



USAID | **MALAWI**
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**FAA 118-119 ANALYSIS
CONSERVATION OF TROPICAL FORESTS
AND BIOLOGICAL DIVERSITY**



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**USAID/MALAWI
SOUTHERN AFRICA REGION**

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LIST OF ACRONYMS

ADB	African Development Bank
AWF	African Wildlife Foundation
CAMSAR	Convention on Wetlands of International Importance
CBD	Convention on Biological Diversity
CBNRM	Community-Based Natural Resources Management
CIDA	Canadian International Development Agency
CITES	Convention on International Trade in Endangered Species
CLZ	Conservation Lower Zambezi
COP	Conference Of Parties
CSP	Country Strategic Plan
DHA	Danish Hunters Association
DNPW	Department of National Parks and Wildlife
DOTS	Directly Observed Therapy Systems
EIA	Environment Impact Assessment
ETOA	Environmental Threats and Opportunities Assessment
EU	European Union
FAO	Food and Agriculture Organization
FEWS	Famine and Early Warning System
FINIDA	Finish International Development Agency
FRIM	Forest Research Institute of Malawi
FY	Fiscal Year
FZS	Frankfurt Zoological Society
GDA	Global Development Alliance
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GIS	Geographical Information System
GTZ	Deutsche Gesellschaft fur Technische Zusammenarbeit (German Technical Assistance)
IBA	Important Bird Areas
ICRAF	International Center for Research in Agro-Forestry
IEE	Initial Environmental Examination
IUCN	International Union for Conservation
MAFE	Malawi Agro-Forestry Extension
MEO	Mission Environmental Officer
MOH	Ministry of Health
MPGRC	Malawi Plant Genetic Resources Center
NAC	National Aids Commission
NBSAP	National Biodiversity Strategy and Action Plan
NCE	National Council for the Environment
NCS	National Conservation Strategy
NEAP	National Environmental Action Plan
NEP	National Environmental policy
NGO	Non Governmental Organization
NHBG	National herbarium and Botanic gardens
NORAD	Norwegian Agency for Development
RCSA	Regional Center for Southern Africa
RDL	Red Data List
RDL	Red Data List
REA	Regional Environmental Advisor
SADC	Southern Africa Development Community
SMME	Small, Medium and Micro Enterprises
SO	Strategic Objective

SOER	State Of Environment Report
TFCA	Trans-Frontier Conservation Areas
UNCCD	United National Convention to Combat Desertification
UNDP	United Nations Development Program
UNDP	United Nations Development Program
UNFCCC	United Nations Framework Conventions on Climate Change
UNFF	United Nations Forum on Forests
USAID	United States Agency for International Development
WESM	Wildlife and Environmental Society of Malawi
WSU	Washington State University
WWF	World Wide Fund

1 EXECUTIVE SUMMARY

Sections 118(e) and 119(d) of the Foreign Assistance Act state that:

Biodiversity: All country-level Operating Unit Strategic Plans must include a summary of analyses of the following issues: (1) the actions necessary to conserve biological diversity, and (2) the extent to which the actions proposed meet the needs thus identified.

Tropical Forestry: For country-level Strategic Plans that cover countries that have any part of their territory within the tropics, each Strategic Plan must also include (1) a summary of their analyses of the actions necessary to achieve conservation and sustainable management of tropical forests and (2) the extent to which the actions proposed meet the needs thus identified.

These requirements may not be waived, modified, or eliminated by the responsible Bureau for country-level Operating Unit Strategic Plans.

This summary analysis was this report was produced by USAID/Malawi in collaboration with the Regional Center for Southern Africa's (RCSA) Regional Environmental Advisor as part of the above mandatory legal requirements.

This assessment has revealed that Malawi has significant and diverse biological resources as it sits at the crossroads of the East and Central African and Southern African floral and faunal sub-regions. It also has a very high human population, which mainly depends on the biological resources for their survival, hence the degradation of natural resources and the environment continues to be a major threat to the social and economic development of Malawi.

Consequently, the Malawian Government has become increasingly concerned about the deterioration of the country's natural resources and the environment in general and has taken major strides such as:

The Government of Malawi adopted a new constitution in 1995 based on the principles of participatory democracy and many of its recent policies and Acts reflect this participatory approach. The Government's new and developing policies for the management of natural resources involves the progressive transfer of resource ownership and management from the state to the resource users i.e. private landowners, communities, clubs and individuals. The Malawi Government approved the Environment Management Act in 1996 that mandates the districts to produce State of the Environment Reports every two years. A State of the Environment Report is crucial in providing an environmental picture of the country. The first national state of the environment report was written in 1998 and this edition represents a continuation of the state of the reporting process. And for the first time the districts have written their own state of the environment reports that have been referred to in order to produce this national document.

Overall Challenges for Conservation Efforts in Malawi

Despite the great steps taken by the Government of Malawi to address issues related to biodiversity conservation, forestry and the environment in general, major challenges lie ahead both within the governmental system and in society at large. The environment is being used up or degraded at an alarming rate causing loss of soil fertility, increase in soil erosion, deforestation, water depletion, loss of wildlife, over fishing, increased pollution and loss of animal, fish and plant species (biological diversity). The overlying cause is high population density that is overly dependent on agricultural production all too often involving poor husbandry techniques, in the absence of other economic opportunities. This is exacerbated by poverty which means that to subsist, a high proportion of the population relies on what they can forage from natural resources (e.g. firewood, fish, wildlife, etc). Since most Malawians depend upon natural resources for their day to day living it is of vital importance that environmental problems are addressed thereby improving their livelihoods.

Tropical Forests

A total of 69 Forest Reserves cover 7,905 km² (about 30% of forest cover) in Malawi. Many were created for watershed protection and are located on mountains and escarpments. However, timber plantations have been

established in some forest reserves, notably on the Viphya and Nyika plateaus in the north, at Dedza in the centre, and in the south, at Mulanje and Zomba. There are estimated to be 68,000 hectares of softwood plantation, mostly Mexican pine *Pinus patula*. Lack of management and neglect has meant that most of the small plantations are in poor condition and uneconomical, while the large bloc on the Viphya Plateau has not been managed since the envisioned pulp industry for which they were planted never materialized. Fires have been a major problem. Ironically some of these fires have been started by disgruntled forest workers – originally hired to protect and manage the forests – who were forced to be released by the Forestry Department due to the uneconomical state of the forests.

While all estates are legally required to maintain 10% of their land area under tree cover (natural or planted) in many cases this requirement has not been met nor has it been enforced (Forestry NFP)

Threats to Tropical Forests

The following are the primary threats to forestry in Malawi:

1) Bush Fires: The most significant force of natural disturbance within this ecoregion is undoubtedly fire. Each year, large areas of the Southern Rift Highlands are swept by fires, primarily anthropogenic. The intensity of this burning regime, which has been practiced for centuries, if not millennia, is believed to have been the main cause of the replacement of previously extensive areas of Afro-montane forests with grassland and scrub-grassland. Although it is unknown exactly how long fire has been a driving force in the ecoregion, and to what extent it has caused grassland to replace forest, fire has definitely reduced forests within the last century, and continues to do so today. Of special concern are the few surviving pockets of the historically widespread *Juniperus procera* forests, particularly the patch on Nyika Plateau, as these have been reduced not only by fire but also by recent indiscriminate felling for charcoal production and other uses.

The high incidence of fires in many areas in Malawi poses further threats to the ecoregion. Although fire is an integral part of miombo ecology, human setting of fires is believed to have increased the frequency of fire far above the natural level. Most of the deliberate burning and the uncontrolled fires occur at the end of the dry season, just before the onset of the summer rains. The fires burn with greater intensity as quantities of dry fuel accumulate. These hotter fires are destructive even to fire tolerant trees and can also have negative impacts because this time coincides with miombo trees breaking their dormancy. Repeated late-season fires in many areas have decreased forest regeneration, seed germination, and seedling survival growth can be severely disturbed. In addition, fire removes species that are less fire-tolerant from the miombo, thereby reducing species diversity.

2) Land Use/Human encroachment: Cultivation poses the other severe threat to the integrity of the ecoregion, as land is increasingly being converted to crops such as tea, coffee, banana, finger millet, potatoes, and pyrethrum. Although shifting cultivation is practiced in places, allowing secondary succession to take place on previously worked fields, fallow lands are generally re-colonized by widely distributed species which may preclude the regeneration of the unique elements of Afromontane primary flora.

Cultivation does not only change the composition of the ecoregion's flora, but it can create serious erosion problems, as fields are often plowed on steep slopes. Overgrazing by large numbers of livestock also cause erosion problems in areas of high human population, such as parts of Malawi's Kirk Range. The continuing destruction of Afromontane grassland habitat threatens the locally occurring churring cisticola (*Cisticola njombe*) and the blue swallow.

The extensive, forested slope below Manene peak (2,650 m) is constantly being encroached upon, the situation compounded by a fast expanding population, and in the past by an influx of Mozambican refugees.

3) Invasive Species: Alien organisms pose a threat to the ecoregions, chiefly in the form of exotic timber trees of the genera *Pinus* and *Eucalyptus*, which have been used in afforesting montane grasslands. The bramble *Rubus* spp. has spread extensively throughout the Nyika National Park, where exotic rainbow trout were also introduced into dams and streams on the Plateau. The uncontrolled invasion by the exotic Himalayan raspberry (*Rubus ellipticus*) and the Mexican pine (*Pinus patula*) (Verboom 1992) have severely affected some ecoregions in Malawi. These invaders have reached every corner of the ecoregion. A successful pine eradication program was carried out on Mount Mulanje between 1987 and 1988, leaving only two areas of the mountain to be cleared. This work was however not followed up and the pines have reappeared, with Mchese Peak the only area not invaded (Chapman 1991). The eradication effort was useful in that it proved the feasibility of controlling the pine invasion. The

Himalayan raspberry, on the other hand, is firmly established and extremely difficult to eradicate. This vigorous bush, which grows up to 6 m high, was first recorded 60 years ago (Chapman 1991).

4) Deforestation: According to Stephen J. Millington and Madalitso Kaferwanthu in the COMPASS II Biodiversity Analysis report, deforestation is one of the most widespread threats to tropical forestry in Malawi. Woodlands are being cleared for fuelwood, charcoal, and building materials as well as for agricultural land.

More than 80 percent of people living in miombo depend on fuelwood and charcoal for cooking, heat, and light. Cutting woody vegetation for the production of charcoal, especially close to major roads and large urban centers is having a marked impact on the miombo vegetation. In many areas, including Malawi, large numbers of saplings are removed from the woodlands to be used as poles for building traditional houses.

The Mulanje cedar, *Widdringtonia whytei*, is under serious threat from over exploitation. Exploitation of this tree began in about 1900, under the control of the Department of Forestry.

Biodiversity

Malawi occurs in the Zambezi phyto-region of southern Africa (White, 1983). This phyto-region has been mapped into eight eco-regions in Malawi by the World-Wide Fund for Nature (WWF)-US (Cumming, 1999).

With its unique conjunction of bio-geographical regions, varied topography and range of habitats, Malawi has high biodiversity, especially for a landlocked country. Records indicate a total of 5,000-6,000 plant species, 188 species of mammals, 69 species of amphibians, 124 species of reptiles, 648 species of birds and 600 species of fish. The level of endemism in plants, invertebrates, and mammals is not well known. However it is estimated that approximately 47 species of the 172 species of molluscs, 12 species of reptiles and seven species of amphibians (especially frogs) are endemic to Malawi. Detailed knowledge is lacking on the distribution and status of endemic and/or rare plant species in Malawi. The 2002 IUCN Red List of Threatened Plants for Malawi lists 14 endangered, 89 vulnerable, and 25 critically endangered species. Approximately 114 plant species are known from only a few localities in Malawi but none of these are formally protected. Only eleven plant species have legal protection in Malawi.

Currently, with over 800 species of fish, 90% of which are endemic, Malawi is one of the countries with the largest number and the most diverse communities of freshwater fish in the world. Around 15% of the global total freshwater species are found in Lake Malawi alone. Ninety-five percent of these species are haplochromine cichlids, which are internationally recognized as an outstanding example of rapid speciation, with a potential to provide greater insights into the understanding of the evolutionary process. Because of their sedentary habits, most of the cichlids rarely migrate long distances from their locality. The resultant isolation of communities has created species endemic not only to the lake but to certain restricted areas within the lake itself. In turn, this aspect has led to an unparalleled adaptive speciation of fish species in the lake. The high rate of habitat specialization also increases vulnerability to disturbance.

Threats to Biodiversity

The following are the most severe threats to biodiversity in Malawi:

1) Overfishing/Unsustainable fishing practices

There has been a steady increase in the number of fishermen (10,601 in 1990 and 13,546 in 1997) and fishermen assistants (25,495 in 1990 and 37,310 in 1997) (trends tables at the end of chapter). The increase is mainly due to more people taking up to fishing to supplement their income requirements. This trend is supported by the UEMP studies which identified a trend of an increasing number of fish vendors in urban areas over the last 5 years of between 50% and 75 %.

Most fishing gears in use are illegal. A 1999 survey of the South-East Arm of Lake Malawi found 100 % of the beach seine nets used had illegal small meshes, 96 % of gillnets were undersized, 57 % of the Mkacha nets, and 35-

40 % of the Chilimila and Kambuzi nets had illegal mesh size. As a result, catches are dominated by juveniles and immature fish, thereby not only reducing the potential production levels, but also eliminating future breeding stocks. The use of illegal gear is a result of poor enforcement (e.g., in 2002 no-one was prosecuted for illegal fishing whereas hundreds of people were prosecuted for poaching in national parks and reserves). It is also a result of the failure of participatory fisheries management and community empowerment to regulate fishing effectively.

2) Agriculture encroachment and unsustainable cropping practices:

Cultivation poses the other severe threat to the integrity of the ecoregion, as land is increasingly being converted to crops such as tea, coffee, banana, finger millet, potatoes, and pyrethrum. Although shifting cultivation is practiced in places, allowing secondary succession to take place on previously worked fields, fallow lands are generally recolonized by widely distributed species which may preclude the regeneration of the unique elements of Afromontane primary flora.

Cultivation does not only change the composition of the ecoregion's flora, but it can create serious erosion problems, as fields are often plowed on steep slopes. Overgrazing by large numbers of livestock also cause erosion problems in areas of high human population, such as parts of Malawi's Kirk Range. The continuing destruction of Afromontane grassland habitat threatens the locally occurring churring cisticola (*Cisticola njombe*) and the blue swallow.

The Thyolo and Mulanje districts are major tea producing areas and the natural vegetation on the south eastern slopes of these mountains has been replaced by extensive tea plantations. Tea was first planted on the slopes of Mount Mulanje in 1891 and then on Thyolo Mountain in 1933. Until the mid 1960's this ecoregion was the most extensive area of tea under cultivation anywhere in Africa (Boeder 1988).

Annual food crops are also planted on the rain-facing southern and southeastern slopes. In the early 1980's, hundreds of hectares of lowland rainforest were destroyed on the southern slopes of Mulanje to grow maize (Chapman 1991). Crop fields continue to extend up the slopes of Mulanje today (above the Forest Reserve boundary) and repeated efforts by the forestry department to evict the encroachers have failed. The extensive, forested slope below Manene peak (2,650 m) is constantly being encroached upon, the situation compounded by a fast expanding population, and in the past by an influx of Mozambican refugees.

3) Climate Change:

There is evidence that global weather patterns are changing as a result of climate change. This is exacerbated by local conditions such as reduced vegetation cover and although the consequences are difficult to forecast, increased variability and unpredictability of local climatic conditions could lead to decreased crop yields and chronic food insecurity. Rapidly changing socio-economic factors can lead to increased sensitivity to climate shocks; for example, the high incidence of HIV and increasing levels of poverty increase the exposure of the population and its inability to cope with climatic stress. Changes in rainfall patterns and distribution through the seasonal cycle are likely to have devastating consequences. Furthermore, the options for employing traditional coping strategies, often dependent on biodiversity, are declining as a result of land and natural resource degradation and increasing vulnerability to climate variability and change.

A further potential impact of climate change is that some ecosystems are more vulnerable to change than others. Among those most vulnerable are high altitude montane ecosystems where relatively small changes are predicted to have a significant effect in shifting altitudinal limits for certain ecosystems and habitats over a relatively short time frame. This could result in unique mountaintop animal and plant communities disappearing, to be replaced by examples of formerly lower altitude communities. While the alpine ecosystems of high mountains that are most vulnerable do not occur in Malawi, and human-induced short-term changes are certainly a greater threat, the situation is certainly deserving of close monitoring.

Crop production in 2003/04 was adversely affected by late onset of rains and a prolonged dry spell which occurred at a critical development stage, especially in the southern region. These developments lowered overall crop production. Crop production estimates figures released by the National Statistics Office indicated a total Maize production of 1,731,925 MT, 13% lower than the estimated 1,983,440 MT produced in 2002/03 season.

During the 2003/4 season, climate extremes in form of floods affected Malawi. Reports from the Disaster Management Secretariat indicate that 1156 people had their houses damaged by floods in areas of Traditional Authority (TA) Nkumba, TA Kaduya, TA Nazombe, TA Chiwalo and Sub-TA Jenala in Phalombe District. The floods occurred on 16th February, 2004. In Zomba, from 21-24 February, floods affected 69 households in TA Mwambo area where houses were damaged.

4) Invasive Species:

Malawi faces a number of threats from invasive alien species (IAS)¹. These include introduced water plants such as Water Hyacinth (*Eichornia crassipes*) and Water Lettuce (*Pistia stratiotes*), which, in addition to competing with native water plants, decrease oxygen levels, provide breeding sites for mosquitoes and bilharzias snails and impede navigation, hydropower schemes and irrigation. These species are already causing problems in the upper Shire River. A serious threat to the montane region is the uncontrolled invasion by the exotic Himalayan raspberry (*Rubus ellipticus*) and the Mexican pine (*Pinus patula*). These invaders have reached every corner of the ecoregion. A successful pine eradication program was carried out on Mount Mulanje between 1987 and 1988, leaving only two areas of the mountain to be cleared. This work, however, was not followed up, and the pines have re-appeared, with Mchese Peak the only area not invaded. The eradication effort was useful in that it proved the feasibility of controlling the pine invasion. The Himalayan raspberry, on the other hand, is firmly established and extremely difficult to eradicate. This vigorous bush, which grows up to 6 m high, was first recorded 60 years ago. The introduction of exotic conifers has been accompanied by the arrival of various pests, one of which (an aphid) has caused serious damage to native Mulanje cedar trees.

Perhaps the most serious threat is the potential introduction into Lake Malawi waters of non-native fish species. This has had a catastrophic effect in Lakes Victoria and Tanganyika where native fish radiations comparable to that of the cichlids of Lake Malawi have been decimated.

Summary of Forestry and Biodiversity Conservation Activities in Malawi

Government of Malawi and Parastatal Agencies

1) Policy development and Institutional Frameworks:

The Malawi Government adopted a new constitution in 1995 based on the principles of participatory democracy and many of its recent policies and Acts reflect this participatory approach. The Government's new and developing policies for the management of natural resources involves the progressive transfer of resource ownership and management from the state to the resources users i.e. private landowners, communities, clubs and individuals.

The Malawi Government approved the Environment Management Act in 1996 that mandates the districts to produce State of the Environment Reports every two years. A State of the Environment Report is crucial in providing an environmental picture of the country

2) Reforestation programs:

To tackle the deforestation problem facing Malawi's environment, the Forestry Department, under the Wood Energy Project funded by the World Bank, embarked in the establishment of fuelwood and poles plantations country wide. A total of 22,895 hectares were established, bringing the total of plantations under the Forestry Department to 97,210 hectares. The private sector has also established a total of 35,539 hectares of additional fuelwood and poles plantations mostly on tobacco and tea estates.

¹ USAID-DAI/COMPASS II, Analysis of Biodiversity: Threats & Opportunities, November 2005

Alongside this initiative was the production of charcoal made from pine to replace charcoal from indigenous wood. Like the mbaula project, Government developed the technology and passed it on to private entrepreneurs. The estate sector embraced this technology because it resulted in cuts in their energy budget. Apart from the estate sector, no other sector has adopted it. This initiative, therefore, had limited success.

3) Research and Education

Main research areas for Forestry Research Institute of Malawi (FRIM) are, silviculture (both natural trees and exotic), social forestry, forest mensuration, tree breeding, forest seed services, forest entomology, forest pathology, soil sciences and wood sciences.

Research programmes are reviewed by the National Forestry Research Committee which meets once every 3 years. It is during such meetings where research projects are drawn up and prioritized to address specific problems.

Besides FRIM, there is also Agro-forestry Research being conducted at Makoka and Chitedze Agriculture Research Stations through the sponsorship of ICRAF.

Forestry Department runs Malawi Forestry College and Wildlife which provides training at certificate and Diploma levels producing Foresters and Forestry Assistants or their equivalents. The course duration is 24 months and 18 months respectively. Besides regular courses, the College also conducts short courses ranging from 4 to 6 weeks each after which a certificate of attendance is issued. Graduates of the short courses are usually employed as forest nursery workers, forest guards and patrolmen/women. Malawi College of Forestry is the only forestry training institution in Malawi.

Local and International NGOs and International Donors

1) TFCA Development of Malawi-Zambia Transfrontier Conservation Areas

With the support of the Peace Parks Foundation, transfrontier conservation areas (**TFCA**) have been proposed between Malawi and Zambia for the areas of Nyika National Park, Vwaza Marsh Wildlife Reserve and Kasungu National Park and their neighboring protected areas on the Zambian side. A Memorandum of Understanding was signed by both governments in 2004. The project has prioritized the Nyika TFCA and has undertaken studies and developed a proposal that includes 17 sub-projects, including increased wildlife law enforcement to stem the uncontrolled poaching that has decimated wildlife populations in the area.

2) World Bank Mount Mulanje Biodiversity Conservation Project

This **World Bank/GEF** project was approved in 2000 and is still ongoing. Its goal is to maintain the Mount Mulanje ecosystem, including globally significant biodiversity and vital ecological services. It has five components;

1) Setting the administrative structure for a Conservation Trust; 2) Biodiversity Conservation, Research and Monitoring; 3) Environmental Education; 4) Forest Co-Management and Sustainable Livelihoods; and 5) Capitalizing the Conservation Trust Fund (\$ 5.5 million).

3) Danish Lake Chilwa Bird Hunters Capacity Development

The **Danish Hunters Association** (DHA) involves local communities in managing their waterfowl resources, by setting up some areas as breeding refuge where snaring would be abandoned, and by restricting access for bird shooters in various ways. The latter is popular since bird hunters come from the outside and cause a great deal of disturbance, hindering the efforts of local groups to control management.

4) EU Miombo Research Projects

A great deal of valuable research on the management of miombo ecosystems, including case studies from Malawi, has been supported under the EU Management of Miombo Woodlands Project (1998-2002) with the support of CIFOR. This resulted in the publication of "Policies and Governance Structures in Woodlands of Southern Africa" in 2003.

5) SADC Biodiversity Support Programme

The SADC programme, based in the Environmental Affairs Department of the Ministry of Mines, Natural Resources and Environment, has focused its program on two thematic areas to help Malawi meet its objectives and obligations under the Convention on Biological Diversity. These areas are (1) Invasive Alien Species; and (2) Access and Benefit Sharing. Two studies have recently been finalized. One is an assessment of user needs for databases, standards and guidelines on Invasive Alien Species (IAS) and establishment of the status of IAS in Malawi. The other is policy, legislation and other mechanisms for access to and benefit sharing of genetic resources in Malawi.

6) WESM Biodiversity Awareness:

The Wildlife and Environment Society of Malawi (WESM) has long been involved in biodiversity awareness-raising, education (promotion of wildlife clubs), monitoring (game counts) and non-extractive natural resource-based activities (such as beekeeping). It partners with government and donor organizations on a number of initiatives related to its area of interest and expertise. Other active NGOs include the Wildlife Action Group, which works with DNPW in Thuma Reserve to develop wildlife conservation and ecotourism activities. As part of its private sector partnership emphasis, DNPW has also ceded management of Majete Wildlife Reserve to a private group, African Parks Conservation Ltd., which is currently aiming to undertake an ambitious game restocking program.

7) US Agency for International Development (USAID):

USAID is funding the second phase of the Community Partnership for Sustainable Resource Management (COMPASS II). The purpose of COMPASS II is to enhance household revenue from participation in Community-Based Natural Resource Management (CBNRM) initiatives that generate income as well as provide incentive for sustainable resource use in Malawi. Development Alternative Inc. (DAI) is implementing this project. Through the Global Development Alliances, USAID is also assisting communities to adopt integrated approach to catchment area management, adopt sustainable agricultural practices, increased crop production and diversification, agro-forestry, and biodiversity conservation.

8) NORAD Malawi, Nyika/National Bio-diversity Strategy and Action Plan

This five-year project (2002-2207) is funded by **the Norwegians**, the purpose is to assess diversity of plants; inventory micro-organism, inventory ecosystems; and capacity building.

Value, Use and Economics of Biodiversity in Malawi

Malawi's economy is entirely based on the biological resources and services provided by the ecosystems. For instance, ecosystems perform services beyond production of food, fiber, fuel and income, such as recycling of nutrients, control of local microclimate, regulation of local hydrological processes, regulation of the abundance of undesirable organisms, and detoxification of noxious chemicals. The following are the primary economic and social values of biodiversity in Malawi

1) Economic: The Forest Industries

Forest industry and trade in Malawi is represented by a handful of companies. There is potential for improvement. These companies are RIPLY through a concession with the Department of Forestry, Leopard Matches Ltd, established in 1967 (and is an international company which deals with processing of wood into match products), Shire Ltd, a national company established in 1964 and Wood Industries Corporation, originally a division of the Forestry Department and was privatized in 1993.

2) Health:

Apart from using plants and animals and their components to avert nutritional diseases (e.g., kwashiorkor) various biological resources such as microorganisms are used in preparing chemical components of modern and traditional medicines while plants are directly ingested as herbal medicine. A recent study of the interactions between woodlands, vulnerability and rural responses to HIV/AIDS (Barany et al., 2005) explored the relationships between woodland management and HIV/AIDS in Malawi. The research emphasizes the role of traditional woodland coping strategies in affected communities and suggests that this may become more commonplace as the epidemic matures and mortality rates increase.

3) Ecotourism:

The use of biodiversity for aesthetic and recreational purpose is practiced at the local community level and by non-residents for both consumptive and non-consumptive uses. Site seeing, photographic safaris and mountain hiking are some of the non consumptive uses and fishing and hunting are some of the consumptive uses. All these activities depend on the continued existence of plant and animal species, and quality habitats and ecosystems.

Tourism in Malawi thrives on natural resources and major resources attractions include water bodies, biological diversity, parks, mountains, and cultural heritage. The value of biodiversity in terms of aesthetic value has never been estimated although tourism dominated by visits to the lake and game viewing contributed to 4.2% and 3.2% of the GDP between 1996 and 1997.

4) Livelihood (Fishing, Agriculture etc.)

According to the Government of Malawi in its State of the Environment Report of 2004, fish plays a very important economic and nutritional role as a source of food, income and employment. Statistics indicate that fish contributes an estimated 4 per cent to the country's Gross National Product (GNP). Fish provides an important means of livelihood to rural poor in particular the lakeshore communities, where 14 per cent are employed in fishing, constituting 52 per cent of their livelihood means. Nearly 1.6 million people derive income from fishing, fish processing, marketing and trading, boat and gear making and allied industries.

5) Energy Needs:

Most of the wood fuel is consumed by the rural people for domestic purposes in Malawi. Various studies have shown that the national trend of fuelwood consumption over time is increasing. Over the period of 7 years (1983 - 1990), wood consumption increased from 8.5 million tons to about 12 million tons per year, an increase of about 41 %. Within the same period, wood demand for tobacco industry increased by about 29 %

6) Commercial Timber

Exploitation of timber as construction materials is generating good revenues to communities adjacent to forest plantations. Species such as (*Widdringtonia cupressoides*) Mulanje cedar, *Pterocarpus angolensis* (Mlombwa), *Khaya athonthea* (mbawa) produce quality and durable hard wood and as a result their populations are unfortunately threatened due to unsustainable harvesting²

USAID/Malawi Strategy: Actions, Opportunities, and Threats

This section proposes actions per by SO that are needed to address the threats identified in the analysis.

USAID/Malawi will implement its Country Strategic Plan (CSP) (FY2006-FY2010), through three Strategic Objectives (SOs) and one MCA-funded Special Strategic Objective (SpO) that are consistent with the U.S. State Department and USAID FY 2005 – FY 2009 Strategic Plan mission statement and responsive to the challenges faced by the Government of Malawi as stated in documents, including the Malawi Poverty Reduction Strategic Plan, the Malawi Economic Growth Strategy, and the Malawi Growth and Development Strategy. This new strategy will focus on:

- Increased Household Food Security of Poor and Vulnerable Populations;
- Enhanced Wealth/Asset Creation and Retention Capacity for the Rural Poor;
- Improved Health and Education Status of the Malawian populations
- Improved Fiscal Responsibility and Anti-Corruption Measures (SpO)

SO: Increased Household Food Security of Poor and Vulnerable Populations

1. Deforestation:

- USAID/Malawi could promote renewable energy particularly in rural areas in biologically sensitive areas or adjacent to tropical forests that are heavily reliant on fuel wood and crop residues for basic energy needs, such as household cooking and heating;
- Support public awareness campaigns of environmental and conservation issues, possibly by training the media on ways to improve reporting
- Build capacity of institutions (both governmental and non-government) through training managers of protected areas in natural resource management;

2. Climate Change:

- Improve monitoring and forecasting systems for floods and droughts
- USAID/Malawi will continue and reinforce its support towards the development of Malawi's Early Warning System. It is almost impossible to prevent the occurrence of natural disasters caused by climate variability, and their damages. However it is possible to reduce the impact of disasters by adopting suitable disaster mitigation strategies which could minimize the potential risks by developing disaster early warning strategies and prepare and implement developmental plans to provide resilience to such disasters. The Early Warning System shall incorporate monitoring of biophysical indicators such as on-farm and off-farm forest cover, soil fertility, plant and animal biodiversity. Accurate and timely information on the status of such natural resource indicators at the local level will help to inform policies and interventions for agricultural and economic growth assistance as well as for food aid

² Government of Malawi, "Biodiversity Strategy and Action Plan for Malawi, p.9"

3. Overexploitation of Natural Resources & Pollution:

- USAID will as much as possible continue to support the application of conservation farming (minimum tillage) and the use of small-scale irrigation systems will significantly increase productivity while contributing to decreased soil erosion, improved moisture retention and better aerated soils. Conservation farming techniques will be expanded by all present and future implementing partners that are/will be focusing on the production side of the value chain.
- In biologically sensitive areas, USAID/Malawi could support activities that encourage non-farming income-generating activities to lower the pressure on the natural resource by communities leaving adjacent to parks and protected areas (both inland and lakeshore zones). By ensuring that basic needs are met, these actions will reduce pressures to seek short-term profits from unsustainable practices such as fuel wood and timber harvesting.
- Promote community participation in natural resource management and land use planning decisions
- USAID/Malawi may have a comparative advantage to support cleaner production processes capacity building and training through its initiatives to *increase market shares and add value to agricultural products through processing*. Cleaner Production is a proven business-oriented problem-solving strategy that helps businesses improve the efficiency of their production processes. Increased efficiency generally translates into higher profits and better quality. The more efficient use of input materials and energy equates to reduced waste, resource degradation and pollution, thereby reducing impacts on human health and the environment. In addition, cleaner production furthers fundamental development goals by enhancing the long-term sustainability of income generation programs.

6.2 **SO: Enhanced Wealth/Asset Creation/ and Retention for the Rural Poor**

These are additional actions that USAID/Malawi could undertake under its different programs, under this SO to address the threats that have been identified in this analysis. These actions could complement the above ones.

Additional Ways in Which USAID Program Could Address Malawi's Conservation needs identified

1- Deforestation:

- The recommendations made for the previous SO holds under this SO as well for deforestation.
- USAID/Malawi could consider supporting innovative public-private alliances under its MCA programs to support small enterprises that sustainably harvest forest products and link them with regional markets. Alleviate pressures on the natural resource base through support for private sector development: provision of rural financial services, business development services, improved market infrastructure, conditions and information services, and promotion of investment and public/private partnerships can achieve two objectives that will together relieve pressure on natural resources. The first objective is the creation of off-farm opportunities in agricultural marketing, supply and processing which can reduce population pressures on a compromised resource base. The second positive development would be enhanced incomes and productivity from existing production areas, thus potentially reducing agricultural expansion.

2- Overexploitation of Natural Resources & Pollution

- All the recommendations made for the previous SO holds for tackling the natural resource over-exploitation threats identified in section 2 and 3 of the analysis.
- For projects involving small scale farmers, USAID/Malawi should encourage practices to minimize ground water pollution and to incorporate technological improvements, such as the introduction of soil fertility enhancement approaches and improved seeds.
- USAID/Malawi could support targeted biotechnology research to develop or utilize crops that have the potential to help small and marginal farmer participate in agricultural markets.

- USAID/Malawi could assist municipalities, districts to integrate conservation and biodiversity preservation into their integrated development plans, and pay special attention to waste management in areas that impact aquatic ecosystems
- Promotion of intensive agricultural production practices that will reduce expansion into forested and uncultivated areas: planned interventions will include efforts to increase soil fertility, introduce higher-yielding crop varieties, increase access to improved seed, promote crop diversification, and encourage agro-forestry.
- USAID/Malawi could support the development and marketing of Eco-Certified Products: training for sustainable cultivation, harvesting and processing of a variety of products including shade-grown or organic coffee, honey, traditional medicines and even possibly timber could be considered as part of this economic growth strategic objective. Certification standards exist and could be tapped into for many of these products, as well as for organic produce.

3- Invasive Species

- Should more resources made available to USAID/Malawi will work with the GoM and other stakeholders involved in biodiversity conservation in Malawi to promote and support the establishment of a focal point institution on biodiversity to regularly monitor vulnerable, rare and endangered species of micro-organisms, flora and fauna.
- Design and implement awareness campaigns on invasive alien species directed at key stakeholders within the Malawian public and government

4- Climate Change

- USAID will promote sustainable methods of service delivery at the local sphere of government that should result in the abatement of green house gas emissions, improved cost-recovery, biodiversity resource conservation, and energy-efficiency. These activities would also contribute to the US Presidential Initiatives for Global Climate Change, Clean Energy and Water for the Poor.
- Where possible, USAID will encourage the use of appropriate technology to reduce pollution and promote cleaner energy use; and incorporate methods to conserve water.

SO: Improved Health and Education Status of Malawians

Additional ways in which USAID Program Could Address Malawi's Conservation needs identified under its health portfolio:

Should additional resources become available USAID/Malawi could consider, where appropriate, in collaboration with the Ministry of Education and other appropriate agencies in the Government of Malawi to include some of the following activities into this program:

- support environmental training in schools
- Incorporate environmental awareness and education into the curriculum;
- Train teachers on conservation and biodiversity modules
- Where possible, USAID/Malawi could support health care management practices that address potentials for biohazards and which incorporate proper disposal of hazardous waste. This will help to prevent the spread of disease and to minimize pollution, particularly of groundwater table.
- The existence of multiple lakes in Malawi and with respect to its geographical position, Avian Flu-infected migratory birds from several areas in Europe, may somehow transit in Malawi, exacerbating the yet precarious livelihood situation of Malawians and the struggle of their government to alleviate poverty. To the extent that USAID/Malawi is called upon to include and support any programs related to the avian flu pandemic in this present strategy, the activities should minimize any adverse environmental impact and exposure of the flu to humans.
- Increase access to family planning services to limit expansion into protected and forested areas

- Develop an HIV/AIDS and natural resources activity which provides HIV/AIDS vulnerable populations with improved access to water, energy, and low labor intensive agricultural technologies
- Direct funding or provision of Insecticide Treated Bednets (ITN) will need to comply with the recommendations made under a Programmatic Environmental Assessment (PEA) conducted in 2002 for USAID Africa Bureau ITN programs. In any case USAID/Malawi will have to develop a Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP), should it support any ITN program to tackle malaria problem in Malawi.

SpO: Improved Fiscal Responsibility and Anti-Corruption Measures

No specific actions are anticipated under this Special Strategic Objective

Conclusion

As this analysis indicated, Malawi faces complex social, economic and environmental problems that threaten the country natural resource base, which are pushing the country to complete dependence on foreign aid. The health of this crisis seems to reside in the country's high population, recurring droughts, declining terms of trade, increasing pressure on agricultural land, unsustainable exploitation of the country's natural resources. Marginal areas have been brought under cultivation, continuous cropping have exacerbated a situation yet difficult. Although the Government of Malawi is responding courageously to these threats and other economic distortions, many obstacles remain.

With the scarcity of true environmental funding, USAID/Malawi strives to do its utmost to incorporate activities across its strategic objectives that address the threats to tropical forestry and biodiversity as outlined in the analysis. To the extent that additional funding becomes available, USAID/Malawi would consider supporting additional programs that are consistent with the GRZ's objectives.

2 INTRODUCTION

USAID/Malawi is currently in the process of developing a five-year Country Strategic Plan (CSP) to guide its activities for 2006-2010. This new CSP is a highly integrated approach that addresses three major interrelated development challenges, such as: (1) Chronic Household Food Insecurity; (2) Obstacles to Wealth/Asset Creation and Retention for the Rural Poor; and (3) Poor Health and Education Status. This new USAID/Malawi's strategy supports the U.S. Government (USG) foreign assistance operational goal of Transformational Development (TD), as defined in the Strategic Issues: The Africa Bureau USAID's Strategic Framework for Africa (SFA) and not only responds to U.S. Government (U.S.G.) foreign policy goals for the region, but also responds to Malawi's national planning and strategic priorities as stated in the following Government of Malawi documents: the Malawi Poverty Reduction Strategic Plan, the Malawi Economic Growth Strategy, and the Malawi Growth and Development Strategy. Each of these plans or strategies, which chart Malawi's way forward, delineates Malawi's efforts and attention on poverty reduction through private sector led economic growth and increased public sector investment in health and education.

USAID/Malawi will help achieve these goals through three Strategic Objectives (SOs) and one MCA- funded Special Objective (SpO): 1) Increased Household Food Security of Poor and Vulnerable Populations; 2) Enhanced Wealth/Asset Creation and Retention Capacity for the Rural Poor; 3) Improved Health and Education Status of Malawians and, Improved Fiscal Responsibility and Anti-Corruption Measures (SpO)

USAID/Malawi recognizes that protection of the environment and wise management of the natural resources base are absolute requirements of any successful development program. In order to ensure that environmental issues are integrated into USAID/Malawi's development planning, a Tropical Forestry and Biodiversity analysis is required by Sections 118(e) and 119(d) of the 1961 Foreign Assistance Act, which codifies U.S. interests in forests and biological diversity. The provisions require that all country strategic plans include: 1) an analysis of the actions necessary in that country to conserve biological diversity and tropical forests; and 2) the extent to which proposed USAID actions meet the needs thus identified.

In addition to being a legal requirement, the FAA 118-119 analysis technically and strategically enables USAID/Malawi to identify opportunities for using funds earmarked by Congress for biodiversity or tropical forest conservation in its programs; it will also help the Mission identify opportunities for increasing the sustainability of its Strategic Objectives in all sectors.

To conduct this assessment of tropical forestry and biodiversity threats and opportunities USAID/Malawi worked in collaboration with the Regional Environmental Advisor (REA) from USAID's Regional Center for Southern Africa (RCSA), Mr. Camilien Jean W. Saint-Cyr. Several USAID/Malawi colleagues assisted, especially the Mission Environmental Officer (MEO), Autman Tembo who facilitated the process of information gathering, including meetings with USAID/Malawi staff, which enabled me get a good understanding of the country program and strategy, the Sustainable Economic Growth (SEG) SO Team Leader, Mr. Mark Visocky who facilitated all aspects of this visit, the Program Officer, Znedek Suda, and the Private Sector Advisor, Mr. Richard Kimball both of whom worked diligently to help complete this report in time for submission with USAID/Malawi's 2006-2010 Strategic Plan.

This summary analysis is derived greatly from the draft Assessment of Current Status: threats and Opportunities of Malawi's Biodiversity being produced by Mr. Stephen Millington and Madalitso Kaferwanthu, under USAID-funded Community Partnerships for Sustainable resource Management program with the Development Alternatives, Inc. This analysis is also drawn upon a series of Government of Malawi documents on tropical forestry, biodiversity conservation and environmental legal frameworks. In particular, Malawi's First National Report to the Convention on Biological Diversity, the Government of Malawi State of the Environment Report (2005 Draft), the Government of Malawi, 2004 National Environmental Policy, the 2001 Malawi's National Forestry Programme, the 2005 draft Malawi's National Biodiversity Strategy and Action Plan etc., these documents provided a wealth of information on the country profile, the status of forestry, biodiversity and environmental situation in general. Most of the photographs are from the Environmental Affairs Department's collection, except for the photograph on the cover page that come from other sources. USAID/Malawi is grateful for their contributions.

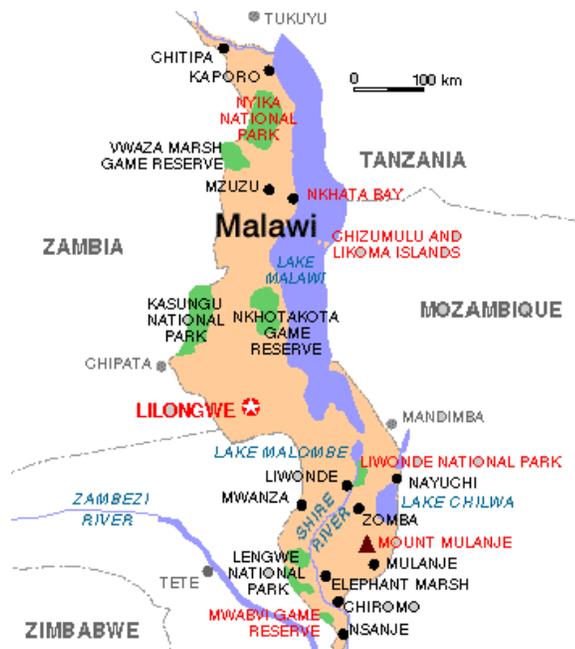
If sections are missing citations, the information likely came from one of these documents. Other sources of information included USAID/Malawi Annual Reports, Environmental Assessments, USAID/Malawi Strategy and Policy documents, Government of Malawi's pieces of legislation etc.

Despite the importance of the FAA 118-119 analysis on the sustainability of USAID actions, the time available for completion of this study has been brief; hence, there may be some gaps in the report. Specifically, there was insufficient time to conduct consultation with stakeholders other than USAID/Malawi, with for example, the Government of Malawi staff, local and international NGOs, other International Donors, and the Malawian Private sector directly or indirectly involved in biodiversity and tropical forestry conservation.

3 STATUS OF TROPICAL FORESTS IN MALAWI

3.1 Malawi physical and ecological settings

Malawi is a landlocked tropical country with Zambia to the west, Mozambique to the south and east, and Tanzania to the north and east, lying between 9° 45' and 17° 5' S and 30 to 36° E (see Figure below). The national borders encompass Lakes Malawi and Chilwa which cover 2,440 km² leaving a land area of 9,408 km². The Northern region covers 2,690 km², the Central region 3,559 km² and the Southern region 3,176 km².



Map of Malawi

40 % of the total land area is suitable for agriculture (See table below).

Land use in Malawi (ha x10³)

Forest and Woodland	3,700
Permanent Pasture	1,850
Permanent crops	125
Arable	1,875
Total Agricultural area	3,850
Non-arable and Non-permanent crops	7,408
Lakes Malawi and Chilwa	2,440
Total land area	9,408
Total Area	11, 848

Source: NSO, 2000

Most of the arable land in Malawi is under traditional/customary tenure system. Cultivation rights, rather than ownership is granted by the chief through the village headman. Matrilineage is common in the centre and south while patrilineage is common in the north. In the matrilineal system, where the husband leaves his home to live with the wife, cultivation rights are inherited by the wife. By the late 1980s over 56% of households were on holdings of less than 1 ha, and a further 20% on 1.0-1.5 ha. Because of pressure on land there is little opportunity for fallow and rotation to restore soil fertility, and smallholders have expanded their cultivation to marginal, less fertile soils often on hill slopes which are not suitable for intensive cultivation, leading to woodland depletion, soil degradation and erosion. Rainfed agriculture predominates, dependant on a single rainy season between November and April.³

There are 5 main landform areas, the Highlands, Escarpments, Plateaux, Lakeshore and Upper Shire Valley, and the Lower Shire Valley:

The Highlands: These consist of isolated mountains between 1,320-3,000 m Extensive highland plateaux are found in the Nyika, Viphya and Mulanje, while Dedza and Zomba are more isolated. Slopes can become precipitous, and soils are predominantly leached latisols.

The Escarpments: These are associated with major fault lines along the edge of the Rift Valley, running from Karonga in the north to Nsanje in the south. They are also found around the highland plateaux and mountains. Soils are predominantly thin latosols.

The Plateaux: Three quarters of Malawi consists of plateaux at elevations of 750-1300 m. The topography is flat to rolling, with scattered rock inselbergs. The soil is deep well drained latisols on higher parts of the *catena*, with

³ Source: Moriniere and Chimwaza,1996

poorly drained sand and clay in the hollows. Poorly drained hollows are locally called *dambos*, (equivalent to *vleis* in Zimbabwe and South Africa).

The Lakeshore and Upper Shire Valley: Lakeshore plains occupy 8% of the total land area, at 465-600 m. The land is flat to gently undulating, with deep calcimorphic soils in the hollows. The upper Shire River flows through a broad flat valley from the south of the lake towards the south of the country. Soils are similar to those along the lakeshore. Mopanosols are found in some areas along the river.

The Lower Shire Valley: The lower Shire extends from Kapachira falls to Nsanje at the bottom of the country, mostly at less than 180 masl. The river flows through two marshes with extensive areas of hydromorphic soils. To the east of the river, up to the Thyolo escarpment, soils are medium to coarse textured alluvial and colluvial. To the west there is a broad plain with vertisols and grey brown earths, rising towards the western escarpment. Some areas of saline soils are found.

The climate in Malawi is tropical, warm, and changes from semi-arid in the Lower Shire Valley, semi-arid to sub-humid on the plateaus and sub-humid in the highlands. Most of the country receives between 763-1,143 mm rainfall p.a. There are three main areas with precipitation over 1524 mm: Mulanje, Nkhata Bay and the northern end of Lake Malawi (Figure 3). Almost 90% of rainfall occurs between December to March, with no rain at all between May to October over most of the country.⁴

3.2 Malawi Tropical Forest Overview

A total of 69 Forest Reserves cover 7,905 km² (about 30% of forest cover) in Malawi. Many were created for watershed protection and are located on mountains and escarpments. However, timber plantations have been established in some forest reserves, notably on the Viphya and Nyika plateaus in the north but also at Dedza and, in the south, at Mulanje and Zomba. There are estimated to be 68,000 hectares of softwood plantation, mostly Mexican pine *Pinus patula*. Lack of management and neglect has meant that most of the small plantations are in poor condition and uneconomical, while the large bloc on the Viphya Plateau has not been managed since the envisioned pulp industry for which they were planted never materialized. Fires have been a major problem. Ironically some of these fires have been started by disgruntled forest workers – originally hired to protect and manage the forests – who were forced to be released by the Forestry Department due to the uneconomical state of the forests.

While all estates are legally required to maintain 10% of their land area under tree cover (natural or planted) in many cases this requirement has not been met nor has it been enforced (Forestry NFP).⁵

3.2.1 Montane forests, scrubs and grasslands⁶:

These areas are found above 1500 m comprising forest relics in valleys and in isolated stands, with rolling grasslands and scrubland between. The pattern seems to be controlled by regular grass fires, and by the moisture of lower lying areas maintaining a greener and more fire-resistant margin to the remaining forest. Rainfall is above 1500mm, and is partly composed of a mist formed in the cold dry season, which provides moisture outside the main rainy period. The forests vary in composition and include communities dominated by *Widdringtonia whytei* (mulanje cedar) and *Juniperus procera* (African juniper).

Between 1500 and 2100 m a variable grassland occurs of short tufted to densely tangled grasses of low ground cover. Species include *Themeda triandra*, *Exothea abyssinica*, *Monocymbium cerasiiforme*, *Elionurus argenteus*, *Brachiaria serrata*, *Andropogon schirensis*, *Hyparrhenia lecomtei* and *Loudetiasimplex*. On wetter slopes and better soils, *Hyparrhenia cymbaria*, *Rhynchelytrum stolzii*, *R. nerviglume*, *R. stuposum* and *Melinis maitlandii* are also

⁴ USAID, GOM, Washington State University, "A Field Manual for AgroForestry Practices in Malawi, December 1995

⁵ COMPASS II, "Analysis of Biodiversity: Threats and Opportunities (Phase I: Assessment of Current Status)", 2005

⁶ (Source: Moyo et al, 1993 and Roberts 1988)

found. Fire tolerant Protea species invade this type of grassland and many woody shrubs including Tephrosia aequilata and Humularia descampsi.

Above 2000 m the grassland is mainly comprised of *Exothea* species, and produces a short tufted apparently dense ground cover. Species reported in the Malawi montane grasslands include *Exothea abyssinica*, *Loudetia simplex*, *Trachypogon spicatus*, *Helictotrichon elongatum*, *Agrostis* spp, *Monocymbium ceresiiforme*, and *Elionurus argenteus*. *Festuca schimperiana* is common in the wetter areas, with *Danthonia davyi* in exposed situations. *M. ceresiiforme* occupies only shallow soils in the montane area, whereas at lower altitudes it is confined to swampy grasslands. The nutritional value of montane grassland declines in the cold season.

3.2.2 *Brachystegia* woodlands (miombo):

Brachystegia woodland, also known as miombo or savannah woodland, is almost ubiquitous, characteristically containing one or more species of *Brachystegia* with *Julbernardia globiflora*. The grass layer is depressed by the relatively light crowned trees, which have the ability to coppice freely after cutting. The woodland varies in density from tall fairly open woodland to dense scrub according to treatment. Miombo is generally found between 600-1500 m with an annual rainfall of 510 to 1530 mm. Grass species include *Hyparrhenia filipendula*, *Themeda triandra*, *Andropogon schirensis*, *Bewsia biflora* and *Andropogon amplexans*. On shallow soils, especially in the Northern region *Anthephora acuminata*, *Tristachya inamoena*, *Sacciolepis transbarbata*, *Rhynchelytrum nyassanum* and *Homozeugos eylesii* are also found.

Grasses vary according to habitat, but are generally of medium height with low ground cover. When trees are cleared the grasses become more vigorous and a dense vegetative cover results until the scrub re-grows. The grazing value is low with marked seasonal variation, and the sparse cover has a low carrying capacity. Although the grasses respond to burning and produce a flush of fresh growth after fires, the main reason for managed burning is scrub control.

Shallow, seasonally waterlogged depressions at or near the head of a drainage network are called *Dambos* in Malawi. *Dambos* are easily recognised by the sharp contrast between dry typical *miombo* woodland, or cleared agricultural land, and the open herbaceous vegetation on the dambo itself. *Dambos* are nearly treeless areas dominated by grasses or sedges with a build up of organic matter with a hydromorphic, sometimes peaty upper soil horizon. Botanical composition of plant cover varies from the edges to the central, more waterlogged zone in *dambos*. While grasses predominate at the margins, sedges, herbs, rushes and ferns are more common nearer the central wetter area. A *dambo* catchment also acts as a hydrological store, holding water and releasing it as base flow to its headwater stream during the dry season. Because they retain water, *dambos* support vigorous growth of grass when other forms of grazing are in short supply. *Dambos* are particularly important in Central and Northern Malawi, and provide a valuable dry season feed resource for ruminant livestock. *Dambo* margins are also used for gardens providing a more reliable crop output than rainfed dryland farms, and spread labour demand more evenly throughout the year. Gardens are fenced to prevent damage by livestock which compete for space in more densely populated areas. Limited grazing in *dambos* prevents tall grasses such as *Hyparrhenia* from producing seedheads, ensuring continuous growth through most of the dry season (Roberts, 1988). On better soils, such as at Chitedze Research station DM production from *dambo* grasses averaged 5.9 t/year. However, grass DM output can fall as low as 0.2 t/year where poor management has resulted in a dense coppice of *Uapaca kirkiana* such as in West Mzimba. The overall mean DM production in *dambos* is estimated to be 3.2 t/ha/a (Hodges, 1983).

Typical non-arboreal plant species in Malawi dambos

Marginal wash zone	Central seepage zone
<i>Alloteropsis semialata</i> (g)	<i>Andropogon eucomus</i> (g)
<i>Aristida</i> sp (g)	<i>Arundinella nepalensis</i> (g)
<i>Brachiaria filifolia</i> (g)	<i>Eragrostis namaquensis</i> (g)

<i>Hyparrhenia rufa</i> (g)	<i>Eragrostis stapfii</i> (g)
<i>Loudetia simplex</i> (g)	<i>Hyparrhenia bracteata</i> (g)
<i>Monocymbium cerasiforme</i> (g)	<i>Sporobolus subtilis</i> (g)
<i>Setaria sphacelata</i> (g)	<i>Cladium mariscus</i> (s)
<i>Cassia mimosoides</i> (h)	<i>Scleria hirtella</i> (s)
<i>Emilia integrifolia</i> (h)	<i>Dissotis canescens</i> (h)
<i>Impatiens</i> sp (h)	<i>Gladiolus</i> sp (h)
	<i>Typha latifolia</i> (r)

g = grass; s = sedge; h = herb; r = rush; f = fern

3.2.3 Broad-leaved deciduous woodland:

On red clay loamy soils of the Central region plain, and on colluvial slopes and plains elsewhere in Malawi at altitudes of 600-1200 m with rainfall of 510 to 1530 mm a tall grass mixture is found with a broad leaved deciduous woodland, known as chipeta. Varying density of *Acacia polyacantha*, *Piliostigma thonningii* and *Combretum molle* occurs. Selective tree felling has produced communities with a single dominant tree species, while cultivation and overgrazing have produced scrub and thickets. The grass mixture includes *Hyparrhenia variabilis*, *H. filipendula*, *H. gazensis*, *H. nyassae*, *Setaria sphacelata*, *S. longisetata*, *Digitaria setivalva*, *D. diagonalis*, *Panicum maximum*, and *Themeda triandra*. These areas are subject to fierce annual burns, and fire tolerance is a typical characteristic of the woody species found. The grazing is of low carrying capacity. Overgrazing of these areas and of the associated swamp grasslands leads to colonisation by *Urochloa pullulans*, a palatable but poor ground cover plant, and then by *Sporobolus pyramidalis*, which produces a tough, unpalatable tufted ground cover.

3.2.4 Rift Valley escarpment and the foothills:

These areas, at altitudes of 900 to 1500 m and a wide range of rainfall (350-1500 mm) are characterised by lowland woodlands with *Brachystegia manga*, *Pterocarpus angolensis*, and on the lower slopes *Sterculia quinqueloba*. On the lower foothills the baobab (*Adansonia digitata*) with an understory of bamboo (*Oxytenanthera abyssinica*) are frequent. The grasses comprise *Hyparrhenia gracilescens*, *H. filipendula*, *Themeda triandra*, *Andropogon amplexans*, *Schmidtia bulbosa*, *Euclasta condylotricha*, *Eustachys paspaloides*, *Eragrostis superba*, and *Thyrsia undulatifolia*. Grasses form a low ground cover on broken, stony soils. These areas have limited grazing value because of the difficult terrain and lack of dry season pasturage.

3.2.5 Low altitude woodland and parkland:

Low altitude woodland and parkland are found below 600 m and include areas in the Shire Valley and along the lakeshore. Soils are influenced by drift and colluvion, and rainfall may vary sharply within short distances (350mm to 2500 mm in one area alone). As a result a wide floristic range can be found. Tall grasses are associated with low altitude woodland, including *Hyparrhenia gazensis*, *H. variabilis*, *H. dichroa*, *Andropogon gayanus*, *Setaria palustris*, and *Panicum maximum*. In densely settled and cultivated locations, tall reedy grasses are replaced by *Urochloa pullulans* and *U. mosambicensis*. Woodlands are characterised by *Sterculia africana*, *Colophospermum mopane*, *Acacia tortilis* and *Faidherbia albida* according to locality. *Acacia* woodland provides valuable grazing from pods to supplement grasses in the dry season. Mature trees may stand within a dense understory, which includes *Commiphora* spp, *Bauhinia tomentosa*, and *Popowia obovata*. The understory is likely to be man-induced since lone-standing mature trees are found elsewhere in open areas of cultivated land, and in some cases trees are selectively retained by farmers to maturity (eg *Faidherbia albida*). In some areas, woodlands and thickets may be dominated by *Mimosaceae*. *Terminalia sericea* woodlands form on sandy soils, with *Pterocarpus antunesii*, *Fagara* spp and *Grewia* spp woodland and thickets around the Lower Shire river. Base rich soils support *Euphorbia ingens*

and Commiphora thicket, whilst Hyphaene ventricosa, H. crinita and Borassus aethiopicum palms occur where the water table is high.

Becker and Lohrmann (1992) studied small East African goats at a Salima lakeshore site. Green vegetation covered 79% of the site in the wet season, with 40% cover from dry material in the dry season. In the wet season equal time was spent feeding on grass and browse, whereas in the dry season 93% of time was spent feeding on dry browse. *Andropogon schirensis* was the most common grass species, with *Markhamia acuminata*, *Bauhinia petersiana*, *Combretum fragans* and *Friesodielsia obovata* the most common browse. Grass palatability decreased markedly from wet to dry season, but browse palatability remained unchanged. Thorny acacias (*A. polyacantha*, *A. nilotica* and *A. nigrescens*) were very palatable. The leaves of *Friesodielsia obovata*, and *Combretum apiculatum* remained palatable, while the blossoms of *Cordyla africana* and *Lonchocarpus bussei* and fruits of *A. polyacantha* were highly accepted. On wetter areas of vertisols under natural pasture, a vigorous growth of *Ischaemum brachyatherum* holds surface soil together with a dense mat of rhizomes, slowing and diffusing the run-off of water (Mitchell, 1987).

3.2.6 *Swampland:*

Edges of swamps and lakes are fringed with the sedges and grasses including *Cyperus papyrus*, *Echinochloa pyramidalis*, *Typha australis*, *Vossia cuspidata* and *Pennisetum purpureum*.

3.2.7 *Gazetted forests*

These forests are managed by Forestry Department and cover an estimated 1.3 million ha. There are 93 Forest Reserves scattered all over the country. Most of them are on hills and mountains protecting these fragile areas from environmental degradation through erosion but also protects important water catchment areas.

3.3 Policies and Laws Affecting Forestry Conservation in Malawi⁷

The principal Government of Malawi (GOM) agencies—including Ministries and Departments—of direct relevance to forestry conservation in Malawi are the following: the DEPT. OF FORESTRY: responsible for implementing the National Forestry Policy and National Forestry Act, the DEPT. OF NATIONAL PARKS AND WILDLIFE, within the *Ministry of Information and Tourism*, is responsible for the management of national parks and wildlife reserves, as well as the management of wildlife outside of these protected areas, including the conservation of wildlife communities and the protection of rare, endangered and endemic species of plants and animals.

Several political, technical and grassroots' committees have been established in the country to guide or support policy, legislative and programme formulation as well as implementation of environment and natural resources management activities. The Cabinet Committee on Agriculture and Natural Resources (CCANR) is the highest-level policy and decision-making body responsible for environmental policy issues and informs Parliament on the state of the environment.

The Parliamentary Committee on Agriculture and natural Resources (PCANR) lobbies Parliament on all environmental matters but the National Council for the Environment (NCE) advises both the CCANR and PCANR committees. As a policy advisory institution, the NCE operates through working groups and national steering committees. The Technical Committee on the Environment (TCE), which advises the NCE, examines scientific issues and makes recommendations for action

3.3.1 *The National Forestry Policy:*

The National Forestry Policy (1996) and Forestry Act (1997) emphasized the:

⁷ Stephen J. Millington " Analysis of Biodiversity: Threat and Opportunities, (Phase I: Assessment of Current Status), November 2005

- Strengthening core roles of government (planning, programming, monitoring, regulating, extension and managing conservation/protection areas);
- Increasing involvement of private sector and civil society;
- Empowering communities to manage forest resources on customary land and, in collaboration with government, on reserves;
- Engaging with international obligations and processes; and
- Coordinating with other sectors

The National Forest Program (NFP) is “the means to operationalize the Policy and the Act - to translate good intentions into real results. It does this by focusing on the key issues, drawing on experiences of good local and national practice in all the key areas needed for better forestry, and making better two-way connections between policy and practice so that both can be improved”. It consists of 12 strategies, each with priority actions and assigned lead responsibilities. While all twelve strategies are important for biodiversity conservation, those of the most immediate concern relate to management of forest reserves (Strategy #9) and support to community-based forest management (Strategy #4), although managing the process of institutional change (Strategy #1) and optimizing policy influences on forests and livelihoods (Strategy #2) have the potential for significant impacts on management of natural forests and biodiversity.

The implementation challenges of the NFP can only be faced if the Forestry Department fully embraces the reorientation in philosophy, values and roles and relationships indicated above in a meaningful and demonstrable way.

3.3.2 *The National Environmental Policy:*

The Malawi’s Environmental Policy, captured in the framework National Environmental Policy and the Environmental Management Act (1996) stems from nine key environmental issues developed in the National Environmental Action Plan (NEAP) of 1994: Soil degradation, threats to forests, fisheries and water resources; threats to biodiversity, including wildlife issues; human habitat degradation, unsustainable population growth, climate change and air quality issues. The first state of the environment report was published in 1998, with two principal purposes: a) to report on the current status of a number of selected environmental indicators, and b) to report on progress made in implementing the NEAP.

3.4 Dependence on forests in Malawi

3.4.1 *Energy Needs for Households and Tobacco Estates:*

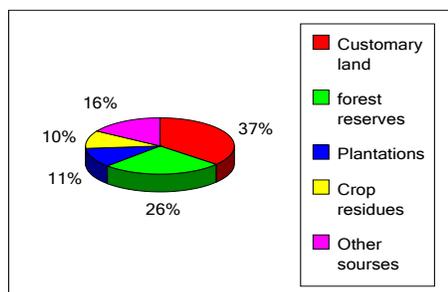
More than 80 percent of people living in Malawi depend on fuel wood and charcoal for cooking, heat, and light. Entire forest reserves, particularly in the south, have been totally cleared in the last few years, with devastating consequences for biodiversity. This unregulated situation created conditions favorable to an explosive growth in the commercial abuse of natural resources, including the rapidly expanding charcoal industry to meet industrial and domestic demands. Cutting woody vegetation for the production of charcoal, especially close to major roads and large urban centers is having a marked impact on the Malawi’s vegetation. It is estimated that 30% of the demand for wood in Malawi comes from the tobacco estates to process (curing) tobacco, with 60% of this wood coming from natural woodlands⁸ The other 40% comes from plantations. Among the large tobacco estates the Kasungu Flue Cured Tobacco Authority (KFTCA) appears to be self sufficient in supplying wood to its growers but is still over-harvesting natural woodlands, while the largest producer, Press Agriculture, meets about half of its wood needs from own resources. The other half is obtained from charcoal from Viphya (25% of its requirement) and indigenous wood customary land (25%).

According to the Government of Malawi, in its “Malawi’s National Forestry Programme”, National demand for forest products is much greater than supply. Aggregate annual consumption of forest products, estimated at 15

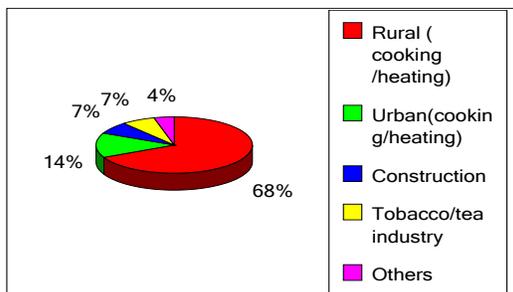
⁸ COMPASS II, Analysis of Biodiversity: Threats and Opportunities (Phase I, 2005)

million cu meters, far exceeds the potentially sustainable supply from current sources of 7-8 million Cu meters. A chronic supply and demand imbalance has consequently emerged, resulting in increasing shortages at the household level. The situation is gravest in Malawi's South.⁹

The graphs below shows the source of fuel wood for biomass energy (Graph 1) and Wood consumption patterns (Graph 2) in Malawi¹⁰



Graph 1



Graph 2

3.4.2 Construction Materials:

In many areas, including Malawi, large numbers of saplings are removed from the woodlands to be used as poles for building traditional houses. There is a high demand for wood for industrial estates and local tobacco curing and brick production.

3.4.3 Medicinal plants:

A recent study of the interactions between woodlands, vulnerability and rural responses to HIV/AIDS (Barany et al., 2005) explored the relationships between woodland management and HIV/AIDS in Malawi. The research emphasizes the role of traditional woodland coping strategies in affected communities and suggests that this may become more commonplace as the epidemic matures and mortality rates increase. A correlation between HIV prevalence and woodland degradation was found, as the use of forest products increase to meet medical and other costs. This has potentially negative implications for affected households including: loss of income generating options, increase in labor spent collecting forest products, reduction in use of firewood (possibly leading to inadequate energy to meet household needs including cooking and sanitation), and reduced access to medicine.

The study by Barany and others (op cit.) also found that collection and/or use of medicinal plants are common woodland-based responses to illness. Focus groups all identified the collection and/or use of medicinal plants as a primary response to illness. Of the households experiencing the illness of an adult member within the last 12 months, 60% relied on medicinal plants as a response. Even those who made clinic visits continued to use medicinal plants as a complement. Interviews with traditional healers revealed that medicinal plants are used in the treatment of at least 10 illnesses and symptoms related to HIV/AIDS.

Medicinal plants in general are becoming less available with 93% of herbalists reporting a general decrease over the last ten years (Barany et al., op cit.). Thirty-two medicinal plant species were identified as vulnerable to over-exploitation and increasingly difficult to source in the last 5 years, including species used in the treatment of HIV/AIDS-related illnesses. When asked about the major factors driving this change, 85% of respondents reported destructive harvesting methods as the main threat, followed by increasing demand for trade (77%), commercial

⁹ Government of Malawi, "Malawi's National Forestry Programme: Priorities for Improving Forestry and Livelihoods, 2001

¹⁰ Government of Malawi, "Ministry of Energy and Mining"

harvesting by outsiders (69%), conversion of forest land (54%), policies that prohibit collection (23%), and finally competing uses (15%). A large majority of the healers (77%) stated that over the last 5 years the number of people collecting medicinal plants in the community had increased with 40% indicating that this was a result of increased illness in the community and more people entering the trade for income generation. In general, these results agree with those from two studies undertaken by COMPASS II (see Irwin, 2004 and Greenberg & Irwin, 2005).

Nevertheless, the estate sector has potential to play a much greater role in wood and timber production. Given the financial muscle and technical capabilities of the estate sector coupled with the land area available on estates for tree planting, this sector has much to offer in increasing production and productivity of forest resources in the country.¹¹

3.5 Threats to Forests in Malawi¹²

3.5.1 Bush Fires:

The most significant force of natural disturbance within this ecoregion is undoubtedly fire. Each year, large areas of the Southern Rift Highlands are swept by fires, primarily anthropogenic. The intensity of this burning regime, which has been practiced for centuries, if not millennia, is believed to have been the main cause of the replacement of previously extensive areas of Afro-montane forests with grassland and scrub-grassland. Although it is unknown exactly how long fire has been a driving force in the ecoregion, and to what extent it has caused grassland to replace forest, fire has definitely reduced forests within the last century, and continues to do so today. Of special concern are the few surviving pockets of the historically widespread *Juniperus procera* forests, particularly the patch on Nyika Plateau, as these have been reduced not only by fire but also by recent indiscriminate felling for charcoal production and other uses.

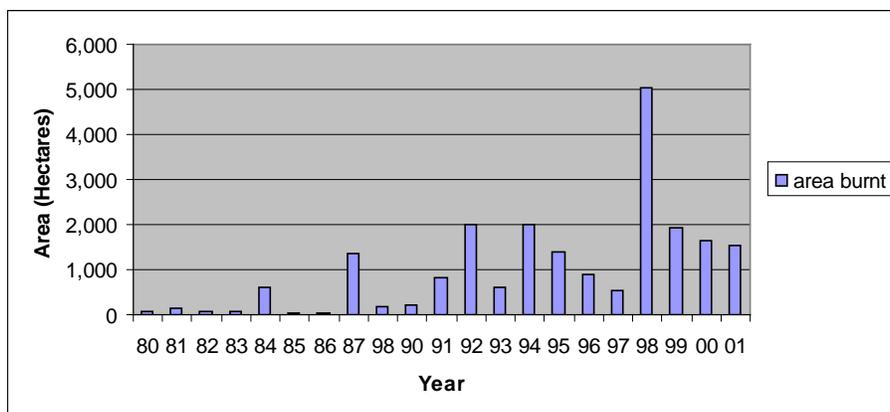
The high incidence of fires in many areas in Malawi poses further threats to the ecoregion. Although fire is an integral part of miombo ecology, human setting of fires is believed to have increased the frequency of fire far above the natural level. Most of the deliberate burning and the uncontrolled fires occur at the end of the dry season, just before the onset of the summer rains. The fires burn with greater intensity as quantities of dry fuel accumulate. These hotter fires are destructive even to fire tolerant trees and can also have negative impacts because this time coincides with miombo trees breaking their dormancy. Repeated late-season fires in many areas have decreased forest regeneration, seed germination, and seedling survival growth can be severely disturbed. In addition, fire removes species that are less fire-tolerant from the miombo, thereby reducing species diversity.

The graph below shows the extent of wild fires in Malawi for the period of 1980-2001¹³

¹¹ Government of Malawi, "Malawi's National Forestry Programme, 2001

¹² Stephen J. Millington and Madalitso Kaferawanthu, COMPASS II "Analysis of Biodiversity: Threats and Opportunities (Phase I: Assessment of Current Status, November 2005

¹³ Government of Malawi, State of the Environment Report, 2004



According to the Government of Malawi, The ability of Forestry Department to control forest fires has also been affected by lack of fire fighting equipment and fire early warning facilities. Although Forestry Department has prepared Project ideas for acquiring fire fighting equipment, no donor has been found to support the initiative. Now technology exists for early monitoring facilities through Satellite technology. Forestry Department has skilled personnel to work with satellite data for monitoring fires both in Plantation and natural forest. Equipment also exist but finance for obtaining satellite data necessary, is not available.

3.5.2 Land Use/Human encroachment:

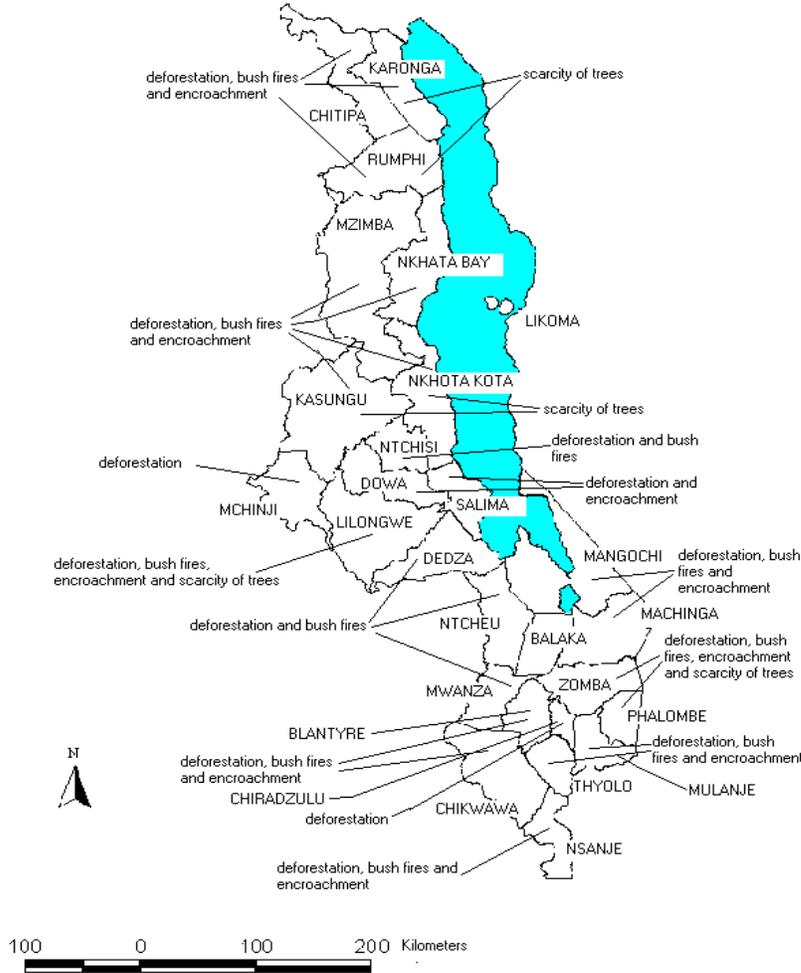
Cultivation poses the other severe threat to the integrity of the ecoregion, as land is increasingly being converted to crops such as tea, coffee, banana, finger millet, potatoes, and pyrethrum. Although shifting cultivation is practiced in places, allowing secondary succession to take place on previously worked fields, fallow lands are generally re-colonized by widely distributed species which may preclude the regeneration of the unique elements of Afromontane primary flora.

Cultivation does not only change the composition of the ecoregion's flora, but it can create serious erosion problems, as fields are often plowed on steep slopes. Overgrazing by large numbers of livestock also cause erosion problems in areas of high human population, such as parts of Malawi's Kirk Range. The continuing destruction of Afromontane grassland habitat threatens the locally occurring churring cisticola (*Cisticola njombe*) and the blue swallow.

In the early 1980's, hundreds of hectares of lowland rainforest were destroyed on the southern slopes of Mulanje to grow maize (Chapman 1991). Crop fields continue to extend up the slopes of Mulanje today (above the Forest Reserve boundary) and repeated efforts by the forestry department to evict the encroachers have failed. The extensive, forested slope below Manene peak (2,650 m) is constantly being encroached upon, the situation compounded by a fast expanding population, and in the past by an influx of Mozambican refugees. The following map shows the forestry resources hotspots and their respective threats.¹⁴

¹⁴ Government of Malawi, "State of the Environment Report, 2004"

HOTSPOTS FOR FORESTRY RESOURCES



The drier western and northern slopes of Mount Mulanje have been impacted to a lesser degree, largely due to the absence of tea plantations. However, the vegetation is still somewhat degraded, mainly by woodcutters. Other plants such as bamboo, thatching grass and *Raphia* palm are also harvested from these lower slopes. The destruction

of the indigenous vegetation of Mount Mulanje had serious implications in March 1991 when heavy rains caused an avalanche on Mchese Mountain, killing 500 people. This avalanche could have been less horrific had the forests on the lower slopes of Mchese been intact (Chapman 1991).

Growing tobacco for export has led to large losses of woodland for both land and fuelwood. These losses increase each year as new land is cleared to avoid the risk of root-knot nematodes. The curing of tobacco, is presently carried out using charcoal, compounding environmental problems.

3.5.3 *Invasive Species:*

Alien organisms pose a threat to the ecoregions, chiefly in the form of exotic timber trees of the genera *Pinus* and *Eucalyptus*, which have been used in afforesting montane grasslands. The bramble *Rubus* spp. has spread extensively throughout the Nyika National Park, where exotic rainbow trout were also introduced into dams and streams on the Plateau. The uncontrolled invasion by the exotic Himalayan raspberry (*Rubus ellipticus*) and the Mexican pine (*Pinus patula*) (Verboom 1992) have severely affected some ecoregions in Malawi. These invaders have reached every corner of the ecoregion. A successful pine eradication program was carried out on Mount Mulanje between 1987 and 1988, leaving only two areas of the mountain to be cleared. This work was however not followed up and the pines have reappeared, with Mchese Peak the only area not invaded (Chapman 1991). The eradication effort was useful in that it proved the feasibility of controlling the pine invasion. The Himalayan raspberry, on the other hand, is firmly established and extremely difficult to eradicate. This vigorous bush, which grows up to 6 m high, was first recorded 60 years ago (Chapman 1991).

2.5.1 *Deforestation:*

According to Stephen J. Millington and Madalitso Kaferwanthu on the COMPASS II on COMPASS II Biodiversity Analysis report, deforestation is one of the most widespread threats to tropical forestry in Malawi. Woodlands are being cleared for fuelwood, charcoal, and building materials as well as for agricultural land.

More than 80 percent of people living in miombo depend on fuelwood and charcoal for cooking, heat, and light. Cutting woody vegetation for the production of charcoal, especially close to major roads and large urban centers is having a marked impact on the miombo vegetation. In many areas, including Malawi, large numbers of saplings are removed from the woodlands to be used as poles for building traditional houses.

The Mulanje cedar, *Widdringtonia whytei*, is under serious threat from over exploitation. Exploitation of this tree began in about 1900, under the control of the Department of Forestry. In 1927 much of Mulanje was gazetted as a forest reserve, but cedar felling continued. Efforts were made to replant cedar stands, but these stands, which were developing well, succumbed to fire. No further attempt has been made to reestablish cedar on the mountain despite the economic incentive (cedar has become a high-priced wood) and the fact that Malawi has adopted the cedar as its national tree (Chapman 1991). Currently, the cedar forests are greatly diminished, occurring as small fragments with a total area of about 14,6 km² (Chapman 1995).

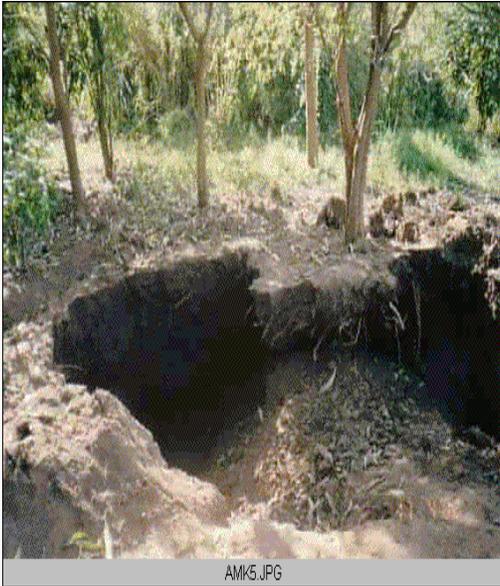
The following table shows deforestation between 1972 and 1993 for both indigenous and plantation forests of Malawi.¹⁵

¹⁵ Government of Malawi, "State of the Environment Report, 2004"

REGION	1972 FOREST EXTENT (Ha)	1992 FOREST EXTENT (Ha)	TOTAL FOREST LOST (Ha)	RATE OF DEFORESTATION (Ha/YEAR)
NORTH	1,507,266	470,238	1,037,028	51,851 (3.4 %)
CENTRAL	1,488,110	777,217	710,893	35,545 (2.4 %)
SOUTH	1,404,510	650,860	753,650	37,683 (2.7 %)
TOTAL	4,399,886	1,898,315	2,501,571	125,043 (2.8 %)

3.5.4 Sand Mining and Rock Aggregate Crushing:

Huge quantities of sand/earth and rocks have been removed from different areas studied and there has been a lot of environmental disturbances such as deforestation, in places resulting into flooding due to siltation, for instance, at Mpanje area lies along the Lilongwe-Mchinji road, approximately 1-2Km from the Mchinji roundabout whilst ABC (African Bible College), lies along the Area 49-Area 25 road, approximately half a kilometer from the Mchinji-Lilongwe road. Here huge quantities of earth have been excavated and the damage so caused to the environment is so alarming and vast. The excavations that have taken place here, depending on climatic conditions, etc., will to a certain extent, influence erosion, flooding and probably land sliding. Surface and ground water systems in the catchment area may also be affected in the sense that there will be increased seepage from the surface into the ground system. Most of the abandoned pits have also been turned into bleeding grounds for mosquitoes and also E. coli. In any case, the exploitation of sand in Malawi generally provokes extensive environmental disruptions which can also be reflected as follows: vast extensions of farming land are annihilated; relief and landscape are changed; underground water contamination; vegetation is destroyed and soil quality degraded, all of which contribute to loss of forestry and biodiversity. (The photo below shows the extent of sand exploitation and its impacts on forests)



Credit: Government of Malawi, “National State of the Environment Report, 2004”

4 STATUS OF BIODIVERSITY IN MALAWI

4.1 Ecosystem Diversity in Malawi: An Overview

Biological diversity is the variability among living organisms from all sources including, *inter alia* terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part. This includes diversity within species and between species of ecosystems. Biological diversity is most conveniently, but not exclusively, described in terms of three conceptual levels:

- Ecosystem diversity: the variety and frequency of different ecosystems.
- Species diversity: the frequency and diversity of species.
- Genetic diversity: the frequency and diversity of different genes and/or genomes.

Malawi occurs in the Zambezi phyto-region of southern Africa (White, 1983). This phyto-region has been mapped into eight eco-regions in Malawi by the World-Wide Fund for Nature (WWF)-US (Cumming, 1999).

With its unique conjunction of bio-geographical regions, varied topography and range of habitats, Malawi has high biodiversity, especially for a landlocked country. Records indicate a total of 5,000-6,000 plant species, 188 species of mammals, 69 species of amphibians, 124 species of reptiles, 648 species of birds and 600 species of fish. The level of endemism in plants, invertebrates, and mammals is not well known. However it is estimated that approximately 47 species of the 172 species of molluscs, 12 species of reptiles and seven species of amphibians (especially frogs) are endemic to Malawi. Detailed knowledge is lacking on the distribution and status of endemic and/or rare plant species in Malawi. The 2002 IUCN Red List of Threatened Plants for Malawi lists 14 endangered, 89 vulnerable, and 25 critically endangered species. Approximately 114 plant species are known from only a few localities in Malawi but none of these are formally protected. Only eleven plant species have legal protection in Malawi.

Currently, with over 800 species of fish, 90% of which are endemic, Malawi is one of the countries with the largest number and the most diverse communities of freshwater fish in the world. Around 15% of the global total freshwater species are found in Lake Malawi alone. Ninety-five percent of these species are haplochromine cichlids, which are internationally recognized as an outstanding example of rapid speciation, with a potential to provide greater insights into the understanding of the evolutionary process. Because of their sedentary habits, most of the cichlids rarely migrate long distances from their locality. The resultant isolation of communities has created species endemic not only to the lake but to certain restricted areas within the lake itself. In turn, this aspect has led to an unparalleled adaptive speciation of fish species in the lake. The high rate of habitat specialization also increases vulnerability to disturbance.

4.2 Species Diversity: Flora

Based on WWF Ecoregions, Malawi is principally represented by the central Zambezan miombo woodland ecoregion, which covers most of the central African penneplain west of Lake Malawi in the northern part of the country. Small areas to the south west and southeast of this region are represented by Southern and Eastern Miombo Woodlands respectively, which differ mainly in rainfall, being rather drier woodlands. Further south, undifferentiated Zambezan woodland predominates, with areas of mopane woodland (also represented by a small area of NW Malawi), acacia woodland and dry deciduous woodland and thicket. Rising above the plateau are mountains of the Southern Rift Montane Forest-Grassland Ecoregion in the north, extending south to the center of the country, and the South Malawi Montane Forest-Grassland ecoregion in the south, with the latter region being almost confined to Malawi, extending somewhat into Mozambique.

By contrast the other ecoregions extend further beyond Malawi's borders. The Southern Rift Montane Forest-Grassland Ecoregion marks the southern limit of many Afro-montane species and the South Malawi Montane Forest-Grassland ecoregion represents the northern limit for many species with more southerly distributions. Thus while the two ecoregions have superficial similarity in topography and habitats, in fact they are quite distinct in a number of their vegetation communities and ecological assemblages. This, in part, accounts for the high biodiversity found in Malawi.

The principal vegetation types of Malawi correspond to the ecological zones and are summarized in the table below¹⁶.

VEGETATION TYPE	DEFINING CHARACTERISTICS	MALAWI EXAMPLES
1. Zambezan Woodland (subdivided into miombo, mopane, and undifferentiated woodlands)		
A. Zambezan miombo woodland	Dominated by species of <i>Brachystegia</i> alone or with <i>Julbernardia</i> and <i>Isobertlinia</i>	Small fragments are found in Chimaliro and Namizimu Forest Reserves and Kasungu National Park
B. Zambezan mopane woodland	Dominated by <i>Colophospermum mopane</i>	Mua Tsanya Forest Reserve, Liwonde National Park, and Vwaza Marsh and Majete Wildlife Reserves
C. Undifferentiated Zambezan woodland	Defined by the absence of miombo or mopane dominants; often dominated by <i>Acacia</i> or <i>Combretum</i> spp.	Once common in Lilongwe, Shire Valley, Phalombe, and drier lakeshore plains
2. Transition Woodlands	Intermediate between forests and woodlands	Small fragments are found in Nkhata Bay, Vinthukutu, Mulanje, Viphya, and Nyika
3. Deciduous Forests and Thickets	Characterized by canopy species deciduous for more than a month and understorey species deciduous for more than two months per year	Small patches of deciduous forest are found in Lengwe National Park and Sambani Forest Reserve, also Mwabvi, Rumphu, and Karonga
4. Evergreen Forest (subdivided into riparian, lowland, mid-altitude, and Afromontane rain forests)		
A. Riparian evergreen forests	Characterized by species adapted to banks	Rivers in Nyika and Viphya plateaux,

¹⁶ COMPASS II, Analysis of Biodiversity: Threats and Opportunities (Phase I), November 2005

VEGETATION TYPE	DEFINING CHARACTERISTICS	MALAWI EXAMPLES
	of river courses or influenced by floods	Dzalanyama Forest Reserve
B. Lowland evergreen forests	Characterized by the presence of only 0-25% of Afromontane species	Foothills around Thyolo and Mulanje mountains, and in Nkhata Bay (Kalwe, Nkuwadzi forests)
C. Mid-altitude evergreen forests	Defined by flora containing a mixture of lowland and Afromontane elements	Mulanje foothills, Kaning'ina Forest Reserve, Chipata mountain
D. Afromontane rain forests	Essentially evergreen	Ntchisi mountain, Misuku Hills, Nyika and Viphya plateaux; Dedza, Zomba, Mulanje mountains.
5. Undifferentiated Afromontane Forests (occurring on high plateaux at 2250-2450 m)	<i>Hagenia abyssinica</i> forest <i>Juniperus procera</i> forest <i>Widdringtonia whytei</i> forest	Nyika National Park Nyika National Park Mulanje mountain & Forest Reserve
6. Afromontane Bamboo	Dominated by <i>Arundinaria alpina</i>	Dedza and Mulanje mountains
7. Afromontane Evergreen Bushland and Thicket	Defined by the dominance of <i>Erica</i> species	Widespread and common on larger mountains (Dedza, Mulanje, Nyika)
8. Afromontane Shrubland	Characterized by stunted individuals of bushland and thicket species	Nyika National Park, Mount Mulanje
9. Afromontane Grassland	Mainly secondary, fire-maintained grassland	Misuku Hills, Mount Mulanje, Nyika and Viphya plateaux, Dedza Mountain, Zomba-Malosa Mountains

4.2.1 Red Data List (RDL):

The Red Data List is a system designed to determine the relative risk of extinction, and the main purpose of the IUNC RDL is to catalogue and highlight those taxa that are facing a higher risk of global extinction (i.e those listed as Critically Endangered, Endangered and Vulnerable).

According to Msekandiana and Mlangeni (2002), Malawi has a total of 5,000-6,000 plant species. A total of 248 taxa are listed on the red data list; of these, 128 are threatened (critically endangered, endangered, or vulnerable) and 63 are categorized as data deficient. There are 114 species confirmed as being restricted to Malawi and a further eight are probably endemic. Thirty-one are near-endemic (distributed in adjacent areas of neighboring countries). Summary details on plant diversity are given in the following table:

Red Data List assessment of plants in Malawi

CATEGORY	NUMBER OF TAXA
Total Species in Malawi	5,000-6,000
Listed on Red Data List	247
Endemic species	114
Possibly endemic species	8
Near-endemic species	31
Possibly near-endemic species	1
Extinct species	5
Critically endangered species	25
Endangered species	14
Vulnerable species	89

Lower-risk near threatened	24
Lower-risk least concern	27
Data deficient	63

4.2.2 Cultivated Plant Genetic Diversity

According to Nsapato and Chiwona, 2000, plant genetic resources have different uses and man's survival depends on their continued presence. The Malawi Plant Genetic Resources Centre (MPGRC) was established in 1992 to coordinate and undertake germplasm conservation activities in the country (Nsapato and Chiwona, 2000). The numbers of agricultural germplasm conserved in the gene bank from 1993 to 1997 were reported in the 1998 SOER (EAD, 1998). The gene bank was holding 2448 samples of 42 species in 2000. Of these, 2026 were seed samples, while 442 were vegetation samples. Presently there are 2514 samples from 56 species and these include 2074 seed samples and 440 vegetative materials.

4.2.3 Domesticated Flora Diversity

There is a huge diversity of domesticated flora in Malawi. Varieties have been developed for different crop species that are grown in the country as a means of enhancing production. Higher and better yielding varieties of maize, groundnuts, sorghum and other crops have been developed and planted in Malawi by mainly small-holder farmers. However, this has resulted in displacement of cropland.

4.3 Species Diversity: Fauna¹⁷

According to Cumming (1999) there are 187 species of mammals, 69 species of amphibians, 124 species of reptiles, 630 species of birds and 600 species of fish. With recent records of small mammals in the Nyika National Park and the cheetah probably extinct, the number of recorded mammals is about 200.

4.3.1 Mammal Diversity

The majority of large mammal species has undergone severe declines in numbers in Malawi, especially in recent years, and is largely confined to protected areas. Despite the presence of protected areas, numbers continue to plummet, mainly due to poaching. Elephant populations have declined up to 80% in Kasungu and Nyika National Parks and were exterminated from Majete Wildlife Reserve in the past decade. Kasungu and Nyika have suffered severely from poaching of many species of large mammals. A report recently commissioned by the Danish Hunters Association indicates that levels of poaching are even higher than previously suspected and paints a gloomy picture for the future unless immediate and drastic actions are taken. The following table highlights what is known about the status of threatened mammals.

SCIENTIFIC NAME	COMMON NAME (ENG.)	DEGREE OF THREAT	CURRENT LOCALITIES
<i>Diceroa bicornia</i>	Black rhinoceros	Critically endangered	Re-introduced to Liwonde National Park after prior extirpation from Malawi

¹⁷ Government of Malawi, "State of the Environment Report, 2004"

SCIENTIFIC NAME	COMMON NAME (ENG.)	DEGREE OF THREAT	CURRENT LOCALITIES
<i>Loxodonta africana</i>	African elephant	Endangered	NATIONAL PARKS: Nyika, Kasungu, and Liwonde; WILDLIFE RESERVES: Vwaza and Nkhotakota; FOREST RESERVES: Thuma and Namizimu
<i>Lycaon pictus</i>	African wild dog	Endangered	Significant decline in Kasungu National Park; now occurs only sporadically in Malawi
<i>Rhynchocyon cirnei</i>	Checkered sengi	Vulnerable	Nyika and Kasungu National Parks
<i>Acinonyx jubatus</i>	Cheetah	Vulnerable	Formerly widespread in protected areas; now probably extinct in Malawi
<i>Panthera leo</i>	Lion	Vulnerable	Formerly widespread in protected areas; now rare in Malawi
<i>Paraxerus palliatus</i>	Red bush squirrel	Vulnerable	Liwonde National Park, Lower Shire, Mulanje and Ntchisi mountains, South Viphya plateau
<i>Lutra maculicollis</i>	Spotted-necked otter	Vulnerable	Present where suitable riverine habitat occurs, even in Lilongwe Nature Sanctuary; also in Shire River, Lake Chilwa, Nkhotakota

A list of protected species produced under the Declaration Order of 1994, 33 large mammals were declared protected in order to accord appropriate management priority to them. This list includes thirteen ungulate species. The status of mammals in different protected areas is described below.

Nyika National Park: A total of 27 large mammal species were recorded in 1997 and 29 in 1999 by the *Biosearch* Nyika Project (Overton, 1997; 1999). The main species are eland, reed buck, roan antelope and zebra. Roan antelope populations seem to be stable while reed buck declined from 1400 in 2000 to 658, Eland from 2,300 in 1997 to 520 in 2002 and zebra from 560 to 200. Other dominant species in the park are the leopard and spotted hyaena. The cheetah is probably extinct. Lion was recorded for the first time in 20 years by the *Biosearch* Expedition 2003 near Mondwe Base Camp. Regarding small mammals, 20-24 species were recorded in 1997 (Overton, 1997). *Biosearch* Expedition 2003 recorded 39 rodent species, five of which are new records for the park and two were new for Malawi.

Kasungu National Park: Most large mammals in the park have declined in numbers. The major cause of the decline has been poaching. Elephant mortality due to poaching and human/elephant conflicts continues to be high. The population has continued to decline from figures reported in the last NSOER of 2002. A dung survey of 2002 found an abundance estimate of 117 with 95% confidence interval of 92 and 142 (Bhima *et al.* 2003). The only wild dog *Lycaon pictus* population in the country is probably now extinct as there have been no recent sightings.

Liwonde National Park: Elephant, water buck, sable and impala are all growing in abundance. A count of November 2003 found 473 elephants, 450 sable and 192 buffalo. The black rhinoceros, which were introduced in 1993, reached nine in number. Other re-introduced species, i.e. buffalo, eland, hartebeest, roan antelope and zebra have all increased in numbers. Ninety-eight water buck were captured and translocated to Majete Wildlife Reserve in August, 2003. From the rhino sanctuary, a total of 268 animals were captured and removed, i.e. 141 sable antelope, 22 buffalo, 55 impala and 50 warthog. One hundred sable antelope, 55 impala and 50 warthog were captured and also translocated to Majete. Two rhino were translocated to Majete Wildlife Reserve in 2003. The small lion population that occurred in the park is believed to have moved to Mangochi Forest Reserve and does not exist in the park any more. Based on Dudley and Stead's (1977) list of 29 large mammals and the re-introductions, there are probably 34 large mammals in the park. There have been no recent observations on small mammals. Happold and Happold's (1987) list of 29 bat species remains the record from the park.

The Frankfurt Zoological Society funded management project is assisting with the development of a Liwonde National Park/Mangochi Forest Reserve Management Plan. This will help maintain the corridor between the protected areas and will be managed as one ecosystem.

Lengwe National Park: Buffalo, impala and nyala have increased recently in the park. In September 2003, 120 buffalo, 10 warthog and 5 nyala were captured and translocated to Majete. In July 2004, 100 buffalo and 15 nyala

were captured and translocated. There would be need to monitor the present status of these species after the capturing.

Vwaza Marsh Wildlife Reserve: The most recent counts of large mammals was conducted in 2002. There were 342 elephant, 140 buffalo, 190 impala, 180 hippo, 140 roan antelope, 202 hartebeest, 152 reed buck, 71 bush-buck, 201 warthog, 39 bush pig, 140 common duicker, 48 puku, 222 kudu, 55 grysbok and 16 zebra. Elephant numbers have increased from the numbers of the late 1990's. Most other species have increased from the numbers of the late 1990's.

Lake Malawi National Park: The park was established in 1980 primarily to protect representatives of Lake Malawi's aquatic communities and their habitats with special reference to the rocky lake-shore and its specialists cichlid communities, locally known as *mbuna*. Ambali *et al.* (2003) undertook the first study to assess the species abundance and distribution of the *mbuna* community. This follows Ribbinck *et al.*'s (2001) study of the inventory and abundance descriptions of specific taxa within the rocky areas of the lake. Ambali *et al.* (2003) found ten genera in this order of abundance: *Pseudotropheus* (65.64%) *Cyanotilapia* (12.22%), *Melanochromis* (8.56%), *Petrotilapia* (5.67%) *Labeotropheus* (3.42), *Labidochromis* (2.9%), *Genyochromis* (0.79%) *iodotropheus* (0.57), *Cyathochromis* (0.13%) and *Gephyrochromis* (0.03%). The Thumbi West Island had the most species diversity. The Maleri and Nakanthenga Islands also maintain high species diversity. Synthesis of the results indicated that the *mbuna* diversity is high in both protected and unprotected areas, suggesting that the exploitation of the *mbuna* for aquarium fish trade does not probably have negative effect on the *mbuna*.

There have been no estimates of other animals conducted. A list of mammals, however, was produced in 1990. These included yellow baboon, vervet monkey, blue monkey, hyrax, bush buck, hippo, otter, grysbok, bush baby, civet, ant bear, porcupine, bush pig, hyaena, leopard and kudu.

Nkhotakota Wildlife Reserve: Since the counts by JOFCA in 1995, no recent count has been conducted. The animals, i.e. buffalo, elephant, lion, leopard, roan, sable, water buck, eland, zebra, reed buck, warthog, bush buck, in the reserve are still there, but there is need for an update. In 2002, however, Nkhotakota had the only sub-population of lion that was breeding well in the country (Chandonnet, 2002). There were no estimates of frequency or survival or survival rates of cubs, but young or spoor of young were frequently seen.

Majete Wildlife Reserve. Since the reserve was concessioned out to a private company two years ago, improvements have been made in terms of management. A boundary fence, road and tourist facilities are being constructed. Prior to this, Majete had lost all this elephants, buffalo, kudu and impala in early 1990s. There was poor management due to poor government funding. Animals have been translocated from Liwonde and Lengwe National Parks.

Mwabvi Wildlife Reserve: There have been no counts recently. Animal observations have been made of buffalo, sable, kudu, impala warthog, klipspringer and nyala.

4.3.2 Birds Diversity

Birds are better known and documented than some other taxa, and are the subject of the Important Bird Area (IBA) analysis that considers bird species across Africa and seeks to identify a network of sites that, taken together, can assure the survival of all species across their ranges should there be a net loss of all remaining habitat elsewhere across the continent. The continued ecological integrity of these sites will be decisive in maintaining and conserving these bird species. Birds are also good indicators of the presence of other groups often confined to specialized habitats and can be good "proxies" for animal and plant species that may be less conspicuous and thus more difficult to document. The following table lists those species of global conservation concern that are known from Malawi. Apart from the migrant birds for which Malawi is only a very small part of their passage and wintering areas, most species are confined to forest habitats.

SCIENTIFIC NAME	COMMON NAME (ENG.)	DEGREE OF THREAT	CURRENT LOCALITIES
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SCIENTIFIC NAME	COMMON NAME (ENG.)	DEGREE OF THREAT	CURRENT LOCALITIES
<i>Bugeranus carunculatus</i>	Wattled crane	Vulnerable	Rare and declining breeding species on Nyika plateau; formerly in Kasungu National Park and perhaps Zomba plateau
<i>Alethe choloensis</i>	Thyolo alethe	Vulnerable	Rare resident in south-eastern montane forests
<i>Zoothera guttata</i>	Spotted ground thrush	Endangered	Very rare resident in southeastern montane forests
<i>Hirundo atrocaerulea</i>	Blue swallow	Vulnerable	Breeding species of montane grasslands from Misuku to Mulanje
<i>Sheppardia gunningi</i>	East coast akalat	Vulnerable	Endemic race <i>bensoni</i> resident at high densities in forest of lakeshore (Nkhata Bay and eastern escarpment of Viphya Plateau (est. 3,000 pairs)
<i>Apalis chariessa</i>	White-winged apalis	Vulnerable	Rare resident of lowland and mid-altitude forest of Shire highlands
<i>Cisticola njombe</i>	Churring cisticola	Near threatened	Common in montane grasslands of Nyika plateau
<i>Dendrocopus stierlingii</i>	Stierling's woodpecker	Near threatened	Occurs commonly in Dzalanyama Forest Reserve and occasionally elsewhere in miombo woodland
<i>Acrocephalus griseldis</i>	Basra reed – warbler	Near threatened	Very rare winter visitor
<i>Circus macrourus</i>	Pallid harrier	Near threatened	Small numbers on passage and winter
<i>Ardeola idae</i>	Madagascar pond heron		Irregular visitor
<i>Falco naumanni</i>	Lesser kestrel	Vulnerable	Small numbers on passage and winter
<i>Gallinago media</i>	Great snipe	Near threatened	Small numbers on passage and winter
<i>Crex crex</i>	Corncrake	Vulnerable	Small numbers on passage and winter
<i>Glareola nordmanni</i>	Black-winged pratincole	Near threatened	Vagrant
<i>Phoenicopterus minor</i>	Lesser flamingo	Near threatened	Irregular visitor
<i>Falco fasciinucha</i>	Taita falcon	Vulnerable	Has bred but irregular

22 Important Bird Areas have been identified in Malawi, based on the occurrence and distribution of 17 species of global conservation concern that are endemic to the Tanzania-Malawi Endemic Bird Area and 94 species restricted to three biomes – the Afro-tropical Highlands, the Zambezian biome (predominantly miombo-restricted species) and the East African Coast biome.

4.3.3 Amphibians Diversity

There were 74 recorded species of amphibians comprising two Apoda and 33 species of toads and frogs in Malawi (Poynton and Broadley, 1985). Thirty-three are from Mulanje Mountain (Bradly, 2001). The *Biosearch* Expedition, 2003 recorded 32 species of frogs and toads in the Nyika National Park. 41% of these were known to occur in Malawi. Two new species were the Mozambique rain frog *Breviceps mossambicus* and Frances squeaker, *Arthroleptis francei*.

A list of threatened amphibian species is found in the table below, but the distribution and abundance of amphibian species remains incomplete and new species may yet be discovered in Malawi.¹⁸

¹⁸ Stephen J. Millington & Madaliso Kaferawanthu, Analysis of Biodiversity: Threats and Opportunities (Phase I)

4.3.4 Reptiles Diversity

There are 124 reptile species listed in Malawi. These include snakes, lizards, chameleons and tortoises. The Nile crocodile *Crocodylus niloticus* is generally widespread in the Shire River and in Lake Malawi. There have been no counts recently, but the Department of National Parks and Wildlife intends to undertake a count soon. Crocodiles are also bred at Nyika Crocodile Farm in Salima Komacroc Farm in Mangochi and Mpatamanga Farm in Blantyre.

There were 56 recorded reptile species on Mulanje Mountain (NSOER, 2002). Wilson (2004) reported a first record of the Gaboon Viper, *Bitus gabonica* the mountain, bringing the list to 57.

4.3.5 Fish Diversity¹⁹

Currently, with over 800 species of fish, 90% of which are endemic, Malawi is one of the countries with the largest number and the most diverse communities of freshwater fish in the world. Around 15% of the global total freshwater species are found in Lake Malawi alone. Ninety-five percent of these species are haplochromine cichlids, which are internationally recognized as an outstanding example of rapid speciation, with a potential to provide greater insights into the understanding of the evolutionary process. Because of their sedentary habits, most of the cichlids rarely migrate long distances from their locality. The resultant isolation of communities has created species endemic not only to the lake but to certain restricted areas within the lake itself. In turn, this aspect has led to an unparalleled adaptive speciation of fish species in the lake. The high rate of habitat specialization also increases vulnerability to disturbance. The table below shows the diversity of Riverine and Lacustine fish species in Lake Malawi, as well as the percentage of endemism.

FAMILY	# OF GENERA	# OF SPECIES	ECOSYSTEM PRESENCE	% ENDEMISM
1. Protopteridae	1	1	River	0.0
2. Anguillidae	1	1	River and Lake	0.0
3. Mormyridae	4	7	River and Lake	0.0
4. Salmonidae	1	1	River	0.0
5. Characidae	2	2	River and Lake	0.0
6. Cyprinidae	5	26	River and Lake	38.0
7. Bagridae	2	4	River and Lake	25.0
8. Amphiliidae	1	2	River	0.0
9. Clariidae	2	17	River and Lake	71.0
10. Mochokidae	2	3	River and Lake	33.3
11. Poeciliidae	1	1	River and Lake	0.0
12. Aplocheilidae	1	2	River	50.0
13. Mastacembelidae	1	2	River and Lake	100.0
14. Cichlidae	41	c. 750	River and Lake	99.5
TOTAL ENDEMICS		c. 768 species		

4.3.6 Domesticated fauna

Among the domesticated fauna are cattle, goats, sheep, pigs, rabbits, guinea pigs, chickens, ducks, turkeys and guinea fowl. Cattle are most numerous in the Central Region.

¹⁹ Stephen J. Millington, COMPASS II/DAI " Analysis of Biodiversity: Threats & Opportunities (Phase I), Systematics team of the SADC/GEF Lake Malawi Biodiversity Project

4.4 Invertebrates Diversity²⁰

An inventory and bibliography of the invertebrate bio-diversity of Malawi was collated by Dudley (1997). He describes invertebrates as a continuum of organisms from the simplest sponges (Porifera) and jellyfish (Cnidaris), through worm phyla (Platyhelminthes, Nematoda and Annelida (earthworms) 7; Mollusca (snails, slugs, mussels, etc.) 175; and Arthropoda (insects) 8,344. This is a total of 8,621 species. Dudley has however, estimated that the total number of insect species could be in the range of 129,000 to 558,000.

As insects make up approximately 85% of the invertebrates, this could mean that Malawi is home to 152,000-656,000 species (Dudley, 1996). There have been several update studies on insects recently. In Nyika National Park, Entomologist Murphy's (2003) report and the *Biosearch* Expedition 2003 list of insects now amounts to 882 species from the 792 species reported in the NSOER of 2002. Murphy has also undertaken observations in Vwaza Marsh Wildlife Reserve, Lake Malawi National Park and Mwabvi Wildlife Reserve.

Murphy (2003) reports that one moth species, *Macrocossus rudis* in Lake Malawi National Park found in November 2003 was not previously recorded in Malawi. In Vwaza Marsh Wildlife Reserve, a Saturniid moth *Imbrasia belina* and a tiger beetle *Myriochile hauseri* previously known from Kenya were recorded. Dirkstra (2004) has recorded 65 species of Odonta (dragonflies) on Mountain Mulanje and its slopes. In the Lower Shire, Dowsett (2004) reported of the first surveys of butterflies in the wildlife reserves and recorded 93 species with an additional eleven species based on sight records. There are no recent updates for the Lake Chilwa area. Below is the lists of insects species recorded in Vwaza Marsh Wildlife Reserve, Lake Malawi National Park and Mwabvi Wildlife Reserve.

	Vwaza Marsh	Lake Malawi	Mwabvi
• Butterflies	17	3	-
• Moths	54	6	6
• Beetles	28	6	-
• Flies	1	-	-
• Bugs	3	-	-
• Plant bugs	1	-	-
• Bees and wasps	1	-	-
• Lace wings/ant lions	4	-	-
• Dragon flies	5	-	-
• Cockroaches	2	2	-

4.5 Value, Use and Economics of Biodiversity in Malawi

²⁰ Government of Malawi, "2004 State Of the Environment Report, 2004

Human society is highly dependent on genetic resources—including those from wild or semi-domesticated sources—for the productivity of its agriculture, livestock and fisheries. Malawi's economy is entirely based on the biological resources and services provided by the ecosystems. For instance, ecosystems perform services beyond production of food, fiber, fuel and income, such as recycling of nutrients, control of local microclimate, regulation of local hydrological processes, regulation of the abundance of undesirable organisms, and detoxification of noxious chemicals.

4.5.1 *Ecological balance:*

Forests or grasslands prevent soil erosion, replenish groundwater, and control flooding by enhancing infiltration and reducing run-off and are major sinks for green house gases. Aquatic ecosystems provide sanctuary or breeding nurseries for aquatic biodiversity (NBSAP, 2005).

4.5.2 *Economic: The Forest Industries*

Forest industry and trade in Malawi is represented by a handful of companies. There is potential for improvement. These companies are RIPLY through a concession with the Department of Forestry, Leopard Matches Ltd, established in 1967 (and is an international company which deals with processing of wood into match products), Shire Ltd, a national company established in 1964 and Wood Industries Corporation, originally a division of the Forestry Department and was privatized in 1993.

Malawi has remained a net importer of processed wood products, in spite of having a substantial forest plantation. The major problem has been gross under utilization of Chikangawa plantations (59 % of the country's softwood plantations) due to lack of investors.

There is potential for improvement. These companies are RIPLY through a concession with the Department of Forestry, Leopard Matches Ltd, established in 1967 (and is an international company which deals with processing of wood into match products), Shire Ltd, a national company established in 1964 and Wood Industries Corporation, originally a division of the Forestry Department and was privatized in 1993.

According to USAID-funded COMPASS II in its Analysis of Biodiversity (draft 2005), relatively few of the biodiversity benefits currently have a direct market value, but the economic cost of degradation of ecosystem services is being increasingly recognized as crop yields decline as a result of soil fertility decreases and fish yields diminish as spawning areas become silted up. There are fundamental asymmetries in access and benefits to ecosystem goods and services in both the short term and long term. It is clear that short term exploitation of some resources is having negative impact on both short term and longer term benefits potentially accruing to a wider (and some arguably more needy) group of beneficiaries. This area has been little studied in Malawi, even for relatively important areas such as fisheries. COMPASS is presently conducting a study of resource valuation for Malawi.

4.5.3 *Health:*

Apart from using plants and animals and their components to avert nutritional diseases (e.g., kwashiorkor) various biological resources such as microorganisms are used in preparing chemical components of modern and traditional medicines while plants are directly ingested as herbal medicine.

A recent study of the interactions between woodlands, vulnerability and rural responses to HIV/AIDS (Barany et al., 2005) explored the relationships between woodland management and HIV/AIDS in Malawi. The research emphasizes the role of traditional woodland coping strategies in affected communities and suggests that this may become more commonplace as the epidemic matures and mortality rates increase. A correlation between HIV prevalence and woodland degradation was found, as the use of forest products increase to meet medical and other costs. This has potentially negative implications for affected households including: loss of income generating options, increase in labor spent collecting forest products, reduction in use of firewood (possibly leading to inadequate energy to meet household needs including cooking and sanitation), and reduced access to medicine.

4.5.4 *Ecotourism:*

The use of biodiversity for aesthetic and recreational purpose is practiced at the local community level and by non-residents for both consumptive and non-consumptive uses. Site seeing, photographic safaris and mountain hiking are some of the non consumptive uses and fishing and hunting are some of the consumptive uses. All these activities depend on the continued existence of plant and animal species, and quality habitats and ecosystems.

Tourism in Malawi thrives on natural resources and major resources attractions include water bodies, biological diversity, parks, mountains, and cultural heritage. The value of biodiversity in terms of aesthetic value has never been estimated although tourism dominated by visits to the lake and game viewing contributed to 4.2% and 3.2% of the GDP between 1996 and 1997.

4.5.5 *Livelihood (Fishing, Agriculture etc.)*

According to the Government of Malawi in its State of the Environment Report of 2004, fish plays a very important economic and nutritional role as a source of food, income and employment. Statistics indicate that fish contributes an estimated 4 per cent to the country's Gross National Product (GNP). Fish provides an important means of livelihood to rural poor in particular the lakeshore communities, where 14 per cent are employed in fishing, constituting 52 per cent of their livelihood means. Nearly 1.6 million people derive income from fishing, fish processing, marketing and trading, boat and gear making and allied industries.

Over 250,000 people depend on fish as a source of food and livelihood along the major fishing areas in Mangochi, Dedza, Salima, Nkhota Kota, Nkhata Bay, Rumphu, Likoma and Karonga Districts. Small-scale local fishers catch up to 95% of the fish in Malawi. Over 70% of this fish comes from Lake Malawi, particularly from Mangochi, Salima, Nkhota Kota, Nkhata Bay, Rumphu, Karonga and Likoma Districts. The rest of the fish come from Lakes Chilwa and Chiuta in Zomba, Machinga and Phalombe Districts. There is also a contribution from the Lower Shire floodplains in Chikwawa and Nsanje Districts. At an estimated, conservative beach price of MK 50/kg, this represents an estimated cash income of well over MK 2.15 billion made by local fishing communities and fishing companies.

Nutritionally, fish provides 70 % of animal protein, and 40 % of total protein in take, in rural and urban diets was derived from fish prior to the collapse of Chambo stocks. Lake Malawi has a rich bio-diversity. With 800 different fish species, it is regarded as one of the World's important freshwater heritage and 14 % of global freshwater fish bio-diversity are found in this lake.

Lake Malawi is the major contributor of fish production in Malawi. Out of the average total annual catches of 60,000 metric tonnes, at least half of it comes from this lake. Fish production from this lake as indicated in figure 1 shows an increasing trend from 1976 to 1988, thereafter; there has been fluctuations until 1996 when a highest catch of 40,000 tonnes was observed. Major species composers of the catch include utaka (32.7%), usipa (28.7 %), chambo (11.7) and a mixture of kambuzi and catfishes. The major gears contributing to this catch are gill nets (43.1% of the catch), chilimira nets (32.9 %) and kambuzi seines (14.5%).

Despite such a pronounced significance to the nation, fish resources are faced with a number of challenges, which if left unchecked will significantly reduce potential as well as actual contribution to the national economy. The Malawi fishery has gradually declined from a peak production of 70,000 tonnes in early 1990s to as low as 50,000 tonnes in the late 1990s. As a consequence, fisheries contribution to total animal protein intake has gone down by 20 per cent from 70 per cent and per capita fish consumption has dropped from 14kg/capita/yr in mid 1970s to below 6kg/capita/yr in 2003. Of particular concern is the Chambo fishery, which has exhibited the single most significant decline. From 1980 to 2000, there has been a total production loss of about 9 000 tons. At current market prices, this is equivalent to an annual USD 15 million loss in revenue to the industry.

4.5.6 Energy Needs:

Most of the wood fuel is consumed by the rural people for domestic purposes in Malawi. Various studies have shown that the national trend of fuelwood consumption over time is increasing. Over the period of 7 years (1983 - 1990), wood consumption increased from 8.5 million tons to about 12 million tons per year, an increase of about 41 % (source) within the same period, wood demand for tobacco industry increased by about 29 %²¹ (source)

Considering all the major wood consumers, wood demand is about 8.5 million m³/year Sustainable wood supply is 5.2 million ha (Kainja, 1993). This calculation excludes National Parks and Game Reserves. There is therefore a wood deficit of 3.3 million m³ between sustainable supply and demand, which will result into exploitation of forest resource below sustainable level. Given the key role that wood plays both in the National economy (supporting agro-industry, which is the backbone of Malawi's economy) and supporting rural livelihood (supply of wood and non-wood products), there is a problem that must be addressed with urgency in order to avert a serious energy crisis and indeed economic collapse.

There is an increasing opportunistic trade in rare commodities and firewood has become such a commodity. In the past few years, it has become more difficult for urban and peri-urban dwellers to obtain firewood easily. In Blantyre for example, this has led to the decimation of Ndirande Forest Plantation and the natural *Brachystegia* forest, which had been established for timber and environmental conservation.

In the customary land areas, trees are being cut for brick burning, lime firing and similar businesses. The production of charcoal destroys large tracts of mainly indigenous plants. This is occurring around all major urban centres of Malawi. A major hot spot is the Mwanza-Chikwawa area including Majete Wildlife Reserve, with charcoal supplying Blantyre City.

4.6 Policies and Laws Affecting Biodiversity Conservation

4.6.1 Water Resources

In 1994, the Government produced and adopted the first water policy known as the Water Resources Management Policy and Strategies (WRMPS). The 1994 WRMPS was revised in 2000. During the revision of the policy, the Water Resources Act of 1969 was reviewed. The 2000 Water Policy was further reviewed and amended in 2004, following recommendations for strengthening of the Water Resources Board. The revision of the policy is aimed at strengthening and harmonizing issues of water resources management and utilization in order to guide the country in the sustainable use of water.

The 2004 revised Draft Water Policy, which is currently awaiting approval by cabinet, includes the following guiding principles.

- Water resources management shall be based on the concept of decentralization and local participation so that the unit of water resources management shall be the catchment;
- Management, conservation, protection and development of water resources shall be undertaken in an integrated manner;
- Water regulation shall be based on reliable continuous data collection, management, and analysis to ensure accurate assessment of water resources and dissemination of information for effective planning of water resources development;

²¹ GOM, " State Of the Environment Report, 2004

- Water demand management approaches shall be adopted in all cases of water resources development and management, and water allocations shall consider ecosystem integrity and biodiversity including marine and estuarine life (*authors note: presumably referring to Lake Malawi*);
- There shall be no agricultural and infrastructure construction activities below the 477-metre above mean sea level contour line along Lake Malawi and below the 100-year flood water level along the rivers.

4.6.2 Forestry

The National Forestry Policy, which was approved by Parliament in 1996, is aimed at promoting sustainable contribution of national forests, woodlands and trees towards the improvement of the quality of life in the country by conserving the resources for the benefit of the nation and to the satisfaction of diverse and changing needs of Malawi population, particularly rural smallholders. The main goal of the Forest Policy is therefore to improve quality of life for rural communities and providing stable local economy in order to reduce degenerative impact of development on the environment that often follows poverty.

The implementation challenges of the NFP can only be faced if the Forestry Department fully embraces the reorientation in philosophy, values and roles and relationships indicated above in a meaningful and demonstrable way.

4.6.3 Environment

The National Environmental Policy (NEP) and the Environment Management Act (1996) were developed from the 1994 National Environmental Action Plan (NEAP), which considered nine key environmental issues:

- i. Soil degradation;
- ii. Threats to forests;
- iii. Threats to fisheries;
- iv. Threats to water resources;
- v. Threats to biodiversity, including wildlife;
- vi. Human habitat degradation;
- vii. Unsustainable population growth,
- viii. Climate change; and
- ix. Air quality.

State of the Environment Reports have been produced every two years from 1998 with the aims of (1) reporting on the current status of a number of selected environmental indicators and (2) reporting on progress in implementing the NEAP.

A revised NEP (2004) included conservation of biodiversity as a cross-sectoral issue and included ten strategies for management of biological diversity in Malawi:

1. Identify valuable areas of biodiversity, particularly outside of protected areas, and in consultation with local communities, explore means of protecting such areas, including gazettement as protected areas, and purchasing of land-use rights or of conservation easements;
2. Promote biodiversity conservation programs undertaken by sectors such as forestry, fisheries and wildlife that protect biodiversity and provide benefits to local communities so that they are motivated to conserve the resources and use them in a sustainable manner;

3. Promote ecotourism both as a means of conserving biodiversity and of earning income;
4. Provide a mechanism for fair distribution of costs and benefits deriving from protected areas between central and local governments and local communities;
5. Foster public support and encourage private investment in biodiversity conservation through public awareness campaigns and appropriate incentive schemes;
6. Establish and develop biodiversity networks, both national and international for information exchange and consultation;
7. Promote and strengthen activities of the National Gene Bank;
8. Provide alternative income generating activities as a means of assisting the conservation of biodiversity;
9. Adhere to and implement international biodiversity treaty obligations that are relevant to Malawi's situation; and
10. Develop legislation to promote and protect indigenous knowledge systems for conservation and sustainable management and utilization of biodiversity.

4.6.4 *National Parks and Wildlife*

The National Parks and Wildlife Act (Amendment) of 2004 allows for local community participation and private sector involvement in the conservation and management of wildlife through a wildlife management agreement or a concession agreement with a designated wildlife management authority.

The Act also contains a declaration on endangered species. This can refer to individual species or to all or some species in a specified area. Lists will be published periodically. Malawi is also a party to the CITES convention on trade in endangered species.

4.6.5 *Protected Areas:*

The government has set up protected areas as a measure to conserve some of the country's biological diversity. There are three main categories of protected areas namely, national parks, wildlife reserves and forest reserves. These areas cover an area of about 1,850,000 ha, which is about 20% of the country. They protect various ecosystems, many of the remaining wildlife animal populations and water catchment areas.

Most protected areas were established in the colonial era, as far back as the 1920s. Although these areas were established this far back, the reduction in forest estate that occurred in the country has, in part, been attributed to Government policy on protected areas in which forests were largely viewed as a hindrance to agriculture (Lowore, 1993). Gazetted forests were regarded as Government property and off limits, and this situation resulted in large-scale deforestation on customary land.

4.7 Participation in International Treaties and Convention²²

Malawi adheres to several international environmental conventions, treaties and protocols. The Government has signed and ratified the Convention on Biological Diversity whose objectives are the conservation of biodiversity, the suitable use of its components and the fair and equitable sharing of the benefits arising from the utilization of the genetic resources. In addition, Malawi is a signatory of the following conventions related to biological diversity:

²² Stephen J. Millington & Madalitso Kaferawanthu, "Analysis of Biodiversity: Threats & Opportunities (Phase I), November 2005

1. *Convention on Biological Diversity (CBD)*. Malawi ratified in 1992.
2. *Convention on Wetlands (Ramsar Convention)* ratified in 1997. Lake Chilwa is a Ramsar Site. However, the country still does not have a wetlands policy.
3. *Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)*: elephants and rhino are Appendix 1 species because if they are not threatened with extinction now, they may become so unless trade in its specimens is subject to strict regulation. The crocodile is in Appendix II and Malawi has a quota of 200 crocodile specimens from the wild per year.
4. *Convention on the World Heritage Sites*. Lake Malawi National Park is a World Heritage Site.
5. *United Nations Framework Convention on Climate Change*. Malawi produced its first initial communication paper on climate change in 2003 through the co-ordination of the Environmental Affairs Department.
6. *The Convention to Combat Desertification and Drought*.
7. *FAO International Undertaking on Plant Genetic Resources*.
8. *Montreal Protocol for the Protection of the Ozone Layer*.
9. *Convention on International Plant Protection*.
10. *United Nations Convention on the Law of the Sea*.

The following Regional Protocols developed by the Southern African Development Community (SADC) also have bearing on biodiversity conservation, environmental management, and natural resources, or for those not yet in force, will require greater regional integration of biodiversity considerations:

1. Protocol on Shared Watercourse Systems (in force since 1998); and Revised Protocol on Shared Watercourses (Malawi is signatory; ratification pending);
2. Protocol on Wildlife Conservation & Law Enforcement (Malawi is signatory; ratification pending);
3. SADC Policy and Strategy for Environment and Sustainable Development approved by Ministers in 1996; proposed Environmental Charter in drafting stages since 2000;

4.8 Threats to Biodiversity in Malawi

4.8.1 Overfishing

There has been a steady increase in the number of fishermen (10,601 in 1990 and 13,546 in 1997) and fishermen assistants (25,495 in 1990 and 37,310 in 1997) (trends tables at the end of chapter). The increase is mainly due to more people taking up to fishing to supplement their income requirements. This trend is supported by the UEMP studies which identified a trend of an increasing number of fish vendors in urban areas over the last 5 years of between 50% and 75 %.

Most fishing gears in use are illegal. A 1999 survey of the South-East Arm of Lake Malawi found 100 % of the beach seine nets used had illegal small meshes, 96 % of gillnets were undersized, 57 % of the Mkacha nets, and 35-40 % of the Chilimila and Kambuzi nets had illegal mesh size. As a result, catches are dominated by juveniles and immature fish, thereby not only reducing the potential production levels, but also eliminating future breeding stocks. The use of illegal gear is a result of poor enforcement (e.g., in 2002 no-one was prosecuted for illegal fishing whereas hundreds of people were prosecuted for poaching in national parks and reserves). It is also a result of the failure of participatory fisheries management and community empowerment to regulate fishing effectively.

4.8.2 Agriculture encroachment and unsustainable cropping practices:

Cultivation poses the other severe threat to the integrity of the ecoregion, as land is increasingly being converted to crops such as tea, coffee, banana, finger millet, potatoes, and pyrethrum. Although shifting cultivation is practiced in places, allowing secondary succession to take place on previously worked fields, fallow lands are generally recolonized by widely distributed species which may preclude the regeneration of the unique elements of Afromontane primary flora.

Cultivation does not only change the composition of the ecoregion's flora, but it can create serious erosion problems, as fields are often plowed on steep slopes. Overgrazing by large numbers of livestock also cause erosion problems in areas of high human population, such as parts of Malawi's Kirk Range. The continuing destruction of Afromontane grassland habitat threatens the locally occurring churring cisticola (*Cisticola njombe*) and the blue swallow.

The Thyolo and Mulanje districts are major tea producing areas and the natural vegetation on the south eastern slopes of these mountains has been replaced by extensive tea plantations. Tea was first planted on the slopes of Mount Mulanje in 1891 and then on Thyolo Mountain in 1933. Until the mid 1960's this ecoregion was the most extensive area of tea under cultivation anywhere in Africa (Boeder 1988).

Annual food crops are also planted on the rain-facing southern and southeastern slopes. In the early 1980's, hundreds of hectares of lowland rainforest were destroyed on the southern slopes of Mulanje to grow maize (Chapman 1991). Crop fields continue to extend up the slopes of Mulanje today (above the Forest Reserve boundary) and repeated efforts by the forestry department to evict the encroachers have failed. The extensive, forested slope below Manene peak (2,650 m) is constantly being encroached upon, the situation compounded by a fast expanding population, and in the past by an influx of Mozambican refugees.

4.8.3 Pollution of water bodies:

One of the most important threats to water bodies are coming from the land. The shores of Lake Malawi have been developed to accommodate a wide range of competing uses of land including, *inter alia*, human settlements, agriculture, industry, tourism, commerce, fisheries, forestry, parks, Government institutions and other infrastructure (Government of Malawi, 1987). This uncontrolled settlement pattern has resulted in enhanced run-off of sediment and nutrients into the lake causing eutrophication of the mesotrophic lake waters, thus allowing the growth of aquatic algae and invasive water plants.

A hydrological and limnological working group identified those catchments from which highly nutrient and sediment-laden waters are entering the lake. Over time, these inputs will alter the chemistry or condition of the lake's water, encouraging algal blooms, increasing the incidence of sediment plumes, and encouraging invasion by plants such as water hyacinth. Such changes will affect the fish species composition, as the endemic fishes of the lake are adapted to clear and quite nutrient poor waters (WWF, 2002).

4.8.4 Climate Change:

There is evidence that global weather patterns are changing as a result of climate change. This is exacerbated by local conditions such as reduced vegetation cover and although the consequences are difficult to forecast, increased variability and unpredictability of local climatic conditions could lead to decreased crop yields and chronic food insecurity. Rapidly changing socio-economic factors can lead to increased sensitivity to climate shocks; for example, the high incidence of HIV and increasing levels of poverty increase the exposure of the population and its inability to cope with climatic stress. Changes in rainfall patterns and distribution through the seasonal cycle are likely to have devastating consequences. Furthermore, the options for employing traditional coping strategies, often dependent on biodiversity, are declining as a result of land and natural resource degradation and increasing vulnerability to climate variability and change.

A further potential impact of climate change is that some ecosystems are more vulnerable to change than others. Among those most vulnerable are high altitude montane ecosystems where relatively small changes are predicted to have a significant effect in shifting altitudinal limits for certain ecosystems and habitats over a relatively short time frame. This could result in unique mountaintop animal and plant communities disappearing, to be replaced by examples of formerly lower altitude communities. While the alpine ecosystems of high mountains that are most vulnerable do not occur in Malawi, and human-induced short-term changes are certainly a greater threat, the situation is certainly deserving of close monitoring.

Crop production in 2003/04 was adversely affected by late onset of rains and a prolonged dry spell which occurred at a critical development stage, especially in the southern region. These developments lowered overall crop production. Crop production estimates figures released by the National Statistics Office indicated a total Maize production of 1,731,925 MT, 13% lower than the estimated 1,983,440 MT produced in 2002/03 season.²³

During the 2003/4 season, climate extremes in form of floods affected Malawi. Reports from the Disaster Management Secretariat indicate that 1156 people had their houses damaged by floods in areas of Traditional Authority (TA) Nkumba, TA Kaduya, TA Nazombe, TA Chiwalo and Sub-TA Jenala in Phalombe District. The floods occurred on 16th February, 2004. In Zomba, from 21-24 February, floods affected 69 households in TA Mwambo area where houses were damaged.

4.8.5 Invasive Species:

Malawi faces a number of threats from invasive alien species (IAS)²⁴. These include introduced water plants such as Water Hyacinth (*Eichornia crassipes*) and Water Lettuce (*Pistia stratiotes*), which, in addition to competing with native water plants, decrease oxygen levels, provide breeding sites for mosquitoes and bilharzias snails and impede navigation, hydropower schemes and irrigation. These species are already causing problems in the upper Shire River. A serious threat to the montane region is the uncontrolled invasion by the exotic Himalayan raspberry (*Rubus ellipticus*) and the Mexican pine (*Pinus patula*). These invaders have reached every corner of the ecoregion. A successful pine eradication program was carried out on Mount Mulanje between 1987 and 1988, leaving only two areas of the mountain to be cleared. This work, however, was not followed up, and the pines have re-appeared, with Mchese Peak the only area not invaded. The eradication effort was useful in that it proved the feasibility of controlling the pine invasion. The Himalayan raspberry, on the other hand, is firmly established and extremely difficult to eradicate. This vigorous bush, which grows up to 6 m high, was first recorded 60 years ago. The introduction of exotic conifers has been accompanied by the arrival of various pests, one of which (an aphid) has caused serious damage to native Mulanje cedar trees.

Perhaps the most serious threat is the potential introduction into Lake Malawi waters of non-native fish species. This has had a catastrophic effect in Lakes Victoria and Tanganyika where native fish radiations comparable to that of the cichlids of Lake Malawi have been decimated.

5 INSTITUTIONS INVOLVED IN CONSERVATION OF FORESTS AND BIODIVERSITY

5.1 Government of the Republic of Malawi (GoM)

Since most Malawians depend upon natural resources for their day to day living it is of vital importance that environmental problems are addressed thereby improving their livelihoods.

²³ GoM, State of the Environment Report, 2004

²⁴ USAID-DAI/COMPASS II, Analysis of Biodiversity: Threats & Opportunities, November 2005

5.1.1 Policy development and Institutional Frameworks:

The Malawi Government adopted a new constitution in 1995 based on the principles of participatory democracy and many of its recent policies and Acts reflect this participatory approach. The Government's new and developing policies for the management of natural resources involves the progressive transfer of resource ownership and management from the state to the resources users i.e. private landowners, communities, clubs and individuals. And it is these users who are being encouraged to carry out their own state of the environment assessments at Traditional Authority level and even community and school level. Information gained at these levels will feed into District State of the Environment Reports which in turn will feed into the National State of the Environment Report, thereby providing the opportunity for everyone to contribute to environmental management in Malawi.

The Malawi Government approved the Environment Management Act in 1996 that mandates the districts to produce State of the Environment Reports every two years. A State of the Environment Report is crucial in providing an environmental picture of the country. Without knowing the state of Malawi's natural resources it is not possible to target resources for improving environmental problems through carrying out environmental action plans and environmental micro-projects. Hence, the state of the environment report is a monitoring tool revealing trends in environmental issues.

The first national state of the environment report was written in 1998 and this edition represents a continuation of the state of the reporting process. And for the first time the districts have written their own state of the environment reports that have been referred to in order to produce this national document.²⁵

5.1.2 Reforestation programs:

To tackle the deforestation problem facing Malawi's environment, the Forestry Department, under the Wood Energy Project funded by the World Bank, embarked in the establishment of fuelwood and poles plantations country wide. A total of 22,895 hectares were established, bringing the total of plantations under the Forestry Department to 97,210 hectares. The private sector has also established a total of 35,539 hectares of additional fuelwood and poles plantations mostly on tobacco and tea estates.

One way of reducing deforestation is by reducing wood consumption by individuals. There have been initiatives designed to introduce an energy saving component through the introduction, distribution and fabrication of energy saving devices, such as the ceramic *mbaula* designed by the Energy Studies Unit. While Government was responsible for the design and marketing of the ceramic *mbaula*, the intention was to pass down this technology to private entrepreneurs. Government is no longer producing these ceramic *mbaula*. The presence of these devices on the market now is evidence of the success of this initiative as private entrepreneurs continue to produce and market them, mostly for the urban market. In 2001 Wood Industries Corporation have been promoting *mbaula* through their Mbaula Stove Project which has involved the free distribution of over 500 stoves, mainly in Zomba District. A slight increase in demand for the *mbaula* stoves has been witnessed.

Alongside this initiative was the production of charcoal made from pine to replace charcoal from indigenous wood. Like the *mbaula* project, Government developed the technology and passed it on to private entrepreneurs. The estate sector embraced this technology because it resulted in cuts in their energy budget. Apart from the estate sector, no other sector has adopted it. This initiative, therefore, had limited success.

5.1.3 Research and Education

Main research areas for Forestry Research Institute of Malawi (FRIM) are, silviculture (both natural trees and exotic), social forestry, forest measurement, tree breeding, forest seed services, forest entomology, forest pathology, soil sciences and wood sciences.

²⁵ H. Thomson, M.P. Minister for Natural Resources and Environmental Affairs in the NSOER Foreword

Research programmes are reviewed by the National Forestry Research Committee which meets once every 3 years. It is during such meetings where research projects are drawn up and prioritized to address specific problems.

Besides FRIM, there is also Agro-forestry Research being conducted at Makoka and Chitedze Agriculture Research Stations through the sponsorship of ICRAF.

Forestry Department runs Malawi Forestry College and Wildlife which provides training at certificate and Diploma levels producing Forestry Assistants and Foresters or their equivalents. The course duration is 24 months and 18 months respectively. Besides regular courses, the College also conducts short courses ranging from 4 to 6 weeks each after which a certificate of attendance is issued. Graduates of the short courses are usually employed as forest nursery workers, forest guards and patrolmen/women. Malawi College of Forestry is the only forestry training institution in Malawi.

The Department of National Parks and Wildlife Education and Extension Unit has four Education Centers, namely the Michiru Mountain Education Centre in Blantyre, the Lilongwe Nature Sanctuary, the Mzuzu Environmental Education Centre and the Cape Maclear Centre in Lake Malawi National Park. Extension Section offices have also been established in recent years at Thazima Camp in Nyika National Park, Kazuni Camp in Vwaza Marsh Wildlife Reserve, at Kasungu National Park, at Makanga Camp in Liwonde National Park and at Lengwe National Park Main Camp. Each Education Centre has a Parks and Wildlife Officer, a Parks and Wildlife Assistant and several Scouts. The role of the Unit is to educate the Malawian public on various aspects of conservation. The public will learn to appreciate the importance of setting aside protected areas. The unit talks to various groups of people like schools, clubs, local communities, leaders, etc.

5.2 Stakeholders in Biodiversity and Forestry Conservation (International Donors, NGOs, Private Sector)

5.2.1 TFCA Development of Malawi-Zambia Transfrontier Conservation Areas

With the support of the Peace Parks Foundation, transfrontier conservation areas (**TFCA**) have been proposed between Malawi and Zambia for the areas of Nyika National Park, Vwaza Marsh Wildlife Reserve and Kasungu National Park and their neighboring protected areas on the Zambian side. A Memorandum of Understanding was signed by both governments in 2004. The project has prioritized the Nyika TFCA and has undertaken studies and developed a proposal that includes 17 sub-projects, including increased wildlife law enforcement to stem the uncontrolled poaching that has decimated wildlife populations in the area.

The project also aims to re-introduce wildlife species once the situation has been stabilized, create improved infrastructure such as roads and fencing, improve fire management and better manage the exotic tree plantations around Chilinda. The planning process will identify different development and land use zones, the development of a Tourism Plan, a Joint Management Plan and a Business Plan for the Nyika TFCA. It is anticipated that the principal private sector investments will be related to tourism and that this will provide financial sustainability for the TFCA.

5.2.2 World Bank Mount Mulanje Biodiversity Conservation Project

This **World Bank/GEF** project was approved in 2000 and is still ongoing. Its goal is to maintain the Mount Mulanje ecosystem, including globally significant biodiversity and vital ecological services. It has five components; 1) Setting the administrative structure for a Conservation Trust; 2) Biodiversity Conservation, Research and Monitoring; 3) Environmental Education; 4) Forest Co-Management and Sustainable Livelihoods; and 5) Capitalizing the Conservation Trust Fund (\$ 5.5 million).

5.2.3 Danish Lake Chilwa Bird Hunters Capacity Development

Snaring and shooting of wildfowl has been practiced for some time but commercial exploitation of wildfowl started in 1996 following the drying up of the lake and the collapse of the fishery in 1995. It was estimated that 365,000 waterfowl were trapped on the western shore. Despite recovery of the fishing industry, commercial waterfowl trapping has remained at a very high level and a more detailed survey in 1998-99 showed that over 450 villagers were involved in the activity on a part-time or full-time basis. It is estimated that that over a million waterfowl were snared between December and April, and over 700,000 birds shot, all of this taking place in the breeding season. Birds shot include several legally protected species such as pelicans, flamingos, spoonbills, ibises and storks. Several large water-birds have already been eliminated through hunting and others are clearly decreasing. The **Danish Hunters Association** (DHA) involves local communities in managing their waterfowl resources, by setting up some areas as breeding refuge where snaring would be abandoned, and by restricting access for bird shooters in various ways. The latter is popular since bird hunters come from the outside and cause a great deal of disturbance, hindering the efforts of local groups to control management.

5.2.4 *EU Miombo Research Projects*

A great deal of valuable research on the management of miombo ecosystems, including case studies from Malawi, has been supported under the EU Management of Miombo Woodlands Project (1998-2002) with the support of CIFOR. This resulted in the publication of "Policies and Governance Structures in Woodlands of Southern Africa" in 2003. The Forest Research Institute of Malawi (FRIM), University of Malawi and the Malawi Forestry Department were involved in this work, and FRIM continues its research into miombo forest management in Malawi. WWF-SARPO also has an ongoing miombo ecoregion management program. Particularly relevant are the lessons and experiences from CBNRM initiatives, both in Malawi and the wider region.

5.2.5 *SADC Biodiversity Support Programme*

The SADC programme, based in the Environmental Affairs Department of the Ministry of Mines, Natural Resources and Environment, has focused its program on two thematic areas to help Malawi meet its objectives and obligations under the Convention on Biological Diversity. These areas are (1) Invasive Alien Species; and (2) Access and Benefit Sharing. Two studies have recently been finalized. One is an assessment of user needs for databases, standards and guidelines on Invasive Alien Species (IAS) and establishment of the status of IAS in Malawi. The other is policy, legislation and other mechanisms for access to and benefit sharing of genetic resources in Malawi.

5.2.6 *WESM Biodiversity Awareness:*

The Wildlife and Environment Society of Malawi (**WESM**) has long been involved in biodiversity awareness-raising, education (promotion of wildlife clubs), monitoring (game counts) and non-extractive natural resource-based activities (such as beekeeping). It partners with government and donor organizations on a number of initiatives related to its area of interest and expertise. Other active NGOs include the Wildlife Action Group, which works with DNPW in Thuma Reserve to develop wildlife conservation and ecotourism activities. As part of its private sector partnership emphasis, DNPW has also ceded management of Majete Wildlife Reserve to a private group, African Parks Conservation Ltd., which is currently aiming to undertake an ambitious game restocking program.

5.2.7 *US Agency for International Development (USAID):*

USAID is funding the second phase of the Community Partnership for Sustainable Resource Management (COMPASS II). The purpose of COMPASS II is to enhance household revenue from participation in Community-Based Natural Resource Management (CBNRM) initiatives that generate income as well as provide incentive for sustainable resource use in Malawi. Development Alternative Inc. (DAI) is implementing this project.

5.2.8 NORAD Malawi, Nyika/National Bio-diversity Strategy and Action Plan

This five-year project (2002-2207) is funded by the Norwegians, the purpose is to assess diversity of plants; inventory micro-organism, inventory ecosystems; and capacity building.

6 ACTIONS NECESSARY TO CONSERVE TROPICAL FORESTS AND BIOLOGICAL DIVERSITY

As described in sections 2 and 3 of the report, the majority of the biodiversity-sensitive sites that are under immediate and significant threats, such as deforestation, invasive species, encroachment, overexploitation etc. are located in a series of well-defined localities throughout the country. Some species have become extinct in Malawi in the last few years. Where entire forests have been cleared, the biodiversity losses may never be known. On the other hand, there a number of promising initiatives ongoing in key areas, often with an explicit goal of conserving biodiversity, including the globally important sites of Lake Malawi, Nyika and Mount Mulanje. This section proposes actions that are needed to address the threats identified; these proposed actions are from various sources.

6.1 Proposed Actions

6.1.1 Deforestation:

- Promote awareness creation and train communities to draft and implement by-laws in order to sensitize communities to reduce indiscriminate cutting of trees, and about the value of the trees, and other natural resources
- Promote reduced use of wood fuel through the use of fuel-efficient stoves for wood and charcoal using models that are culturally adaptable. Develop and promote low-cost alternative sources of energy (non-wood fuels)
- Development of incentives that will promote community based conservation and utilization of forest/tree resources as a means of alleviating poverty and promotes the growing of trees by rural communities and individuals in order to promote self sufficiency in wood products and non-wood products
- Promote agro-forestry techniques as a mean to improve agricultural productivity, diversification and natural resources management, thus alleviating poverty and environmental degradation in Malawi.
- Create an enabling environment/framework for promoting participation of the private sector in forest conservation and management, eliminating restrictions on sustainable harvesting of essential forest products by local communities and promotion of planned harvesting and regeneration of the forest resources by village forest authorities

6.1.2 Invasive Species:

- Establish a focal point institution on biodiversity to regularly monitor vulnerable, rare and endangered species of micro-organisms, flora and fauna
- Design and implement awareness campaigns on invasive alien species directed at key stakeholders within the Malawian public and government
- Develop and implement best management practices for invasive alien species
- Develop training programs for managers, researchers and extension officers in all avenues of the Malawian Government and Private Sector

6.1.3 *Overexploitation of Natural Resources:*

- Promotion of income generating schemes for the communities and the Private Sector, for example, ranching, culling schemes, safari hunting and tourism through provision of incentives
- Preparation and implementation of Sustainable Land Use Management Plans
- Capacity building of local communities on various aspects of wildlife management. Increase conservation awareness among the Malawi lakeshore population and regional and national policy makers, whose decisions regarding regional development have an impact on the lake's ecosystem
- An alternative to the conventional method of making bricks is the use of cement to make cement stabilized bricks, thereby doing away with the large fuel wood consumption. Some construction projects have already started using cement blocks
- Develop multiple use areas as buffer zones around protected areas and include the local populations in the management of these buffer zones

6.1.4 *Climate Change:*

- Support the development of a National Early Warning System (NEWS). It is almost impossible to prevent the occurrence of natural disasters caused by climate variability, and their damages. However it is possible to reduce the impact of disasters by adopting suitable disaster mitigation strategies which could minimize the potential risks by developing disaster early warning strategies and prepare and implement developmental plans to provide resilience to such disasters
- Improve monitoring and forecasting systems for floods and droughts
- Support fundamental research into the effects of climate change on species and ecosystems

6.1.5 *Bush Fires:*

- Development of an environmental awareness campaign to teach farmers and communities around protected areas the uselessness of bush fire practices and their negative effects on the environment.
- Institute policies and develop bylaws to tackle the issue and train community members on fire control measures and techniques.

6.2 Proposed Actions by COMPASS II

According to Stephen J. Millington and Madalitso Kafwanthu, under USAID/COMPASS II implemented by DAI, the following actions shall be taken to address the threats identified in this analysis:

6.2.1 *Evaluation of key sites for biodiversity conservation and development of a list of priority sites:*

This would build on information about key sites, such as protected areas (including forest reserves) and Important Bird Area sites. Since the IBA report, it appears that there has been significant degradation and destruction at some sites. This needs to be verified and status updated. In the event that areas formerly critical for species of global concern are no longer capable of supporting viable populations, the existence of alternative sites should be assessed. Given that Malawi is quite well-explored, at least ornithologically, alternative sites may simply not exist.

A simple matrix could be developed using key criteria including, *inter alia*:

- Biodiversity importance
- Degree and type of threat
- Opportunities for improved management

- Existence of community-based groups
- Demonstrated capacity for improved conservation
- Presence of ongoing or proposed activities

This could also be a useful participatory exercise with stakeholder groups, including local communities, to build understanding about shared values, concerns and priorities, as well as to develop participatory inventory and monitoring systems

6.2.2 Identify key interventions promoting biodiversity conservation to either support and enhance existing initiatives:

This is a priority in consideration of ongoing or planned interventions at priority sites, or to initiate activities favoring biodiversity conservation.

COMPASS II has already adopted a similar strategy through its development pathways approach (COMPASS Development Pathways: Occasional Paper 1, 2004) and is following this approach for the promotion and development of enterprise-based initiatives that can address conservation concerns. To the extent that enterprise-based solutions can be supported by complementary activities to either address immediate issues (e.g., conflict resolution over access and resource use) or build constituencies for biodiversity conservation (awareness-raising, facilitating access to medicinal plants, participation in biodiversity monitoring, etc.), these should be targeted to optimize the results of COMPASS interventions. The selection of priority activities should respond to the site-specific analysis of the primary threats and opportunities to biodiversity.

There will be cases where ongoing conservation activities can usefully be supported by COMPASS enterprise-based approaches and there will presumably be opportunities to build complementary activities around COMPASS interventions. In both cases, the likelihood of achieving successful conservation outcomes should be enhanced.

6.2.3 Set up and support participatory biodiversity monitoring systems at key sites

Given recent trends in the conservation of key sites, continued monitoring will be required. The most effective and sustainable way to do this is by establishing and supporting participatory biodiversity monitoring systems involving motivated local groups and individuals. This is a field that is generating much interest (see, for example, ETFRN, 2002) and some best practice.

6.3 Government of Malawi proposed actions:

The following are actions proposed by the Government of Malawi to address the main threats to biodiversity and sustainable harvest of forest resources. These proposed actions are laid out in the First National Report to the Convention on Biological Diversity, January 1998.

- Promote the efficient utilization and management of the country's natural resources
- Enhance public education and awareness of the importance of sound and sustainable management of biological resources, through national, regional, district and area level campaigns for all stakeholders in government ministries and departments
- Integrate biological diversity conservation, sustainable use and the fair and equitable sharing of its benefits into sectoral, cross-sectoral policies, plans and programmes in the country
- Develop and facilitate institutional mechanisms to empower local communities and the civil society and the government to ensure that any use of biological diversity is sustainable and equitable.
- Develop and promote the use of alternative energy systems both as urban, per-urban and local levels

- Carry out ecological surveys on the translocation of endemic fish species, coupled with an education and training programme in management of the country fish stocks in the country's various lakes and water bodies.
- Promote modern methods of agriculture

7 USAID/Malawi New Strategy: ACTIONS PROPOSED TO MEET CONSERVATION NEEDS IDENTIFIED

As indicated in Sections 2, 3, and 4 of this document, the Government of Malawi is addressing and committed to address key threats to the country's forestry and biodiversity through extensive legislative, policy and institutional frameworks, government departments and agencies, as well as through NGOs and the international donor communities and its private sector.

For instance, the Malawi Government adopted a new constitution in 1995 based on the principles of participatory democracy and many of its recent policies and Acts reflect this participatory approach. The Government's new and developing policies for the management of natural resources involves the progressive transfer of resource ownership and management from the state to the resource' users i.e. private landowners, communities, clubs and individuals. And it is these users who are being encouraged to carry out their own state of the environment assessments at Traditional Authority level and even community and school level. Information gained at these levels will feed into District State of the Environment Reports which in turn will feed into the National State of the Environment Report, thereby providing the opportunity for everyone to contribute to environmental management in Malawi.

The Malawi Government approved the Environment Management Act in 1996 that mandates the districts to produce State of the Environment Reports every two years. A State of the Environment Report is crucial in providing an environmental picture of the country. Without knowing the state of Malawi's natural resources it is not possible to target resources for improving environmental problems through carrying out environmental action plans and environmental micro-projects. Hence, the state of the environment report is a monitoring tool revealing trends in environmental issues.

The first national state of the environment report was written in 1998 and this edition represents a continuation of the state of the reporting process. And for the first time the districts have written their own state of the environment reports that have been referred to in order to produce this national document.

The Government has proposed a set of actions to address the most pressing threats to biodiversity and tropical forestry in the country. A list of actions to be undertaken by both government and other donors and NGOs, is indicated in Section 5 of this report to address some of the most prominent threats to the tropical forests and biodiversity.

Although USAID/Malawi does not have an Environmental Strategic Objective (SO) to directly address the threats identified in section 2 and 3, environmental concerns will however be integrated in accordance to the GoM's objectives as outlined in its National Environmental Action Plan, its National Biodiversity and Strategy Action Plan, and its National Forestry Programme, and its 2004 National State Of the Environment Report where possible, into its strategy.

7.1 Overview of the USAID/Malawi Strategy

7.1.1 The Economic and Social Settings:

Malawi, in many ways, represents the best and the worst of Africa's challenges and opportunities. Widespread debilitating and fatal disease, natural disasters, chronic malnutrition, and premature death are facts of life.

Malawi is one of the 10 poorest nations on earth, and its poverty is starkly represented. Poverty plays out in its demographic indicators -- an average life expectancy of 37 years, a literacy rate of 63 %; and 55 % of the population living on \$1 per day or less. Food insecurity is widespread and often a chronic and pressing challenge, with 25% of the population chronically food insecure and 45% of children stunted from malnutrition. HIV/AIDS prevalence rates are high (15%), resulting in over 500,000 orphans and over 80,000 people dying annually from the disease or associated complications. High birth rates (6.0) are offset by high infant, and child mortality and maternal mortality rates (76/1000, and 133/1000, and 1,800/100,000, respectively) and maternal mortality (1800/100,000). In addition, 60% of the government's health worker positions are vacant, leaving only 96 government doctors to address the health needs of a population of 12 million. The picture in the education sector is also grim, with 22% of primary school teachers having little or no formal training, a high repetition and dropout rates (17% and 22%, respectively), low completion rates (60% of primary students drop out before completing standard 8) and poor overall school quality (80% cannot perform at minimal standards in reading and math), those illustrate the severity of the educational crisis in Malawi.

The economy is highly dependent heavily on agriculture, with 90 percent of the population living in rural areas and agriculture accountings for 40.38 percent% of GDP, and 88 percent of export revenues and 82% of foreign exchange earnings. It employs about 85% of the labor force. Manufacturing accounts for 11% of GDP and is predominantly in the areas of agro-processing of tobacco, tea, and sugar, the majority of Malawi's population is dependant on biological resources for their survival²⁶. Inflation (15.4%), significant domestic external debt relative to revenue (\$3 billion), weak capitalization, high nominal interest rates (prime rate is 25%), and structural impediments and inconsistent counterproductive government policies handicap the economy and the private sector. Governance structures and public institutions have very limited management capacity and many are riddled with corruption, resulting in the misuse or loss of scarce resources needed to address Malawi's development challenges.

Besides these challenges, there are also significant opportunities for a brighter future for Malawi and its people. A reform-minded, democratically elected government has taken concrete actions to rein in government over-spending, borrowing and corruption, address the HIV/AIDS pandemic, and to improve the quality of life of its people. The private sector, civil society, and the media are active, and although facing constraints, are contributing substantively to a more productive, diverse, and free economy and society. Importantly, Malawi enjoys the benefit of peace and stability. Malawi's being a tropical country, has significant biodiversity as it sits at the crossroads of the East and Central African and Southern African floral and faunal sub-regions.

7.1.2 USAID/Malawi Strategy

USAID/Malawi will implement its Country Strategic Plan (CSP) (FY2006-FY2010), through three Strategic Objectives (SOs) and one MCA-funded Special Strategic Objective (SpO) that are consistent with the U.S. State Department and USAID FY 2005 – FY 2009 Strategic Plan mission statement and responsive to the challenges faced by the Government of Malawi as stated in documents, including the Malawi Poverty Reduction Strategic Plan, the Malawi Economic Growth Strategy, and the Malawi Growth and Development Strategy. This new strategy will focus on:

- Increased Household Food Security of Poor and Vulnerable Populations
- Enhanced Wealth/Asset Creation and Retention Capacity for the Rural Poor
- Improved Health and Education Status of the Malawian populations
- Improved Fiscal Responsibility and Anti-Corruption Measures (SpO)

Since the results framework to be proposed under the CSP is still not finalized. The recommendations given here are based upon meeting and discussions with Program Officer and SO team members, therefore it should be recognized that because the details of the results framework may change before it is finalized; these recommendations may need to be adapted.

²⁶ Wildlife and Environmental Society of Malawi, "Biological Diversity in Malawi, January 2005" p.3

The illustrative recommendations given below seek to provide not only USAID/Malawi, but its governmental and non-governmental partners also, with a rich and diverse menu of possibilities, entry points, and options.

7.2 SO: Increased Household Food Security of Poor and Vulnerable Populations

USAID/ Malawi food security strategy will:

- **Increase agriculture sector productivity;** USAID will increase access to support small- scale and drip irrigation, improved seeds and farming technologies, and more affordable access to agricultural inputs (such as fertilizer). USAID/Malawi will build partnerships between the International Research Centers, GOM research facilities, and private sector firms to improve technology transfer. On the processing and marketing side, innovative partnerships will be used to increase market shares and add value to agricultural products through processing. Irrigation schemes, regardless of size, need watershed protection to be sustainable. This will be achieved through effective, community-based natural resource management, including reforestation and water and soil conservation management will be applied.
- **Improve emergency preparedness and disaster mitigation;** Malawi's small-scale farmers are overly reliance on maize as a dietary staple and the crop is particularly susceptible to drought. Droughts have occurred twice in the last five years in Malawi, whether due to long term climatic change or a naturally active period of droughts in the Southern Africa's dry/wet long term cycle. USAID will continue to provide support to the Washington-based FEWSNET activity as well as to the GOM, local governments, and other donors to improve emergency preparedness and the ability of the GOM to respond to future complex emergencies. USAID will continue to support the Malawi Vulnerability Assessment Committee as well as GOM and partner nutritional surveillance activities as part of disaster mitigation.
- **Protect and increase food security of vulnerable populations.** Smallholder-farmers household security is increasingly vulnerable to climatic and structural shocks. Decreased land holding plot sizes, higher prices for inputs, lower product prices, limited access to credit and increased numbers of sick households with income earners stricken with HIV/AIDS, malaria or other ailments lower household food production and make asset accumulation impossible. Through Title II, safety net programs will address the chronically and marginally food insecure. For households that have been affected by HIV/AIDS, malaria and other disabling illnesses, labor- saving technologies and food- for- work programs will build assets and add vital infrastructure such as roads and small- scale irrigation systems

Comment [m1]:

7.2.1 Specific Ways in Which USAID/Malawi Program Could Address Conservation needs identified

1. Deforestation:

- USAID/Malawi could promote renewable energy particularly in rural areas in biologically sensitive areas or adjacent to tropical forests that are heavily reliant on fuel wood and crop residues for basic energy needs, such as household cooking and heating.
- Support public awareness campaigns of environmental and conservation issues, possibly by training the media on ways to improve reporting.
- Build capacity of institutions (both governmental and non-government) through training managers of protected areas in natural resource management.

2. Climate Change:

- Improve monitoring and forecasting systems for floods and droughts
 - USAID/Malawi will continue and reinforce its support towards the development of Malawi's Early Warning System. It is almost impossible to prevent the occurrence of natural disasters caused by climate variability, and their damages. However it is possible to reduce the impact of disasters by adopting suitable disaster mitigation strategies which could minimize the potential risks by developing disaster early warning strategies and prepare and implement developmental plans to provide resilience to such disasters. The Early Warning System shall incorporate monitoring of biophysical indicators such as on-farm and off-farm forest cover, soil fertility, plant and animal biodiversity. Accurate and timely information on the status of such natural resource indicators at the local level will help to inform policies and interventions for agricultural and economic growth assistance as well as for food aid.
3. Overexploitation of Natural Resources & Pollution:
- USAID will as much as possible continue to support the application of conservation farming (minimum tillage) and the use of small-scale irrigation systems will significantly increase productivity while contributing to decreased soil erosion, improved moisture retention and better aerated soils. Conservation farming techniques will be expanded by all present and future implementing partners that are/will be focusing on the production side of the value chain.
 - In biologically sensitive areas, USAID/Malawi could support activities that encourage non-farming income-generating activities to lower the pressure on the natural resource by communities leaving adjacent to parks and protected areas (both inland and lakeshore zones). By ensuring that basic needs are met, these actions will reduce pressures to seek short-term profits from unsustainable practices such as fuel wood and timber harvesting.
 - Promote community participation in natural resource management and land use planning decisions
 - USAID/Malawi may have a comparative advantage to support cleaner production processes capacity building and training through its initiatives to increase market shares and add value to agricultural products through processing. Cleaner Production is a proven business-oriented problem-solving strategy that helps businesses improve the efficiency of their production processes. Increased efficiency generally translates into higher profits and better quality. The more efficient use of input materials and energy equates to reduced waste, resource degradation and pollution, thereby reducing impacts on human health and the environment. In addition, cleaner production furthers fundamental development goals by enhancing the long-term sustainability of income generation programs.

7.3 SO: Enhanced Wealth/Asset Creation/ and Retention for the Rural Poor

USAID/ Malawi's Wealth and Asset Creation and Retention strategy will:

- **Protect and increase the assets and livelihoods of the poor:** Droughts push Malawian poor households farther into food insecurity, as they are unable to obtain or retain resources (fertilizer and seeds) for the next season. Under this program component, USAID/Malawi will expand financial and business development services to micro-enterprises develop new insurance products (crop and life) products and more effective social safety nets.
- **Improved Sustainable Management of Natural Resources and Biodiversity Conservation:** Sustainable and equitable management of Malawi's natural resources and ecosystems is therefore essential to rural wealth and asset creation and retention, poverty alleviation, biodiversity protection. USAID/Malawi will promote sustainable natural resource-based products and services (e.g. fisheries, firewood, charcoal, timber and ecotourism), agro-forestry, soil conservation; small-scale timber production and other practices that protect biodiversity, provide income and improve the health of natural ecosystems. USAID will also link producers to local, regional and international markets.

- **Promote and support anti-corruption reforms:** USAID/Malawi will facilitate the dialogue between the private sector, civil society and the GOM in order to support enabling frameworks that prevent corruption (for example the Anti-Money Laundering act), build private sector systems and codes that oppose corruption, and enhance public awareness of the “corruption costs” to the consumer and the economy.
- **Improve private sector competitiveness:** USAID assist the growth of private enterprises, and assist farmers in exporting high-quality agricultural products internationally, taking advantage of the trade benefits accorded by the U.S. African Growth and Opportunity Act (AGOA). In collaboration with the Southern Africa Global Competitiveness Hub and the Regional Agricultural Trade Expansion Support (RATES) Program, training and technical assistance will be provided to improve product quality standards, foster additional trade linkages among small farmer producer associations and between commodity-specific industry clusters and export markets, and improve the efficiency of the GOM Customs Service.
- **Strengthen the financial services sector and increase access to capital:** USAID will support the growth of MSMEs by improving their access to demand-driven financial services, building sustainable financial institutions, encouraging the establishment of strategic alliances in the capital markets, and assisting the government in creating an appropriate legal and regulatory environment in the microfinance sector. Strategic partnerships will be fostered to build capital markets with buyers, traders, input suppliers, producer groups, and farmer clubs that identify credit as a major constraint. USAID will “pilot” a Development Credit Authority (DCA) initiative to encourage commercial banks and microfinance institutions (MFIs) to extend financing to coffee, dairy, food-processing, and natural resource-based product sectors

7.3.1 *Additional Ways in Which USAID Program Could Address Malawi’s Conservation needs identified*

1- Deforestation:

- The recommendations made for the previous SO holds under this SO as well for deforestation.
- USAID/Malawi could consider supporting innovative public-private alliances under its MCA programs to support small enterprises that sustainably harvest forest products and link them with regional markets. Alleviate pressures on the natural resource base through support for private sector development: provision of rural financial services, business development services, improved market infrastructure, conditions and information services, and promotion of investment and public/private partnerships can achieve two objectives that will together relieve pressure on natural resources. The first objective is the creation of off-farm opportunities in agricultural marketing, supply and processing which can reduce population pressures on a compromised resource base. The second positive development would be enhanced incomes and productivity from existing production areas, thus potentially reducing agricultural expansion.

2- Overexploitation of Natural Resources & Pollution

- All the recommendations made for the previous SO holds for tackling the natural resource over-exploitation threats identified in section 2 and 3 of the analysis.
- For projects involving small scale farmers, USAID/Malawi should encourage practices to minimize ground water pollution and to incorporate technological improvements, such as the introduction of soil fertility enhancement approaches and improved seeds.
- USAID/Malawi could support targeted biotechnology research to develop or utilize crops that have the potential to help small and marginal farmer participate in agricultural markets.
- USAID/Malawi could assist municipalities, districts to integrate conservation and biodiversity preservation into their integrated development plans, and pay special attention to waste management in areas that impact aquatic ecosystems
- Promotion of intensive agricultural production practices that will reduce expansion into forested and uncultivated areas: planned interventions will include efforts to increase soil fertility, introduce higher-

yielding crop varieties, increase access to improved seed, promote crop diversification, and encourage agro-forestry.

- USAID/Malawi could support the development and marketing of Eco-Certified Products: training for sustainable cultivation, harvesting and processing of a variety of products including shade-grown or organic coffee, honey, traditional medicines and even possibly timber could be considered as part of this economic growth strategic objective. Certification standards exist and could be tapped into for many of these products, as well as for organic produce.

3- Invasive Species

- Should more resources made available to USAID/Malawi will work with the GoM and other stakeholders involved in biodiversity conservation in Malawi to promote and support the establishment of a focal point institution on biodiversity to regularly monitor vulnerable, rare and endangered species of micro-organisms, flora and fauna.
- Design and implement awareness campaigns on invasive alien species directed at key stakeholders within the Malawian public and government

4- Climate Change

- USAID will promote sustainable methods of service delivery at the local sphere of government that should result in the abatement of green house gas emissions, improved cost-recovery, biodiversity resource conservation, and energy-efficiency. These activities would also contribute to the US Presidential Initiatives for Global Climate Change, Clean Energy and Water for the Poor.
- Where possible, USAID will encourage the use of appropriate technology to reduce pollution and promote cleaner energy use; and incorporate methods to conserve water.

7.4 SO: Improved Health and Education Status of Malawians

USAID/Malawi's Improved Health and Education Status strategy will:

- **Reduce Transmission and Impact of HIV/AIDS:** The program will concentrate on behavior change in the context of supportive prevention, diagnosis and treatment services, including condom social marketing. Impact mitigation strategies will be focused on services for orphans and vulnerable children and home-based care initiatives, emphasizing increased geographic coverage, increased access to basic mitigation services, improved quality, and national capacity building for replication of successful approaches. Finally, USAID's HIV/AIDS program will assist both the public and private sectors by funding and strengthening NGOs to provide HIV/AIDS related services while providing technical assistance to National AIDS Commission (NAC) and the Ministry of Health (MOH) at the district level to improve management, resource allocation, service delivery, and integration and at the national level in policy development, grant design, coordination, and implementation, and in monitoring and evaluation.
- **Prevent and Control Infectious Diseases of Major Importance:** USAID's program will focus on two infectious diseases – malaria and tuberculosis. USAID/Malawi will support the GoM's National Malaria Control Program with technical assistance to promote effective strategies to manage and prevent malaria-related morbidity and mortality and through the distribution of bednets, the promotion of Intermittent Preventive Treatment for pregnant women; education and behavior change communication; and assistance with malaria research and policy development. Support to the National TB Program will include providing material support to the TB Coalition Group; supporting a treatment with cotrimoxazole at the district level; providing technical assistance and training for the expansion of community-based directly observed therapy (DOTS); promoting

cross-referencing of TB and HIV/AIDS patients; and improving referral systems for TB patients in public sector facilities.

- **Improve Child Survival, Health and Nutrition:** In addition to addressing the HIV/AIDS related needs of children, including reducing mother-to-child transmission, pediatric treatment for infected children and care for orphans and vulnerable children, USAID/Malawi's priorities for addressing child survival will be 1) supporting the GOM in implementing the national strategy for Integrated Management of Childhood Illnesses; 2) improving birth spacing; 3) preventing malaria and diarrheal disease through correct, continuous use of Insecticide-treated nets and use of oral re-hydration therapy; 4) improving knowledge, practices and behavior of caretakers in relation to protecting their children's health, and 5) improving immunization acceptance and coverage.
- **Support Family Planning and Reproductive Health:** USAID will support the GOM's family planning and reproductive health programs. The main areas of assistance will be improving the Reproductive Health Logistics Management Information System to ensure the availability of contraceptives, and working with the MOH and Christian Health Association of Malawi to improve quality of care and environmental safety in major health facilities in Malawi by training health workers in infection prevention and hygienic practices.
- **Achieve Equitable Access to Quality Basic Education:** USAID will support the GOM's basic education strategy by expanding access to underserved groups (e.g., orphans and vulnerable children) and improving the overall quality of basic education. Primary education will remain USAID's priority for development assistance. Depending upon resource availability, USAID also hopes to assist in the lower secondary levels, given only 36% of those completing primary school enter secondary school. School feeding programs will be established to increase access to basic education of the most vulnerable children, including girls, by providing them with a nutritious meal and take-home rations for their families.
- **Increase the capacity of higher education to contribute to development:** USAID will expand and strengthen the development and delivery of pre-service and in-service training by teacher training colleges to primary school teachers. USAID will also support higher education institutions that provide or enhance education, research, analysis, and training services capacity relevant to other development sectors, such as agriculture.
- **Improve quality of workforce through vocational/technical education:** USAID will support the transmission of vocational training and life skills as part of holistic school reform through the involvement of communities in training their students in after-school activities, such as tinsmithing, carpentry, and sewing. USAID will also support the use of interactive radio instruction and community radio which will help youth acquire the knowledge, skills, and attitudes they need to find work, create their own jobs, and earn a productive living.

7.4.1 Additional ways in which USAID Program Could Address Malawi's Conservation needs identified

Should additional resources become available USAID/Malawi could consider, where appropriate, in collaboration with the Ministry of Education and other appropriate agencies in the Government of Malawi to include some of the following activities into this program:

- support environmental training in schools
- Incorporate environmental awareness and education into the curriculum;
- Train teachers on conservation and biodiversity modules
- Where possible, USAID/Malawi could support health care management practices that address potentials for biohazards and which incorporate proper disposal of hazardous waste. This will help to prevent the spread of disease and to minimize pollution, particularly of groundwater table.
- The existence of multiple lakes in Malawi and with respect to its geographical position, Avian Flu-infected migratory birds from several areas in Europe, may somehow transit in Malawi, exacerbating the yet precarious

livelihood situation of Malawians and the struggle of their government to alleviate poverty. To the extent that USAID/Malawi is called upon to include and support any programs related to the avian flu pandemic in this present strategy, the activities should minimize any adverse environmental impact and exposure of the flu to humans.

- Increase access to family planning services to limit expansion into protected and forested areas
- Develop an HIV/AIDS and natural resources activity which provides HIV/AIDS vulnerable populations with improved access to water, energy, and low labor intensive agricultural technologies
- Direct funding or provision of Insecticide Treated Bednets (ITN) will need to comply with the recommendations made under a Programmatic Environmental Assessment (PEA) conducted in 2002 for USAID Africa Bureau ITN programs. In any case USAID/Malawi will have to develop a Pesticide Evaluation Report and Safer Use Action Plan (PERSUAP), should it support any ITN program to tackle malaria problem in Malawi.

7.5 SpO: Improved Fiscal Responsibility and Anti-Corruption Measures

USAID/Malawi's Special Objective strategy will:

- **Promote and Support Anti-Corruption Reforms:** USAID/Malawi's Special Objective strategy will promote and Support Anti-Corruption Reforms: USAID, in collaboration with the U.S. Department of and Justice, will work with the GOM, civil society and the media to implement an integrated project that will build and strengthen systems and institutions that prevent corruption, expand the oversight capabilities of appropriate institutions, and improve the GOM's anti-corruption law enforcement capability. Institutions targeted for assistance include the Ministry of Finance, the National Assembly, the Auditor General, the Accountant General, the Malawi Revenue Authority, and the Malawi Police.
- **Strengthen Public Sector Executive Function:** USAID, in collaboration with the U.S. Department of the Treasury, will work with the GOM implement an integrated financial management information system and supporting institutions and structures to improve fiscal management. Poor fiscal management makes itself felt in poor planning, inadequate resource levels for necessary public investments, and credit-market crowding to cover recurring deficits. Institutions targeted for assistance include the Ministry of Finance, the Auditor General, the Accountant General, and the Malawi Revenue Authority.

7.5.1 Additional ways in which USAID Program Could Address Malawi's Conservation Needs identified

- **Institutional Strengthening:** USAID/Malawi could support and strengthen Community-Based Organizations' ability to advocate for policies such as land tenure and use-right certification should help to improve land management by providing incentives for long-term investments in land productivity and tree planting. Community organizations in their turn could also advocate for greater community participation in land use planning decisions, which could limit encroachment into protected areas and forests
- **Local Conflict Resolution:** Because many local level conflicts are based in competition over resources—whether over land rights, or between farmers and pastoralists, for example—training to improve traditional dispute resolution mechanisms could lead to better resource management. If rights of access and use to local resources are clearly delineated in a participatory fashion, there are often fewer incentives to surreptitiously harvest timber and forest products, or for herders or farmers to encroach upon each others' lands.
- **Gender:** Progress in this area could lead towards improving women's rights of access to and ownership over land and other natural resources. Security of tenure and access often leads to improved investments in and management over the environment.
- **Advocacy:** USAID/Malawi's Investments in improving reporting capacity of the media could focus on training in environmental issues. Increased awareness can often be a very effective tool leading to greater investments in environmental protection.

7.6 Possible Negative Environmental impacts from USAID Program and Mitigation Measures

7.6.1 Possible Negative Environmental Impacts by SO:

SO: Increased Household Food Security of Poor and Vulnerable Populations

The following activities promoted under this SO could have a negative environmental impact if Best management Practices and Mitigation measures are not implemented under their respective environmental reviews:

- Increase agriculture sector productivity: Activities such as small- scale and drip irrigation, improved seeds and farming technologies, access to agricultural inputs (such as fertilizer), increase market shares and add value to agricultural products through processing. Irrigation schemes, community-based natural resource management, including reforestation and water and soil conservation management; promoted under this SO can have negative biophysical impacts. For instance in developing market infrastructure and promoting of agro-processing could potentially have detrimental impacts on tropical forests, biodiversity and the environment if not carefully planned. If such activities do go forward they will be subject to USAID's statutory requirements under Regulation 216 of the U.S. Foreign Assistance Act requiring environmental impact assessments (IEEs and possibly EIAs).
- Protect and increase food security of vulnerable populations: Activities such as food- for- work programs will build assets and add vital infrastructure such as roads and small- scale irrigation systems will have negative biophysical impacts Unless proper attention is paid to environmental considerations, such activities could lead to soil salinity and possible disruption of habitats. Such negative effects would be avoided through the Regulation 216 environmental compliance procedures.

Comment [m2]:

SO: Enhanced Wealth/Asset Creation/ and Retention for the Rural Poor

The following activities promoted under this SO could have a negative environmental impact if Best Management Practices (BMPs) and Mitigation measures are not implemented under their respective environmental reviews:

- Protect and increase the assets and livelihoods of the poor: Activities such as: procurement of fertilizer and improved seeds, expand financial and business development services to micro-enterprises develop new insurance products can negatively impact the physical environment and result in loss of biodiversity. Improper use of fertilizers can lead to water pollution by toxic organic compounds and nutrient loading from agricultural runoff can cause biological stress or aquatic ecosystems, especially nitrates can cause eutrophication of lakes and algal blooms. Improper use of pesticides can become increasingly concentrated and toxic in fish and other animal species, which in turn reduce productivity of fisheries, pollute drinking water, and reduce biodiversity.
- Improved Sustainable Management of Natural Resources and Biodiversity Conservation: Activities such as: promoting sustainable natural resource-based products and services (e.g. fisheries, firewood, charcoal, timber and ecotourism), agro-forestry, soil conservation; small-scale timber production and other practices that protect biodiversity, provide income and improve the health of natural ecosystems, promotion of soil conservation activities can contribute to further degrade the natural resource base. For instance unsustainable removal of trees from natural forests reduces soil productivity, lessens forest regeneration, and increases the siltation of water bodies. Removal of substantial numbers of a single commercial tree species from a forest can affect the long-term genetic viability of local populations of this species (Sharma 1992). Excessive harvesting of local fisheries can frequently exceed resource carrying-capacity limits. Ecotourism activities can have negative

impacts on the environment through soil erosion, can cause change in animal behavior, and can reduce local resource availability to community members living adjacent to protected areas.

- Improve private sector competitiveness & Strengthen the financial services sector and increase access to capital: Activities such as: to assist the growth of private enterprises, and assist farmers in exporting high-quality agricultural products internationally, taking advantage of the trade benefits accorded by the U.S. African Growth and Opportunity Act (AGOA) while contributing to economic development and poverty alleviation, can also harm the physical environment. Some possible negatives impacts are: Private sector commercial trading expansion and business development that will be promoted under this SO could lead to environmentally destructive and unsustainable expansion of services, and activities into previously pristine natural forests and woodland areas inter alia.

SO: Improved Health and Education Status of Malawians

The following activities promoted under this SO could have a negative environmental impact if Best Management Practices (BMPs) and Mitigation measures are not implemented under their respective environmental reviews:

- Reduce Transmission and Impact of HIV/AIDS & Prevent and Control Infectious Diseases of Major Importance: Activities such as increased access to basic mitigation services, service delivery, prevention of malaria through continuous use of Insecticide-treated nets and improving immunization acceptance and coverage have the potentials to harm the physical environment and human welfare and wellbeing. For instance infectious and biohazardous waste that is generated during these types of activities can spread infectious diseases. Specifically immunization programs and some HIV/AIDS treatments interventions will need to address potential for biohazards and proper disposal of hazardous waste.

SpO: Improved Fiscal Responsibility and Anti-Corruption Measures

No biophysical interventions foreseen under this SO, but due diligence shall be promoted as appropriate.

7.6.2 Mitigation Measures:

- Some activities implemented under the USAID/Malawi strategy may impact the biophysical environment. To maximize the positive benefits and minimize any damage to the environment, all activities will be subject to 22CFR216. As such, an Initial Environmental Examination (IEE) will be completed for each Strategic Objective in FY2006. The IEEs will lay out measures to help mitigate possible negative environmental impacts. All activities should be designed to be environmentally sound and to adhere to Malawi rules and regulations
- Environmental screening of each proposed project shall be undertaken to determine the appropriate extent and type of Environmental Assessment. Proposed projects will be classified into one of three categories, depending on the type, location, sensitivity, and scale of the project and the nature and magnitude of its potential environmental and social impacts.
- Where possible, USAID should promote sound environmental practices through all of its programs, including those projects that involve Millennium Challenge Account, Global Development Alliances, and Development Credit Authority.
- For business development and promotion of medium, small and micro-enterprises development, possible negative environmental impacts can be mitigated by supporting environmentally friendly national, provincial, and district level development planning institutions and build their capacity to help avoid possible negative outcomes. Eco-labeling and “green” sourcing requirements may provide incentives for Malawian exporters to

build environmental management capability and to “green” their production processes to increase and maintain their level of access to western markets.

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