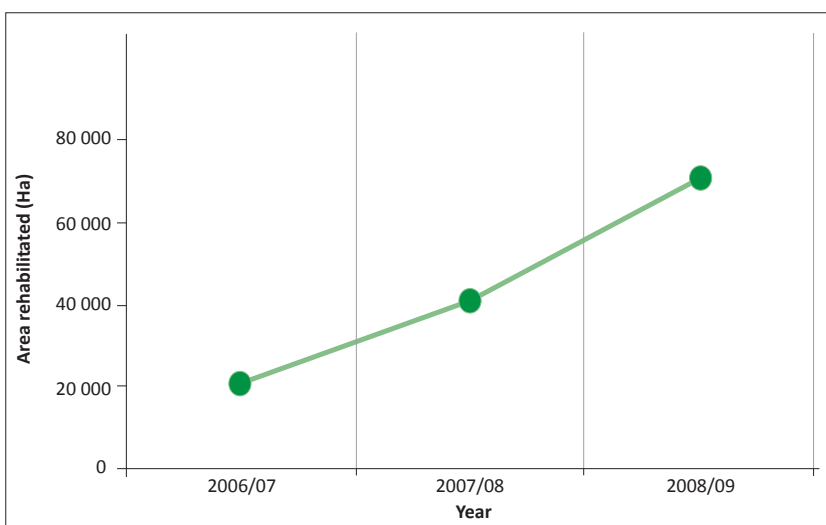


Figure 5.3: Natural forest rehabilitation trends

Source: GoK 2008a

Shared Vision Programme for conservation of the Mount Elgon Forest so that it remains a pristine Nile Basin water catchment. At the national level, it is encouraging to note that squatters who hold claims to land in the gazetted Mount Elgon forest have received government assistance to resettle in the Chepyuk settlement scheme which entered its second and third phases in 2010.

The Cherangani Forest

The Cherangani Forest is composed of 14 forest blocks scattered along the Cherangani Hills that cover an area of 97 397 ha. It is located on the western ridge of the Great Rift Valley and forms the upper catchment of the Nzoia, Kerio, and Turkwel rivers. It is an ancient fault-block formation of non-volcanic origin with a series of gently rolling hills that form an undulating upland plateau on the western edge of Kenya's Rift Valley. These hills lie between the Elgeyo Escarpment to the east and Mount Elgon to the west, rising to 3 365 m above sea level at Cheptoket Peak in the north-central section. Located on the Cherangani escarpment, the hills are covered by a number of gazetted indigenous forest reserves. There has been active participation of local CFAs in the management of the forest with their vigilance helping to stem illegal logging activities. For example, a road expansion project that cleared swathes of the forest incurred the wrath of the local people who formally complained to the forest zonal manager. KFS should take note of such positive actions and use these to cement its relationship with CFAs. This could, for example, help KFS to keep pastoralists out of forests such as that in Marakwet.



A stand of mangroves in the Mikokoni area Lamu County.

Over the last 20 years, local inhabitants have encroached on forest land converting it into farmland. Cherangani Hills was however the least affected of the five forested water towers, with only 174.3 ha deforested. So far, a total of 29 352 ha of degraded natural forests have been rehabilitated out of which 2 752.2 ha were earmarked for enrichment planting. Another 26 600 ha were put under protection for natural regeneration. This brought the total area currently under restoration to 70 250 ha over the past three years. These trends are shown in Figure 5.3.

Mangrove forests

Mangrove forests located along the Indian Ocean coastline have traditionally supplied wood and non-wood products to places as far away as Arabia. A mangrove timber export ban imposed in 1982 in order to reduce over-exploitation and degradation of mangrove forests was revoked in 1993 (Better Globe 2009). The normal practise is that poles are selectively harvested, leaving behind crooked trees of poorer quality. There are many knowledge gaps that need to be filled in



The non-material benefits of forests relating to aesthetics and recreation, such as those provided by this Mount Kenya forest are often unappreciated.

developing the most appropriate methods for sustainably managing this resource in future. Mangroves also deserve urgent attention as there are indications that rising sea levels caused by global warming will adversely affect them. The proposed construction of a deep sea port in Lamu is also likely to have far reaching implications on the 360 km² of mangroves growing in the archipelago.

Endowment value of forest and woodland resources

The contribution of forestry to the Kenyan economy is currently undervalued in terms of GDP contribution (GoK 2008c). Consequently it is poorly mainstreamed into macro and sectoral plans and its budgetary allocation is low. The total value of the resource is not fully quantified either as inventorying has only been carried out in the protected forest areas on an ad hoc basis. Moreover, resources falling outside these protected areas are not accounted for. It is therefore necessary to adopt an appropriate accounting and evaluation system for forests and woodlands that will reflect their true value.

Total environmental accounting for all goods and services provided by forest ecosystems continues to draw worldwide debate. The economic benefits contributed by the Mount Kenya forests, for example, are estimated at about Ksh. 2 billion per year (Emerton 1997). The bulk of this value comprised watershed catchment protection and domestic use benefits but excludes ecological, option and existence values.

Timber products

Sawn timber remains highly valued and in short supply in Kenya for a number of reasons. One is that the land available for forestry is diminishing in medium to high potential agro-ecological zones. Forests in such places face direct competition from land for agricultural production. Growing demand for land for agriculture, infrastructure and urban development—estimated at 5 000 ha per year—exerted by an increasing population on limited arable land is dramatically reducing forest acreage (World Bank 2007).

Apart from sawn timber, forests provide posts for construction as well as poles for fencing and power transmission. Other woody products that are derived from them include pulp as well as block and fibre boards. The sale of forest products is recorded to have increased from 423 400 to 503 700 m³ from 2007 to 2008. Forests also play a direct role in supplying domestic energy requirements in the form of wood fuel and charcoal. This fact is not captured appropriately in national economic surveys since petroleum-based products are viewed as the key drivers of the economy (GoK 2010c). Redressing this disconnect would be useful in better appreciating forests' contribution to the economic and social pillars of Vision 2030.

Plantation forests which represent 0.3 percent of the country's forested area mostly comprise *Cupressus lusitanica* and *Pinus patula*. They are complemented by smaller areas planted with *Eucalyptus* species. Establishing and maintaining young plantations became a major challenge following the abolishment of the 'shamba' system in the country in 2003. In its place, non-residential cultivation was strongly recommended after studies showed that it could be equally effective if well regulated for the mutual benefit of the government and communities involved (Kagombe and Gitonga 2005). This arrangement is currently being undertaken through CFAs using the terms of the Plantation Establishment and Livelihood Improvement Scheme (PELIS). Under such terms, 3 519 ha of industrial forest plantations were established in 2008 (GoK 2008a). The 2005 Forests Act also provides for participation of communities and the private sector in forest management through licensing and concession agreements. Because of delays in signing these agreements, the relevant subsidiary regulations should be urgently finalized (World Bank 2007). Only 3 of 19 regulations have been finalized so far.



Demonstration of efficient wood processing at farm level.

The logging ban has had a range of negative outcomes for forest conservation even though it was intended to protect forests from over-exploitation. Trees worth more than Ksh. 10 billion are over-mature while silvi-cultural thinning operations have fallen behind schedule, leading to a loss of about Ksh. 3.5 billion in government revenue. A large amount of resources is also spent on enforcement of the ban which would have been available for alternative economic activities in the forestry sector. As a result, a black market is flourishing where timber fetches premium prices. Harmonization of tariffs within the East African Community could help to reduce smuggling of forest products within the region, enhancing forest conservation. This will also provide opportunities for the region to trade in timber products (World Bank 2007).

Demand and supply of forest and woodland products

Kenya has an annual per capita wood consumption of 1 m³. A strategy is required to cover the total deficit of 7 million m³ required for satisfying the huge national demand that stood at 37 million m³ in 2009 (GoK 2009a). This makes Kenya a net importer of wood products as current supply does not satisfy demand. The logging ban in state forests continues to adversely affect all saw millers with the exception of three firms which were exempted from the ban. Much of the wood in the market is thus obtained from trust lands and farmlands.

Rising costs of petroleum-based fuel and high electricity tariffs have resulted in most of Kenya's population relying on wood fuel as the primary source of energy. This encourages further destruction of forests and woodlands. Charcoal production and trade have thus become a critical part of the economy in the country's drylands, providing domestic energy for 82 percent of urban and 34 percent of rural households. This industry represents an estimated annual value of over US \$ 427 million (KSh. 32 billion). It employs over 700 000 people along the entire chain and indirectly supports over 2.8 million people. This is despite the unfavourable policy and legal environment that charcoal production operated under before the Charcoal regulations were gazetted in 2009. It is estimated that 1.6 to 2.4 million tonnes of

charcoal are used in the country annually and this has negative environmental consequences since the trees that produce this charcoal are unsustainably harvested (GoK undated). In the ASALs, indigenous tree species such as *Balanites*, *Acacia*, *Terminalia*, *Combretum*, *Dalbergia* and *Newtonia* are preferred for charcoal-making even though they have a comparatively low regeneration capacity. Charcoal is also often produced as a by-product of other forms of land use change, for example, after clearing land for cultivation. Such traditional methods of land clearing destroy an equivalent of 121 061 ha of forests per year, or 12 km², accelerating desertification in the country.

Water supply

Forests serve as major reservoirs of water which they store up to 20m below ground and release slowly into the rivers. Evapo-transpiration within the forest contributes to formation of rain clouds. Forests also trap moisture in water-laden winds, convert it into water droplets and cause it to fall as rain on a frequent basis. The organic matter on the forest floor slows down water movement and mitigates flash floods. This in turn protects the human settlements, infrastructure and crops located downstream. The forest canopies intercept rain drops, dissipating their impact and preventing soil erosion.

Forests will therefore continue to play an important role in water catchment, especially given Kenya's status as a water scarce country. It is thus recommended that appropriate compensation schemes for suppliers of watershed ecosystem services are developed and implemented. This will ensure a steady flow of water for irrigation, intensive agriculture, urban settlements, industrial processes as well as hydro-power plants that traditionally produce most of Kenya's electricity output (UNEP 2009a). There is need to undertake all developments in a logical manner so that incidents such as construction of dams in gazetted forests as happened in South Nandi are avoided. This catchment service is particularly important given the prolonged drought that the country frequently experiences and which substantially depresses capacity to generate hydro electric power.

The potential of hydro-power generation from rivers whose upper catchments are in the Mau Forest such as the Sondu and Ewaso Ng'iro is considerable. The Sondu-Miriu hydropower scheme, whose catchment is the South West Mau Forest Reserve cost US\$ 54 million to construct and has an installed capacity of 60 MW. In addition, the Sang'oro hydropower scheme will add 21.4 MW to the national grid when it is completed. Figure 1.8 (Chapter 1) shows the existing and planned power plants around the country.

Non-wood products

Non-timber products comprise mainly food and pharmaceutical raw materials that are mostly derived from woodlands. These are in such high demand that sometimes their sources become endangered, requiring legal protection. For example, because of over-exploitation in the wild, aloes are recorded on the IUCN red list.

Essential oils, gums, resins, herbal medicines, silk and honey, are among other commodities derived from the sector although their value has not been comprehensively assessed. It is clear however, that the annual consumption of gum arabica is on the increase in the domestic market and that prices are highly variable along the value chain (Better Globe 2009). Further, Kenya has 59 indigenous species of aloe, some of which are endemic. In order to tap the full potential of these aloes, their commercial production has been regularized. Relevant government agencies should also disseminate the economic opportunities that domestication of previously wild species present.

Inhabitants of the ASALs rely heavily on non-timber forest products. Indeed 90 percent of the livestock medicines they use are herbal-based. In arid areas, gums and resins are harvested from various

trees and are a source of income. *Acacia senegal* var. *kerensis* grows widely in the drylands and produces gum arabica in commercial quantities. Two other varieties of this tree namely, *Acacia senegal* var. *senegal* and *Acacia senegal* var. *leiorachis* are also producers of gum arabica although the extent of their commercial potential has not been conclusively established. Northern Kenya is estimated to have the capacity to produce 10 000 tonnes of gum arabica per year of which only 30-50 tonnes are currently consumed by the domestic market in the adhesives, printing, food and pharmaceutical industries (Better Globe 2009).

Another important species is the East African sandalwood (*Osyris lanceolata*) which occurs in parts of Kenya as well as Algeria and Zimbabwe although it is not abundant in any one place. It is a hemiparasitic plant that grows in the wild and is prized for its scented wood and essential oils. As such, it has attracted considerable interest in pharmaceutical and cosmetic industries in the Middle East, Europe and South Africa (CBK 2009). In Kenya however, it enjoys a protected plant status. The volume of impounded products is not well recorded so it is not possible to gauge the scale of illegal activities that are undermining its conservation.

Prunus africana is a classic example of how economic pressure can threaten the very existence of a species. As with other members of the *Prunus* genus, *Prunus africana* possesses extrafloral nectaries that provide anti-herbivore insects with a nutrient source in return for protecting the foliage. While the fruit is too bitter to be eaten by humans, it is consumed by many animals. In addition, it is a habitat for the rare Carruther's Mountain Squirrel which is currently protected under Appendix II of CITES. Further, a herbal remedy prepared from

A field of Aloe turkanensis on a farm in Baringo District.





Wood carvings are some of the wares on sale in many craft markets in Kenya.

the bark of *Prunus africana* is used to treat a benign prostatic hyperplasia. The over-harvesting of mature bark for this purpose threatens these species because stripping off too much bark kills off the trees. In the 1990s, it was estimated that 35 000 debarked trees were being processed annually. The current figure is estimated to be much higher.

Wood carvings

The wood carvings industry has good potential for wealth generation and provision of employment in line with the aspirations of Vision 2030. The industry earns an average of US\$ 20-25 million annually in export revenue from carvings bought by tourists. The preferred indigenous tree species such as *Brachylaena huillensis* (Muhugu), *Combretum schumanii* (Mkongolo) and *Dalbergia melanoxylon* (African Blackwood or Mpingo) have already been exhausted in many of the

Sibilo Petrified Forest near Lake Turkana in northern Kenya. Petrification is a natural process that occurs when all organic material in a tree dies and is replaced by a combination of minerals. Once complete, petrified wood is no longer considered wood and becomes classified as stone.

original sources and there have been initiatives to move onto more sustainable sources (CBK 2009). These include fast growing tree species that can be introduced on farms. Wood carving is listed as one of the threats facing conservation of the Chyulu Hills ecosystem (KFWG 2011). An entity which aims to certify forest products as harvested using sustainable methods was registered in 2010. Such certification processes should help to support production of wood carvings on a sustainable basis.

Tourism

Forests are major habitats for wildlife and are major contributors to the tourism sector's foreign exchange earnings. In addition, montane forests supply water to biodiversity sanctuaries such as Lake Nakuru National Park which depends on the Molo River and the Maasai Mara National Reserve whose lifeblood is the Mara River. Both rivers originate from the Mau Forest Complex (CBK 2009) and are central to buttressing tourism's role in meeting the Vision 2030 aspirations. Rivers that originate from the Mau forests also flow through a number of conservation areas where the tourism potential is not fully developed. These include Kakamega, Kerio Valley and South Turkana, Lake Baringo and Lake Natron National Reserves. These conservation areas host a diversity of flora and fauna and closed canopy forests are major habitats for a large percentage of the country's wildlife and other biodiversity. In spite of their small area, they contain 50 percent of the country's tree species and it is estimated that they harbour 40 percent of larger mammal, 30 percent of bird and 35 percent of the nation's butterfly species. Indigenous forests are home to both endemic and threatened species.

Kenya's forests also provide great potential for ecotourism which



Box 5.2: Seven points to define ecotourism

- 1) **Involves travel to natural destinations:** These destinations are often remote areas, whether inhabited or uninhabited, and are usually under some kind of environmental protection at the national, international, community or private levels.
- 2) **Minimizes impact:** Ecotourism strives to minimize the adverse effects of hotels, trails, and other infrastructure by using either recycled materials or available local building materials, renewable sources of energy, recycling and safe disposal of waste and garbage, and environmentally and culturally sensitive architectural designs. Minimization of impacts also requires that the numbers and the behaviour of travellers is regulated to ensure limited damage to the ecosystem.
- 3) **Builds environmental awareness:** Ecotourism means education, for both travellers and residents of nearby communities. Well-trained, multilingual naturalist guides with skills in natural and cultural history, environmental interpretation, ethical principles and effective communication are essential to good ecotourism. Ecotourism projects should also help educate members of the surrounding communities, school children and the broader public in the host country about the importance of environmental conservation.
- 4) **Provides direct financial benefits for conservation:** Ecotourism helps to raise government funds for environmental protection, research and education through a variety of

mechanisms, including park entrance fees, tour company operations, hotel, airline and airport taxes.

- 5) **Provides financial benefits and empowerment for local people:** National Parks and other conservation areas will only survive if there are 'happy people' around their perimeters. The local community must be involved and receive income and other tangible benefits (potable water, roads, health clinics, etc.) from the conservation area and its tourist facilities.
- 6) **Respects local culture:** Ecotourism is not only environment-friendly, it is less culturally intrusive and exploitative than conventional tourism. It strives to be culturally respectful and has a minimal effect on both the natural environment and the human population of the host country. Part of being a responsible ecotourist is learning beforehand about the local customs, respecting dress codes and other social norms and not intruding on the local community unless invited or when visiting as part of an organized tour.
- 7) **Supports human rights and democratic movements:** Ecotourism demands a more holistic approach to travel, one in which participants strive to respect, learn about and benefit both the local environment and local communities.

Source: *Classic Escapes* 2009

has the potential to significantly reduce poverty because it typically involves local communities in enterprise management and monetary benefit sharing. The fundamental characteristics of ecotourism are highlighted in Box 5.2.

Opportunities in the forest sector

Economic opportunities

The forestry sector contributes tangible and non-tangible benefits to the Kenyan economy worth more than KSh. 20 billion. More than one million households living within a radius of 5 km of forest reserves benefit in various ways from them through grazing, fishing, collection of firewood, water and herbal medicines. Other opportunities include butterfly farming and bee-keeping. Efforts should be made to ensure greater participation of women in forestry development since the 2005 Forests Act is gender neutral and does not take into account the gender-specific impacts of this and other legal and policy interventions.

The Forests Act also provides opportunities for joint management of state-owned plantation forests through concessions, licenses, contracts, joint agreements and other public private partnerships. This will promote tree planting and also stimulate the creation of a sustainable forest industry which will eventually result into increased forest cover and with it, greater welfare benefits to the poorer segments of society promised by Vision 2030.

For the country's forests to fulfil their full economic potential, KFS should intensify its surveillance and build partnerships with local communities. The latter can play an important watchdog role in stopping encroachment on the forests and illegal logging. It should also employ legal and voluntary mechanisms to rehabilitate



Women farmers here participate in tree planting activities that focus on farm forestry.

degraded forests.

Carbon sinks and carbon trading

In 2005, Kenya ratified the Kyoto protocol and was the first African country to engage in carbon trading. This was after the Kenya Electricity Generating Company (KenGen) concluded an emissions reduction agreement with the World Bank. Three hydro power plants and one geothermal project have since been accepted by the World Bank Carbon Finance Unit. These projects are Olkaria II 3rd Unit at Eburru, Kipevu Combined Cycle at Kiambere, Sondu Miriu and the redevelopment of Tana Power Station. These projects are estimated to displace 2.4 million tonnes of carbon dioxide and generate revenues of about US\$ 17.9m for KenGen.

Mumias Sugar Company has also entered into an agreement with Japan Carbon Finance to buy carbon emission reductions. This will see the company reduce its carbon and methane emissions by using bagasse to generate electricity. The money generated from these projects will be used to finance geothermal development and a number of community development projects (Mazingira News 2009).

Kenya's forests act as important carbon sinks. Healthy forests also increase the resistance of ecosystems to climate change by stemming land degradation. There is therefore need to encourage tree planting and to enhance forest cover by ensuring that many tree seedlings are planted for each tree that is harvested. The KFS has begun a project of planting 6 million trees around the country to help in reforestation. Kenya has also signed its first carbon deal under the Reducing Emissions from Deforestation and Forest Degradation (REDD) programme between Wildlife Works Carbon and KFS. The project aims to protect the 80 000 acre Rukinga Forest Reserve in south-eastern Kenya. This project will create a corridor that links the Tsavo East and Tsavo West national parks which together form Kenya's largest protected area. These parks have nevertheless been under threat from overgrazing, poaching and deforestation (GoK 2010e).

Charcoal burning releases 14.4-21.6 million tonnes of CO₂ emissions so degradation of the drylands (which are the main sources of charcoal in the country) contributes to global warming and climate change. Clean Development Mechanism (CDM) projects and mitigation measures have the potential to improve rural livelihoods in activities such as brick and charcoal making as well as agro-processing. Pioneers of CDM in Kenya include the Green Belt Movement which has spearheaded small-scale reforestation projects in the Aberdare and Mount Kenya regions that are funded by the World Bank. The projects bring together players such as KFS and a number of CFAs in activities related to climate change mitigation. The National Environment Management Authority (NEMA) website lists all the other licensed CDM projects. For them to succeed, it will be necessary for KFS to control illegal activities such as grazing in the forests as this poses a threat to the survival of the trees established in carbon projects.

Agroforestry

Croplands are spread out across Kenya, from the high rainfall areas in the highlands to more marginal cropping areas which are often classified

Small scale charcoal production in Baringo: Charcoal is a commodity that is commonly offered for sale in the ASALs.



as agro-pastoral. Due to scant and erratic rainfall, the major land use in the ASALs is a limited amount of cropping mixed with livestock keeping. Croplands and associated agro-ecosystems cover about 20 percent of Kenya (WRI 2007). For most of Kenya, rainfall alone is not sufficient to grow crops and in the ASALs that are not irrigated, a patchwork of grasses, shrubs and trees dominate the landscape with water availability and soil types determining the exact spatial patterns of plant communities.

Livelihood strategies adopted by Kenyan families range from those that predominantly focus on livestock products in rangeland ecosystems to a combination of livestock, food and cash crops in areas with adequate rainfall and suitable soils. The six dominant livelihood classes are:

- Forests combined with fishing
- Pastoral or agro-pastoral
- Marginal mixed farming
- High potential mixed farming
- Cash cropping or irrigated cropping
- Wage labour or urban livelihoods

Pastoral livelihoods dominate the ASALs while cropping combined with pastoral livestock keeping (agro-pastoral) is practised in the margins of areas where rain-fed agriculture is possible (WRI 2007). This is also practised in areas around permanent water sources such as on mountainous areas and along river courses in the dry belts of Kenya. High potential agricultural lands in central and western Kenya are dominated by a combination of dairy, food and cash crop farming. Farmers in areas with less fertile soils and erratic rainfall such as along the coast of the Indian Ocean prefer a blend of livestock and food crops. Fishing is sometimes combined with pastoral livestock keeping or food crop cultivation but this is a localized occupation.

Farms are now recognized as a source of 30-50 percent of Kenya's wood supply. Agroforestry is the primary source of wood fuel while private lands (farms or range lands) are the major source of wood for charcoal. The proportion of croplands covered by woodlots is highest along the foothills of the Aberdare Range and Mount Kenya, in Central Kisii, as well as Nyamira and Buret Districts. In some instances, woodlots cover more than 12 percent of the land. Spatial patterns are determined by factors such as proximity to densely settled rural and urban areas, as well as other pockets of high wood demand (for example, the tea growing areas).

Even in places where tree planting efforts are limited by climatic factors, farmers still plant some trees to demarcate boundaries and meet their energy requirements. This calls for greater allocation of funds for drylands forestry research in order to provide farmers with a wider choice of options for tree growing in the country's drylands. Charcoal production and firewood collection are important economic activities and contribute significantly to income generation in all areas except the remotest locations or those with very little woody vegetation. Besides improving livelihoods, tree planting in drylands is an effective way to control desertification.



A young Cedar forest in Aberdare National Park.

Threats to harnessing the opportunities provided by forests and woodlands

Population pressure

Loss of forests and woodland resources in Kenya is closely related to population dynamics and over-exploitation of wood products, conversion into agricultural land and other land uses. The greatest threat to our environment (forests and woodlands included) is however posed by poverty whereby people's basic needs for adequate food, shelter and health are not met. Efforts to obtain basic needs under such circumstances generally lead to destruction of forests and woodlands. Unsustainable land use is also driving land degradation which has negative impacts on the economy and livelihoods, exposing more than 23 percent of vulnerable rural communities to desertification in Kenya.

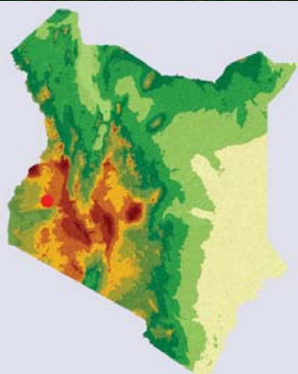
Kenya's population is on the rise and stood at 38.6 million in 2009 (GoK 2010d) and at the 2.9 percent growth rate, it is estimated to stand at 40.9 million in 2011. The resulting high demand for forest and woodland products by a rising population creates land use conflicts and environmental degradation as forests are cleared to make way for human settlements and agriculture. Frequent droughts in Narok, for instance, are attributed to the rapid growth of settlements and the increased rate of deforestation by conversion of bushlands into smallholder farms, charcoal burning and illegal logging upstream in the Mau forest (UNEP 2009a).

Encroachment and illegal logging

On average, 5 000 ha of forest cover are lost every year through illegal logging, encroachment, excision for settlement of people and cultivation (GoK 2010f). In 2001, the excision of 67 000 ha of forest was justified as needed to settle landless Kenyans and those internally displaced by political turmoil. This excision however resulted in a major disruption of the functions of Kenya's water towers (Wamahiu 2009). Illegal timber harvesting is also rampant since the logging ban is not adequately enforced, highlighting the need to raise the capacity of KFS to do so. The Maasai Mau Strategic Plan 2010-2020 showcases what can be

Encroachment and illegal cultivation in Maasai Mau Block of the Mau Forest Complex.

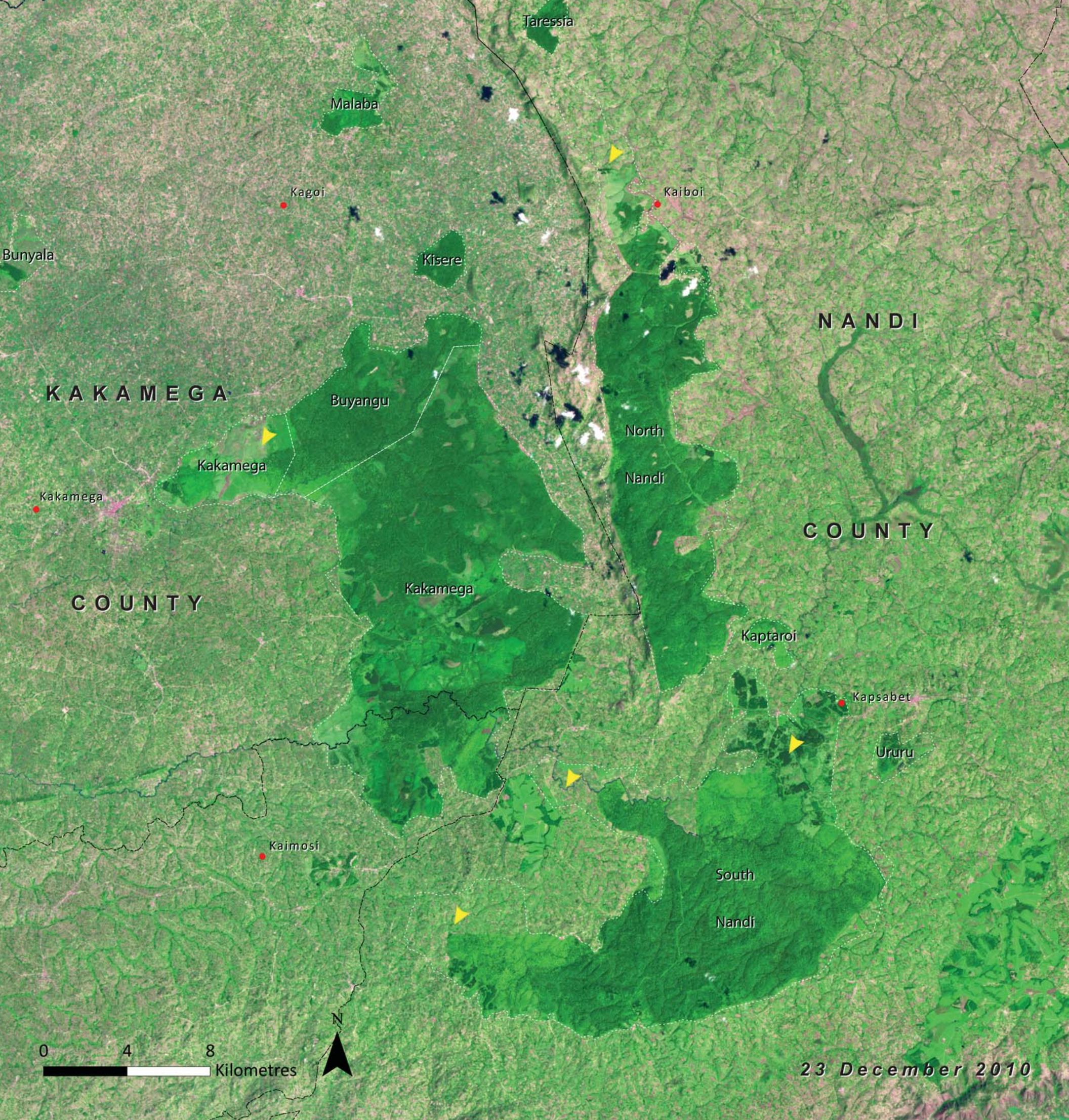




Kakamega Forest – Kakamega forest, the only surviving rain forest in Kenya is a remnant of the Guineo-Congolian rainforest presently scattered across Uganda, Democratic Republic of the Congo and Kenya. This forest harbors dominantly central African flora that distinguishes it from other forests of Kenya. It is a precious remnant of the once vast Trans-Africa ecosystem that provides a unique sanctuary for a remarkable diversity of endemic

plants, birds and insects. Between 10-20% of the total number of animal species are endemic to the forest.

Changes in land use of the forest ecosystem, aggravated by the increase in human population around the forest ecosystem have occurred within the past three decades. This population depends on the forest for their livelihood from which they obtain a variety of products



such as food, herbal medicines, woodfuel and building materials. As a result parts of the forest have been converted to agricultural activities and settlements.

A 1991 survey which compared standing timber volumes with those from similar surveys 26 years before showed that in the short period, the forest had lost 50% of its volume. The study further predicted

that it would take about 60 years to establish complete protection of the forest and restore it to its 1965 condition assuming no other interventions are adopted. These two Landsat images (1973 and 2010) clearly capture this trend.

Category	Total Area (ha) 1970s and 2000s		% change (1970s-2000s)	% change 2030 (ha)
Woodland	444 079	49 231	-88.9	Substantial
Shrub land	374 202	785 890	52.4	53.0
Bare land	59 242	804	-98.6	-
Cropland	42 388	328 104	87.1	94.0
Close natural forest	390 871	189 050	-51.6	-60.2
Open natural forest	-	103 174	100.0	100.0
Grassland	201 223	55 752	-72.3	-74.3
Total (Ha)	1 512 005	1 512 005		

Table 5.2: Land-cover change in Narok district

Source: NEMA 2010

achieved through cooperation between the private sector, and central and local governments. Such plans are important reference points that can motivate stakeholders to withstand political pressure and act rationally to save the country's environment in order to secure ecological services for the present and future generations.

Overexploitation

Deforestation in all of Kenya's five waters towers is mainly due to poor environmental governance. The consequences include loss of forest cover, increased soil erosion, drying of rivers and streams, siltation in dams and increased costs of forest-related products such as timber (NEMA 2005). The statistics of land cover/land use change in Narok

District between 1970 and 2000 is detailed in Table 5.2. The projected scenario by 2030 depicts substantial change in the area under woodlands, closed natural forests and grasslands.

Vulnerability to climate change, pests and diseases and fires

Forests and woodlands are particularly vulnerable to climate change. This is because the impacts of climate change and variability lead to changes in land cover and land use, increase the incidence of pests, diseases and fire outbreaks and foment loss of livelihoods (Ojwang et al 2010). Monoculture forest plantations are especially prone to pest attacks and an exotic pest known as blue gum chalcid is currently threatening eucalyptus trees in Kenya. First reported in western Kenya in 2002, it has now spread to most parts of the country. This pest is native to Australia and research to develop integrated management approaches (including biological measures) that can bring it under control is underway.

An estimated 3 000 ha of state forests are lost to fires annually. These fires are either spread accidentally from neighbouring private farms or are started deliberately as an act of sabotage. It is therefore recommended that a participatory approach to formulating and implementing forest policies and projects is adopted in order to ensure local community support.

A section of the Maasai Mau forest that has largely been cleared for human settlement.





Manual clearing works well in bringing thickets of *Prosopis juliflora* under control.

Tree diseases can occur on seed, seedlings and planted trees. Seeds mostly suffer from *Fusarium*, *Penicillium* and *Aspergillus* fungal infections which are best prevented by using only certified seed that is free of infection. Seedling diseases include damping off caused by *Fusarium* fungus, mildew on young seedlings caused by *Oedium* sp. (powdery) and shot holes on indigenous seedlings. These challenges can be adequately addressed in the tree nursery by reducing sowing density to overcome damping off, applying fungicides and avoiding excessive watering. Seedlings that have been exposed to sufficient sunshine are also generally less susceptible to diseases.

Rhizomorphs under the bark, a symptom of *Armillaria* root rot disease.



Invasive alien plant species

The current and most well-known case of an alien plant becoming invasive in Kenya is that of *Prosopis juliflora* that has colonized the ASALs. This exotic tree was originally introduced for fodder, and wood fuel production. It is now considered a weed that competes with indigenous vegetation. A number of technologies which promote utilization of its timber and non-timber products in order to control it have been advanced by Kenya Forestry Research Institute (KEFRI). KEFRI has also imported a biological control agent that could help to tame *Prosopis*.

Harnessing the opportunities in forests and woodlands

The Forests Act 2005

For many years, forest legislation and practise in Kenya has been criticized for failing to protect the country's indigenous forests or to ensure sustainable use of plantations and other areas of forest and woodland (World Bank 2007). Prior to the enactment of the 2005 Forests Act, most forest-adjacent communities were alienated by exclusion from forest management. The 2005 Forests Act was a timely piece of legislation that instituted the necessary legal mechanisms to comprehensively address the challenge of sustainable forest management. The law contains many innovative provisions to correct previous shortcomings and creates an enabling environment for developing the institutional capacity of the relevant agencies. It also promotes community participation in forest management and benefit-sharing, nurtures transparency and accountability and encourages the formation of public-private partnerships. In addition, it takes cognizance of the role of farm forestry and dry land forests.

The Forests Act also enables members of forest-dependent communities to enter into partnership with KFS through registered CFAs. So far, 351 CFAs have been registered. Out of these, 36 have had their management plans approved as already indicated. More active involvement of local communities is currently hampered by lack of information on potential benefits as well as lack of awareness on the mechanisms for benefit sharing. Any further delays in the process of drawing up forest management agreements should be avoided in order to sustain the interest of local communities and potential donors (KFWG 2010).



Conservation efforts by a Community Forest Association in Narok District.

The Forests Act 2005 in 2011 and beyond

Implementing the Forests Act of 2005 was already causing conflict with other national legislation under the old constitutional dispensation. It is however now due for review in order to align it with the new Constitution. This could be the perfect opportunity to address the thorny issues it contains. For example, the Water Act of 2002 provides for the formation of committees to manage catchment areas gazetted under the Act. The Forests Act also provides for the formation of committees at the conservancy level for managing forests. There are no clear linkages in the operations of the two committee categories, each of which is constituted by different individuals. There is also conflict between the 2005 Forests Act and the Wildlife (Conservation and Management) Act (Cap 376), especially where forests are double-gazetted. The wildlife law does not allow consumptive utilization of natural resources within national wildlife parks while the former does. Besides, the Environmental Management and Coordination Act (EMCA) mandates NEMA to conserve the biological diversity which has a direct bearing on forest resources. Management of forests and woodlands also has to take into account the National Environment Action Plan (NEAP) of 2009 which recommends a range of actions to address environmental issues in Kenya. The Trust Lands Act, Local Authorities Act and Chiefs' Authority Act all pose potential risks of conflict of interest or of power relations. There is therefore need to urgently harmonize all these policies and laws (World Bank 2007).

Strengthening policy and legal frameworks

There are various laws and policies governing the management of forests and woodlands in Kenya. These include the Constitution, forestry master plans, laws and policies dealing with land tenure as well as sectoral laws on wildlife, water and agriculture. In the past, Presidential decrees were also issued on matters concerning forests and woodlands even though they were often not backed by legislation and were difficult to implement. Whereas from a legal perspective, land tenure is governed by various policies and laws that have a direct impact on the conservation or excision of forests, access to land is governed by various cultural practises at the community level. Customary laws most often determine overall ownership of property as well as succession and inheritance of productive assets. In most cases, males are the owners, beneficiaries and successors of these productive assets. In contrast, women are subjected to systematic discrimination that is

associated with legal pluralism, where enacted laws are often superseded by customary and religious laws (NALEP 2010). It is therefore vital to carry out educational programmes that elicit attitudinal shifts with regard to the status of women.

Actualizing constitutional provisions could be effected by ensuring that implementation of relevant provisions of the new Constitution features in annual performance contracts from the 2011/12 financial year. The Fifth Schedule of the new Constitution provides timelines for enacting land and environment legislation. Emphasis should be placed on making the process participatory and ensuring that government operations are informed by the bill of rights stipulations on land and the environment as well as devolution (MFW 2010).

Vision 2030

In the social pillar of Vision 2030, special attention is paid to the conservation and restoration of Kenya's forests, especially the five water towers. These forests supply environmental goods and services that support the other sectors of the economy (GoK 2008b) and undergird the attainment of the goals of the economic, social and political pillars of Vision 2030. The Vision's first medium-term plan also sets out a number of flagship projects through which Kenya will endeavour to achieve the MDGs by 2015 (GoK 2008c). It is also important to note that Kenya's new Constitution upholds the objective of achieving and maintaining a tree cover of at least 10 percent of the country's total land area (GoK 2010b), which would help the country to attain its conservation objectives and in turn deliver improved livelihoods for Kenyans in line with the aspirations of the country's long term development blueprint.

Conclusion and recommendations

Forests and woodlands resources make considerable contributions to Kenya's economy and human development. However, they are under severe pressure from the growing population. There have been attempts by the government to address these pressures. However, despite the enactment of the 2005 Forests Act, there are still challenges afflicting the sector. These are compounded by the fact that forests are currently undervalued in terms of the goods and services they provide to local and national economies.

In light of the above, the following recommendations are proposed:

- Forests and woodlands are currently undervalued in terms of the goods and services they provide and the socio-economic benefits derived from them. Using the total economic value (TEV) approach to conducting inventories, **comprehensive data should be gathered by relevant authorities in order to ensure that informed decisions on the country's forest and woodlands resources are made.**
- The Forests Act of 2005 is in conflict with a number of other laws. There is need to harmonize all of these laws amongst themselves and with the new Constitution. **There is also need to adopt a multi-sectoral implementation strategy in order to support forest conservation and environmental management** in the country.
- **The future of forestry lies in the expansion of tree planting** within and outside gazetted forests.

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