

MALAWI GOVERNMENT

Ministry of Energy, Mines, and Natural Resources

National Biodiversity Strategy and Action Plan

**Environmental Affairs Department
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FOREWORD

Malawi's Biodiversity is characterised by a large number of species, diverse habitats and ecosystems some of which are important sites of high endemism such as Lake Malawi, Nyika plateau and Mulanje mountain. Lake Malawi, covering about 20% of Malawi's total area, boasts of over 700 endemic Cichlid species and contains 15% of world's freshwater fish. It was declared a UNESCO World Heritage site in 1984. On the other hand, Lake Chilwa which became a Ramsar site in 1997 and also an important bird Sanctuary in Malawi is a wetland of international importance. It annually supports about 153 species of resident and 30 species of migratory water birds.

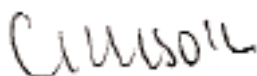
Biodiversity provides various benefits to Malawians such as food, shelter, medicine, income, cultural and spiritual. It is also source of livelihoods and engine of economic growth. Despite these benefits the sustainability of biodiversity is threatened by several factors such as habitat loss (due to agricultural expansion); encroachment into protected areas; disruption of important, fragile but unprotected ecosystems; uncontrolled bush fires; illegal exploitation of forestry and wildlife resources; over-exploitation of freshwater biodiversity and policy failures. The greatest challenge for Malawi is to ensure conservation and sustainable use of biodiversity resources whilst dealing with equally pressing and important issues of rapid human population growth, extreme poverty, high illiteracy levels, HIV/AIDS and harmonisation of policies and legislation in the country.

Despite all these problems Malawi is committed to conserve and sustainably use its biological resources. This is exemplified by the recent efforts to rehabilitate heavily deforested forest reserves (e.g. Ndilande Forest Reserve), putting in place regulatory framework for Access and Benefit Sharing, and developing strategies and action plans for natural resources management, the latest being this Biodiversity Strategy and Action Plan. Development of this strategies would not have been possible if Malawi did not put in place enabling policy framework such as the National Environmental Policy (NEP) and the Environmental Management Act (EMA) in 1996.

This NBSAP outlines the status of the various biodiversity resources in Malawi and stipulates strategies and actions necessary to ensure the management and sustainable utilisation of biodiversity. It further provides strategic guidance for the implementation of Chapter III Section (d) of Malawi's Constitution.

The NBSAP recognises the importance of stakeholder participation in biodiversity conservation and the need to improve accessibility and availability of information on biological resources. It also recognises the importance of harmonising sectoral policies and legislation in the conservation and sustainable use of biodiversity, and promotion of fair and equitable sharing of benefits that arise from the utilisation of biodiversity resources and traditional knowledge. Although the Government has taken necessary steps to strengthen our ability to conserve biological resources, programmes proposed in this document will strengthen our co-operative effort in promotion of biodiversity issues through participatory approach and various media.

It is my sincere hope therefore that this NBSAP will increase our appreciation of the rich biological resources and that it will provide a strategic framework for reversing the trend of environmental degradation in the country.



C. P. MSOSA

Secretary for Energy, Mines and Natural Resources

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Acronyms and Abbreviations

ABS	Access and Benefit Sharing
ACTS	African Centre for Technology Studies
ARET	Agricultural Extension Research and Technology
AU	African Union
BCFP	Blantyre City Fuelwood Project
BNRML	Block National Resource Management Committee
BSAP	Biodiversity Strategic Action Plan
BSP	Biodiversity Support Programme
BVCs	Beach Village Committees
CBD	Convention on Biological Diversity
CBNRM	Community Based Natural Resources Management
CBOs	Community Based Organisations
CCANR	Cabinet Committee on Agriculture and Natural Resources
COJEA	Coalition of Journalists for Environment and Agriculture
COMPASS	Community Participation for Sustainable Resource Management in Malawi
COP	Conference of the Parties to the Convention on Biological Diversity
CURE	Coordination Unit for the Rehabilitation of the Environment
DANIDA	Danish International Development Agency
DARTS	Department of Agricultural Research and Technical Services
DDP	District Development Plan
DEAP	District Environmental Action Plan
DESC	District Environment Subcommittee
DNA	Deoxyribonucleic acid
DNPW	Department of National Parks and Wildlife
DREA	Department of Research and Environmental Affairs
EAD	Environmental Affairs Department
EDOs	Environmental District Officers
EIAs	Environmental Impact Assessments
ELISA	Enzyme-Linked Immunosorbent Assay
EMA	Environmental Management Act
EMF	Environmental Management Fund
EPA	Environmental Protection Agency
ESCOM	Electricity Supply Commission of Malawi
FCM	Fisheries Conservation and Management Act
FD	Forestry Department
FECO	Forum for Environmental Communication
DoF	Fisheries Department
FR	Forest Reserve
FRIM	Forestry Research Institute of Malawi
GDP	Gross Domestic Product
GEF	Global Environment Facility
GMOs	Genetically Modified Organisms
GOM	Government of Malawi
GRBC	Genetic Resources and Biotechnology Committee
GTI	Global Taxonomic Initiative
GTZ	German Agency for Technical Cooperation
HIV/AIDS	Human Immunovirus/ Acquired Immunodeficiency Syndrome
ICDPS	Integrated Conservation Development Projects
ICRAF	World Agroforestry Centre (International Centre for Research in Agroforestry)

ICTP	Information and Communication Technology Policy
IFDC	International Centre for Soil Fertility on Agricultural Development
IGAs	Income Generating Activities
IITA	International Institute of Tropical Agriculture
IKS	Indigenous Knowledge Systems
IPR	Intellectual Property Rights
IUCN	The World Conservation Union (International Union for the Conservation of Nature)
LSM	Law Society of Malawi
MASAF	Malawi Social Action Fund
MBERU	Molecular Biology and Ecology Research Unit
MDI	Malawi Dairy Industries
MEET	Malawi Environmental Endowment Trust
MIRTDC	Malawi Industrial Research and Technology Development Centre
MMCT	Mulanje Mountain Conservation Trust
MoA&FS	Ministry of Agriculture and Food Security
MoE	Ministry of Education
MoGC	Ministry of Gender and Community Services
MoHP	Ministry of Health and Population
MoJ	Ministry of Justice
MoLGRD	Ministry of Local Government and Rural Development
MoLPPS	Ministry of Lands, Physical Planning and Surveys
MoLVT	Ministry of Local and Vocational Training
MoMNRE	Ministry of Mines, Natural Resources and Environment
MoT&PSD	Ministry of Technology and Private Sector Development
MoWD	Ministry of Water Development
MPRSP	Malawi Poverty Reduction Strategy Paper
MRA	Malawi Revenue Authority
MZUNI	Mzuzu University
NAC	National Aids Commission
NBSAP	National Biodiversity Strategy and Action Plan
NCE	National Council for the Environment
NEAP	National Environmental Action Plan
NEP	National Environmental Policy
NFAP	National Fisheries and Aquaculture Policy
NFP	National Forestry Policy
NGOs	Non-Governmental Organisations
NHBG	National Herbarium and Botanic Gardens of Malawi
NORAD	Norwegian Agency for International Development
NPs	National Parks
NPGRC	National Plants Genetic Resource Centre
NRC	Natural Resources College
NRCM	National Research Council of Malawi
NSDC	National Spatial Data Centre
NSO	National Statistical Office
NSSD	National Strategy for Sustainable Development
NTFPs	Non timber forestry products
NWP	National Wildlife Policy
PAP	Poverty Alleviation Programme
PCANR	Parliamentary Committee on Agriculture and natural Resources
PCR	Polymerase Chain Reaction

PFM	Participatory Fisheries Management
PPB	Participatory Plant Breeding
S&T	Science and Technology
SABONET	Southern African Botanical Network
SABSP	Southern African Biodiversity Support Programme
SADC	Southern African Development Community
THs	Traditional Healers
TRIPS	Trade Related Aspects of Intellectual Property Rights
UNCED	United Nations Conference on Environment and Development
UNCCD	United Nations Convention to Combat Desertification
UNEP	United Nations Environment Programme
UNESCO	United Nations Education, Scientific and Cultural Organisation
UNFCCC	United Nations Framework Convention on Climate Change
UNIMA	University of Malawi
USAID	United States Agency for International Development
VFAs	Village Forestry Areas
VNRMCs	Village Natural Resources Management Committees
WAMP	Water Resources Management Policy
WEHAB	Water, Energy, Health, Agriculture and Biodiversity
WESM	Wildlife and Environment Society of Malawi
WMA	Wildlife Management Areas
WRMP	Water Resources Management Policy
WSSD	World Strategy for Sustainable Development
WTO	World Trade Organization
WWF	World Wildlife Fund

Executive Summary

This strategy was prepared in response to the National Environmental Action Plan (NEAP), which identified biodiversity loss as one of the major environmental concerns requiring immediate action. In addition this strategy demonstrates Malawi's commitment to implementing the requirement of the International Convention on Biological Diversity (CBD). It thus provides a strategic framework for action to conserve and sustainably use the biodiversity. The strategy is arranged into five chapters as follows.

Chapter One

Introduction

This chapter provides brief background information to Malawi highlighting the topography, climate, soils, vegetation, land tenure, population and economy.

Chapter two

Rationale for Biodiversity Conservation in Malawi

For the ordinary Malawian, biodiversity means sources of livelihoods, God given and therefore unlimited. Both early and current natural resource management policies follow a sectoral approval and treats biodiversity under a separate sector. The official interpretation of biodiversity, therefore, appears to be fundamentally different, from that of the ordinary Malawian. Taking the CBD definition as a benchmark, the clear understanding of the perception of various stakeholders is considered an important step towards sustainable biodiversity management and conservation.

Malawi's biodiversity is unique and thus contributes to the global biodiversity. It is important to the human society, being a source of food, medicine, fodder etc. Thus this global and national importance of biodiversity gives us the obligation to ensure its continued existence.

Despite this importance, biodiversity is threatened by the dramatic loss of habitats, habitat fragmentation and isolation of the remaining communities. High population and density are also considered the greatest causes of biodiversity degradation since more land is cleared for agriculture and settlement. Other threats to biodiversity include invasive species, genetically modified organisms, inadequacy of policies and market failures. For effective implementation these threats must be understood.

Chapter three

Vision, Goals and Guiding Principles for Biodiversity Management in Malawi.

The vision

The vision for this biodiversity strategy is to conserve, protect and manage by the year 2020 all forms of life for all people with full participation of all stakeholder, and to use the biodiversity sustainably and where benefits accrue to share them fairly and equitably.

The strategy established four goals which highlight Malawi's commitment to biodiversity conservation and sustainable use at the national, regional and international levels and summarise the outcomes that Malawi intends to achieve through the implementation of this strategy, as follows.

Goal one

Actively protect, conserve and maintain protected areas, mountains and species within them; promote restoration of degraded and vulnerable ecosystems and habitats and recovery of rare and threatened species.

Goal Two

Enhance and improve biodiversity knowledge base through research; strengthen and build human and infrastructure capacity for effective information dissemination and research.

Goal Three

Enhance agricultural production through active protection and management of agricultural biodiversity and support initiatives that encourage fair and equitable sharing of benefits arising from the use of the genetic resources.

Goal Four

Enhance community understanding and appreciation of biodiversity, and support coordinated community action to conserve and sustainably use biodiversity.

Eight principles are identified to guide the conservation and management of biodiversity and the implementation of this strategy. These principles are similar to those presented in Environmental Management Act and National Strategy for Sustainable Development.

Chapter four

Strategies and action for Malawi's biodiversity

Guided by the goals and guiding principles for biodiversity conservation and management, the strategy identified a total of 192 actions which are grouped into the following eleven themes: terrestrial biodiversity; aquatic biodiversity; sustainable use of biological diversity; indigenous knowledge, access and benefit sharing; biotechnology; invasive species; biodiversity policies and legislation; community participation; information, knowledge and capacity; incentive measures; and Malawi's role in global biodiversity conservation.

The focus of each theme is summarised in a brief but concise scope. This is followed by a description of desired outcomes to be achieved when the actions are implemented. A description of the status of the biodiversity component is provided and is followed by a description of current biodiversity management regimes. Based on this, gaps and inadequacies in our biodiversity knowledge are identified. Strategies and actions are formulated as interventions for the gaps and inadequacies.

Major issues for each theme were varied but can all be summarised into the following broad categories.

- Inadequate public participation and awareness
- Inadequate and unharmonised sectoral policies
- Unsustainable use of genetic resources
- Inadequate infrastructure, institutional and human capacity
- Inadequate biodiversity knowledge base
- Lack of sustainable financing mechanisms

Chapter Five

Strategic Priorities, Targets and Implementation Arrangements

A total of 192 actions were identified to be implemented over a period of fifteen years. Of these 24 were prioritised based on the extent to which they address the existing gaps in biodiversity conservation and the extent to which they would contribute to the implementation of Global 2010 targets. Priority actions are grouped into the following five broad categories:

Infrastructure and human capacity enhancement that will contribute to substantial improvements in our knowledge and understanding of the biodiversity.

Enhancement and maintenance of partnership and relationships between government departments and communities, government and the development partners and NGOs.

Promoting sustainable use of genetic resources through promoting systematic protection and characterisation of agrobiodiversity and protection from biopiracy, invasive species and pests.

Enhancement of good governance by prioritising actions that encourage Malawi to continue taking a leading role in coordinating and monitoring implementation of natural resource programmes, and provision of funding for biodiversity programmes through the national budget.

Enhancing protected areas management through community participation, research, information management and policy enforcement.

Implementation arrangement

This strategy and actions are directed at all stakeholders involved in the management and utilisation of biological resources and its implementation will require their active participation. However, the primary responsibility for the implementation of this strategy should continue to rest in the Environmental Affairs Department. For effective implementation, this will be supported by coordinating mechanisms through a biodiversity secretariat and a committee which shall among other things oversee and coordinate the development of a detailed workplan for the implementation of this strategy.

The National Biodiversity Secretariat will require professional staff, infrastructure and continuous financial support. This will only be possible if the portion of the Environmental Fund is earmarked for biodiversity programmes and supplemented by government funding through the national budget.

Chapter one

Introduction

Background Information to Malawi

Topography

Malawi has a total area of 119,140 km² of which 20,902 km² (20%) is made up of inland waters dominated by Lake Malawi. Mozambique borders it to the south, east and west, Tanzania to the north and Zambia to the west (Figure 1).

Malawi lies between latitudes 9°22' and 17°03' S and longitude 33°40' and 35°55' E. The topography varies from near sea level in the lower Shire (i.e. 50 m above sea level) to about 3,000 m on high mountains e.g. Mulanje.

Climate

The climate is continental with two distinct seasons - the dry and wet seasons, which are characterised by large seasonal variations in temperature and rainfall. The rainy season runs from November to April and the dry season from May to October. The average rainfall is about 1,200 mm per annum with the highest rainfall being recorded in Nkhata Bay and Mulanje. Shire valley receives the lowest rainfall (below 900 mm per annum). The mean annual minimum and maximum temperatures range from 12°C to 32°C. Temperatures are highest in the rift valley and along the lakeshore and could be as high as 38°C. The highest temperatures occur at the end of October, but thereafter the rains usher in cool weather. The lowest temperatures are experienced in high altitude areas, particularly the Viphya and Nyika plateaux, and the Dedza, Zomba and Mulanje mountains.

Soils

Malawi's soils are dominated by three major soil types: the Eutric leptisols (also known as lithosols), the Chromic levisols (latosols), and the Haplic lxisols. The most

widespread of the group are the shallow stony soils associated with steep slopes. These red-yellow soils include the ferruginous soils of the Lilongwe Plain and some parts of the Southern Region and the weathered ferrallitic soils, some with a high lateritic content, which are of low fertility and easily exhausted. The Haplic lxisols include the alluvial soils of the lacustrine and riverine plains; the vertisols of the Lower Shire Valley and the Phalombe plains; and the mopanosols of Liwonde and Balaka areas.

Vegetation

As a result of its varied topography and rainfall regimes, Malawi presents a rich mosaic of different habitats. Several attempts to classify the vegetation of Malawi have been made, but according to the classification by White, vegetation in Malawi is represented by three regional centres of endemism: the Zambezian regional centre of endemism, the Afromontane Archipelago-like regional centre of endemism, the Eastern (Forest) regional mosaic. This classification as modified by Dowsett-Lemaire identifies nine major vegetation types (Table 1). The most extensive of these are: the miombo woodland, deciduous forests and thickets, evergreen and semievergreen forests, and Afromontane grassland.

Population

The population, currently estimated at 11 million people and growing at 2%, down from 3.2% in 1994, has a density of 105 persons per sq. km. This decline in population growth is due to the repatriation of Mozambique refugees and the impact of HIV/AIDS related diseases. The last census in 1998 showed that the population distribution by region was 46.5% (south),

41.4% centre and 12.1% (north). The Southern Region has the highest density of 162 persons per square kilometre, followed by the Central and Northern Regions with 113 and 44 persons per square kilometre, respectively. Blantyre District has the highest density at 389/km² while Chitipa has the lowest density at 29/km².

There has also been considerable rural to rural migration of farmers from the densely populated southern highlands to the less densely populated central and the more sparsely populated northern regions. The level of urbanization is very low such that over 80% of the population lives in rural areas. The high population densities have resulted in a low land holding which is estimated at 0.8 ha per household.

Economy

Agriculture continues to be the mainstay of the country's economy. The sector accounts for about 36% of the Gross Domestic Product (GDP), 87% of the total employment, and supplies more than 65% of the manufacturing sector's raw materials. Agriculture is also the main livelihood of the majority of rural people.

Malawi's agriculture is characterised by a dual system consisting of the smallholder sub-sector and the estate subsector. The smallholder sub-sector operates on 4.8 million ha of customary land and contributes 80% of Malawi's food and 10% of exports. The estate sub-sector concentrates on tobacco, tea and sugar, which account for 80% of all agricultural exports.

Land Tenure

The Land Act recognises three land tenure categories: customary, private and public. Customary land is land that is held, occupied or used under customary laws but excludes public land. It constitutes about 65% of the land in Malawi. Public land is the land which is occupied, used or acquired by the government, and any other land which reverts to government on termination, surrender or fall-in of freehold

or leaseholds. It constitutes 21% of the land in Malawi. Private land is land owned, held or occupied under freehold title, or a certificate of claim, or which is registered as private under the Land Act and it constitutes 14% of the land in Malawi.

A land policy approved and adopted by the Malawi Government in 2001 aims at ensuring tenure security and equitable access to land. Following the adoption of this policy, the current Land Act is being reviewed. The revised Act will classify land into three categories: government, public and private land. Government land will comprise land owned by the government and put to specific national use. Public land will be managed by the government or traditional authority, but exclusively for the public whilst private land will include freehold and customary land allocated exclusively to families or individuals and leaseholds. Private land will be subject to common residual rights of the state such as compulsory acquisition.

Under the new land law, customary tenure will be codified and granted full statutory recognition as free simple customary estate, registered and available for disposition under market conditions. Customary land will be demarcated and district/village registries set up and maintained throughout the country.



Figure 1. Map of Malawi

➤ Table1: Vegetation types of Malawi

Vegetation type	Defining characters	Malawi examples
Zambeian Woodland (Divided into miombo, mopane, and undifferentiated woodlands)		
Zambeian miombo woodland.	Dominated by species of <i>Brachystegia</i> , alone or with <i>Julbernardia</i> and <i>Isoberlinia</i>	Small fragments are found in Chimaliro and Namizimu FRs and Kasungu NP.
Zambeian mopane woodland.	Dominated by <i>Colophospermum mopane</i> .	Mua Tsanya FR, Vwaza marsh, Liwonde NP and Lower Majete WR
Zambeian undifferentiated woodland	Defined by the absence of miombo and mopane dominants but often dominated by <i>Acacia</i> and <i>Combretum</i> species.	Once common in Shire Valley, Phalombe, Lilongwe and drier lake shore plains.
Transition woodland	Intermediate between forests and woodlands.	Small fragments are found in Nkhata Bay, Vinthukutu, Mulanje, Viphya and Nyika
Deciduous forests and thickets	Characterised by canopy species deciduous for more than a month and understorey species deciduous for several months	Small patches of deciduous forests are found in Lengwe NP and Sambani FR; Lengwe, Mwabvi, Rumphu and Karonga.
Evergreen forest (subdivided into riparian, lowland, mid altitude and Afromontane rain forests)		
Riparian forest	Characterised by species adapted to banks of river courses or influenced by flood	Rivers in Nyika and Viphya Plateaux, Dzalanyama FR.
Lowland rain forest	Characterised by the presence of only 0-25% of Afromontane species	Foothills around Thyolo and Mulanje mountains, and in Nkhata Bay (Kalwe, Nkuwadzi forests).
Mid altitude rain forest	Defined by flora containing a mixture of lowland and Afromontane elements	Mulanje foothills, Kaning'ina FR, Chipata mountain.
Afromontane rain forest	Essentially evergreen	Ntchisi mountain, Misuku Hills, Nyika and Viphya plateaux; Dedza, Zomba, Mulanje mountains.
Undifferentiated Afromontane forests They occur on high plateaux (2250-2450 m)		
<i>Hagenia abyssinica</i> forest		Nyika National Park.
<i>Juniperous procera</i> forest		Nyika National Park.
<i>Widdringtonia whytei</i> forest		Mulanje mountain.
Afromontane Bamboo	Dominated by <i>Arundinaria alpina</i>	Dedza and Mulanje mountains.
Afromontane evergreen bushland and thicket	Defined by the dominance of <i>Erica</i> species	Widespread and common on larger mountains (Dedza, Mulanje, Nyika).
Afromontane shrubland	Characterised by stunted individuals of bushland and thicket	Nyika National Park, Mulanje mountain.
Afromontane grassland plateaux,	Mainly, secondary, fire-maintained grassland	Misuku Hills, Mulanje Mountain, Nyika and Viphya Dedza Mountain, Zomba-Malosa mountains.

Source: Dowsett-Lemaire (2001)

Chapter Two

Rationale for Biodiversity Conservation in Malawi

What is Biodiversity?

The term biodiversity is defined as variability among living organisms from all sources including *inter alia* terrestrial, marine and other aquatic systems and complexes of which they are part and includes diversity within, or between species and ecosystems. The term biodiversity is however relatively new to Malawi and as such is perceived differently by stakeholders. The National Environmental Policy (NEP) of 1996 affirms that Malawians are intrinsically linked to natural resources perhaps on the premise that natural resources are a source of livelihoods provided by God. In addition, natural resources are believed to possess spiritual powers. This is manifest in ritual ceremonies, which are often conducted in the forests protected by traditional beliefs (e.g. Khuluvi forest in Nsanje and the Ndunda forest in Makanjira, Mangochi). Such forests are often very small but very valuable to the surrounding people. Some species (e.g. *Adansonia digitata*, baobab/mlambe and *Pseudolanchnostylis maprouneifolia*, msolo) also hold traditional values in the communities and are symbolized as holy trees. The protection accorded to individual species may extend to other species around them, resulting in the protection of the entire ecosystem. Although these traditional beliefs have contributed to community participation in biodiversity conservation, the belief that

natural resources are God-given and therefore unlimited, has ironically contributed to the current rate of biodiversity loss.

Both early and current natural resource management policies follow a sectoral approach which appears to favour the management of economically important resources (e.g. forestry, fisheries, wildlife, land and agricultural resources). Resources that are perceived not to be of obvious economic importance such as viruses, bacteria are sometimes placed in a biodiversity sector which is not governed by a separate policy framework and a single institution. By treating biodiversity under a separate sector, Malawi appears to consider biodiversity as fundamentally different from forest, fisheries, agricultural, wildlife, water and land resources. It would thus appear that the official understanding of biodiversity is fundamentally different from that of the Convention on Biological Diversity (CBD), which considered biodiversity as the variability among living organisms at genetic, species and ecosystems levels.

Understanding the value of biodiversity as perceived by different stakeholders including the local communities is therefore an important step towards multisectoral and multicultural approaches to biodiversity management.

Importance of biodiversity

Contribution towards global biodiversity

Malawi has unique and diverse flora, fauna and ecosystems which are attributed to its diverse climate, soils and topography. 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 adaptive speciation of fish species, which is more diverse than the finches of the Galapagos Islands.

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 about seven species of amphibians, especially frogs, are endemic to Malawi. There is lack of detailed knowledge of the distribution and status of endemic and/or rare plant species in Malawi. The 2002 IUCN Red Data 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.

It is clear from the above that Malawi's biodiversity is unique and an important part of the global biodiversity. The responsibility to conserve and manage the biodiversity therefore does not rest in Malawi alone but also in the international community.

Value of biodiversity to Malawi

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

The driving force for Malawi's agricultural sector is the rich agrobiodiversity (which is defined as the variability among living organisms associated with cultivated crops and domesticated animals and the ecological complexes of which they are a part). Agrobiodiversity is often placed in two broad categories: domesticated plants and animals. Domesticated plants may be categorised as cereals, legumes, commercial/industrial crops, wild food crops, fruits and vegetables, and roots and tubers.

Tobacco is the major export earner for Malawi, contributing over 65% of the foreign exchange earnings. Other important export commodities include tea and sugar, which, respectively, contribute about 10% and 11%. Maize, on the other hand, is the major staple food crop with 60% of the total cropped land devoted to its production. Livestock contributes about 8% to Gross Domestic Product (GDP). Ruminants, such as cattle, goats and sheep, and monogastrics, such as pigs and chickens, constitute the livestock enterprises, which provide for both subsistence and commercial requirements.

The full potential of Malawi's biological resources in the health sector cannot be estimated with certainty due to lack of data and research in the field of traditional medicine. It is envisaged, however, that biological resources are a source of medicine or raw material for medicine. Globally it is known that more than half of the world's modern drugs are derived from biological resources and it is estimated that some 20,000 species of plants are used in traditional medicine. As biotechnology makes new advances and new screening tools become available, there is increased potential and interest in biodiversity as a source of both raw materials and chemical information for developing new medicines.

The fisheries sector is estimated to contribute 4% towards the GDP. Socio

economically the fisheries sector provides employment opportunities to people in fishing, processing and marketing. It is estimated that more than 250,000 people along the major fishing areas depend on fish as a source of food and livelihood. It is also estimated that the fisheries sector provides 60-70% of total animal protein in Malawi.

In the forestry sector use of biodiversity, especially in forests adjacent to villages, is extremely important as source of fuelwood, food (vegetable, tubers, fruits, insects, mushrooms), construction material, medicines, etc. Commercial uses of the forest plantations are mainly in form of timber and firewood. Although a few indigenous tree species yield good timber most are poor in commercial timber. Species such as *Widdringtonia cupressoides* (Mulanje cedar), *Pterocarpus angolensis* (mlombwa), *Khaya anthotheca* (mbawa) produce quality and durable hard wood and as a result their

populations are threatened due to unsustainable harvesting.

Wildlife maintained in forest reserves is source of protein to the surrounding communities. Hunting, for the past decades, constituted the major use of wildlife resources and is probably the oldest subsistence and livelihood use of biological resources in Malawi. In areas where human population is small and game is common, nearly all animal protein consumed by the local population is derived from wildlife.

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

Malawi's response to biodiversity conservation

The government as far back as the 1920s set up protected areas as a measure to conserve and protect the unique ecosystems, habitats and species (Figure 2). The main three categories of protected areas-national parks, wildlife and forest reserves-together cover approximately 185,000 ha and represent about 20% of the total land area. Lake Malawi National Park forms the only Fisheries Protected area in Malawi. Natural resources that are not part of the protected areas network such as fisheries, water, agriculture and land are guided by separate policies and legislation.

Despite establishing a network of protected areas and policy frameworks, biological resources have continued to decline. This prompted Malawi in 1991 to establish the Department of Research and Environmental Affairs (DREA), which was mandated to coordinate issues pertaining to research and sustainable use of the environment. The department was elevated to a full ministry (Ministry of Research and Environmental

Affairs, MoREA) in 1994 but was restructured three years later in 1997. The Environmental Affairs Department (EAD) is now under the Ministry of Mines, Natural Resources and Environment (MoMNRE) and currently is the CBD focal point whilst the research component (managed by the National Research Council of Malawi, NRCM) is under Office of the President and Cabinet (OPC).

Malawi has for the past decade made significant progress in reducing the threats to biodiversity. For instance, through a consultative process the government in 1994 developed the National Environmental Action Plan (NEAP). The NEAP spells out strategies and actions that Malawi needs to put in place and undertake to conserve, sustainably use and manage the biological resources. NEAP also identified threats to biodiversity as one of the main key environmental challenges in Malawi. The Government in 1996 developed a cross cutting environmental policy, the NEP and

enacted the Environmental Management Act (EMA) that aimed at providing a legal framework for the regulation and establishment of sustainable environment utilization practices. To facilitate implementation of NEAP Malawi in 1998 developed an Environmental Support Programme (ESP) whose objective was to integrate environmental concerns into socio-economic development. In keeping with the requirement of the NEP and the EMA, Malawi undertook an environmental policy reform through which old legislation and policies pertaining to the conservation and sustainable use of biological diversity (such as Forestry Policy, National Parks and Wildlife policy, Fisheries and Aquaculture policy, Water and Land policies) were reviewed and harmonized.

Various committees and working groups had been established to oversee and coordinate implementation of government biodiversity initiatives. These include the National Biodiversity Committee, which coordinates activities pertaining to the implementation of the Convention on Biological Diversity; Genetic Resources and Biotechnology Committee (GRBC) which controls access to genetic resources; The National Council for Environment (NCE) which is charged with environmental monitoring and thus operates like an environmental watchdog; and the CBNRM working group (an ad hoc-committee of the NCE) which was established to coordinate implementation of community based natural resources activities. The working group was also involved in the development of a CBNRM strategy and action plan.

The Government developed the National Environmental Education and Communication Strategy to raise awareness of the complexity of the environment, environmental issues and methods of sustainably managing the environment and other life support systems. Through this strategy community based natural resource management techniques have been disseminated to the communities. For example, Wildlife and Environmental

Society of Malawi (WESM) is currently implementing a community based natural resources project in Mwanza where communities are engaged in fruit juice processing from *Adansonia digitata* (baobab/mlambe) and *Tamarindus indica* (bwemba) fruits, guinea fowl rearing, bee keeping, tree planting and cane furniture making. Community Partnerships for Sustainable Resources Management in Malawi (COMPASS) empowered Natural Resource Management Clubs around Nyika National Park on community based natural resources management techniques.

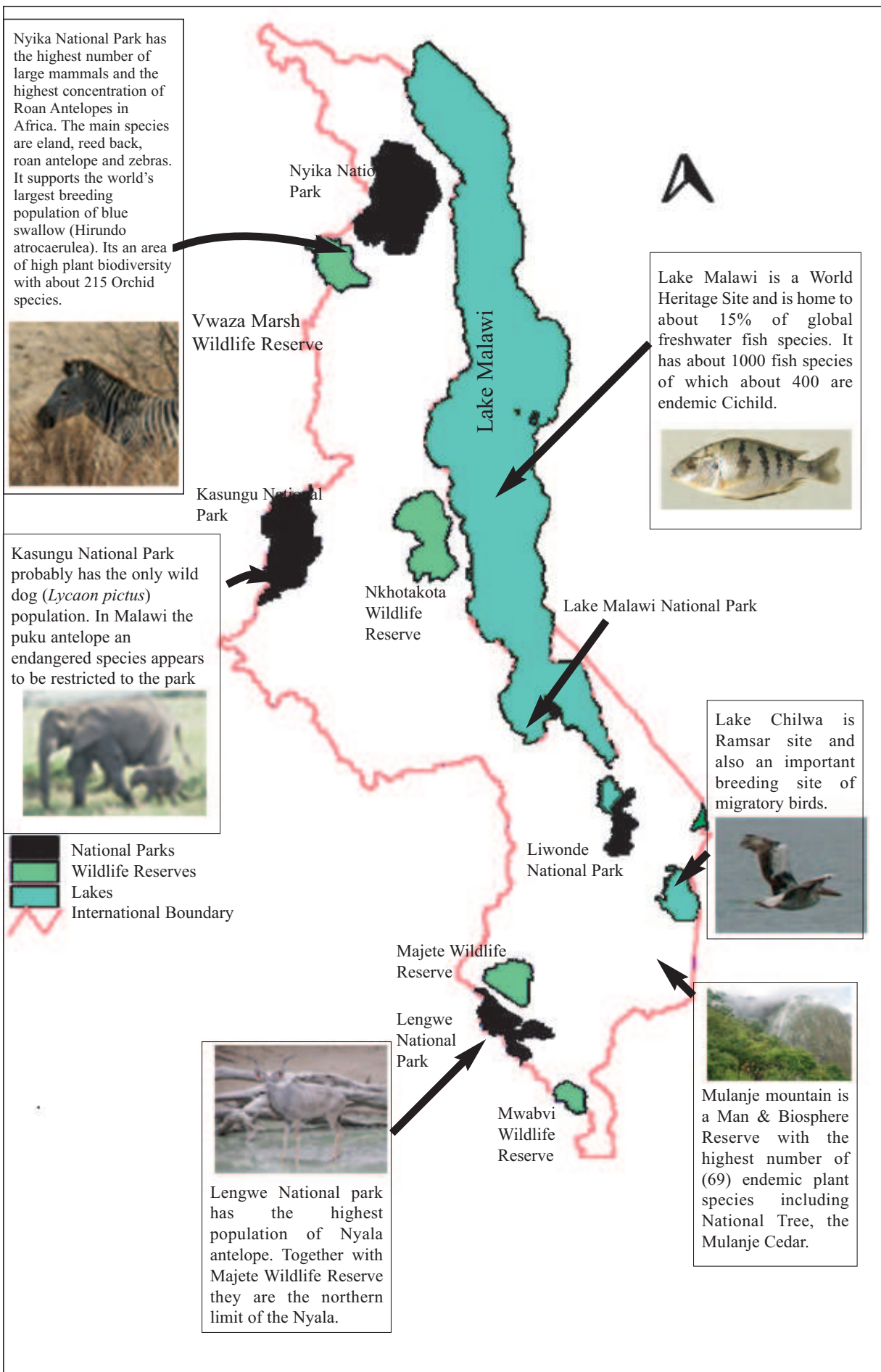


Figure 2: Biodiversity Hotspots of Malawi.



Figure 3: Indigenous fruit juices: (a) *Tamarindus indica* (bwemba) fruit and fruit juice, (b) *Adansonia digitata* (baobab/mlambe) fruits and fruit juice. Photos by D. Mauambeta (WESM)

Threats to biodiversity

Malawi's efforts to halt the current rate of biodiversity loss can be achieved if factors that contribute to habitat loss, population growth and poverty are also reduced. These factors are perceived here as major challenges to biodiversity conservation in Malawi.

Habitat loss and fragmentation

The greatest threat to biodiversity in Malawi is the dramatic loss of habitats, fragmentation of species and habitats and isolation of remaining communities due to unsustainable land use practices. In Malawi agriculture, urbanisation, infrastructure development and human settlements are the major uses of land.

The agriculture sector comprises small, medium and large-scale farmers. Small-scale farming is largely practiced by smallholder farmers whose land holding ranges from 0.5 to 1.5 ha. The small-scale farming is characterised by continuous cultivation on the same piece of land, cultivation in wetlands and riverbanks, encroachment into protected areas and cultivation on mountain slopes. This practice has contributed to soils degradation and has subsequently resulted in low productivity. The estate sector is dominated by tobacco, tea, coffee and sugarcane production. Estates are required by law to set aside 10% of their land for forests.

Despite this requirement deforestation is widespread in forests within and outside the estates while enforcement of the 10% is weak.

Developmental activities contribute to habitat loss through conversion of arable land, wetlands and forests for road construction, urbanization and human settlements. In addition, damming of rivers for irrigation and water supply lead to changes in ecosystems downstream and also impede migration of aquatic organisms upstream and hence cut off species access to spawning areas.

Invasive alien species

Invasive alien species have either been intentionally or accidentally introduced into Malawi and threaten indigenous biodiversity through consuming and preying on them, competing with indigenous species. The major threats to biodiversity are from invasive plants. There are four major invasive aquatic species in Malawi (e.g. water hyacinth, *Salvinia molesta* and *Pistia stratiotes*), which mainly threaten biodiversity through alteration of the microclimate and displacing the indigenous aquatic flora and fauna. Terrestrial alien species e.g. *Eucalyptus* sp., *Prosopis* sp., *Gmelina arborea*, *Lantana camara*, *Rubus fruticosus* also affect biodiversity in similar manner.

Population pressure

High population and density are considered the greatest causes of biodiversity degradation since more land is cleared for settlement and in search of fertile areas to increase food production. These activities have directly contributed to the reduction in forest cover from 45% in 1975 to 28% in the early 2000s. Of the 28% forest cover, 21% are forest reserves, national parks and wildlife reserves, and 7% are customary land forests. Deforestation has resulted in soil erosion and reduction in species composition and abundance and has increased sedimentation and siltation of many rivers and lakes.

The increased population has also brought about great demand for fish for domestic consumption leading to an increase in the number of fishermen, localised fishing, and reduced fish catches. In recent years, fish landings have fallen dramatically due to overfishing and environmental degradation. Total catches declined from 76,500 tonnes/year in 1990 to 43,000 tonnes in 1999, while per capita consumption declined from 10.2 kg/year to 7.0 during the same period. There has been a decline in the stocks of *Oreochromis spp.* (chambo) in both Lakes Malawi and Malombe from 8,500 to 6,000 tonnes between 1984 and 2000, representing about 75% reduction in fish catches.

Lakeshore areas are also experiencing ecological and environmental degradation because of the very dense and increasing human population whose livelihood depends on the utilization of a limited and diminishing resource base. Anadromous fish species face more serious threats from unsustainable agricultural practices in catchment areas where there is a complete damming of rivers without provision of fish ladders to enable migration of the fish into the rivers to spawn. In addition, cultivation on riverbanks has been suggested to be responsible for the degradation and eventual loss of spawning habitats due to siltation, exacerbated by pesticide pollution. For instance, *Labeo mesops* (ntchila), which

used to be the most abundant species, has almost disappeared because of loss of spawning habitats along the rivers and river mouths.

The high population and density has also resulted in increased demand for indigenous plant resources for food, medicine, fodder, fuelwood and construction material and has led to these becoming locally rare. This coupled with unsustainable harvesting methods of plant resources, such as uprooting, tree felling and debarking have reduced their populations to non-sustainable levels.

Wildlife is equally threatened due to increased population since deforestation for cultivation and settlements destroys natural habitats for large animals. Increased population also has resulted in increased demand for game meat. For example, in Majete Game Reserve, elephants became extinct in 1992 due to poaching whilst in Lake Chilwa over a million birds are captured every year primarily for food and for sale.

Land for human settlement cannot be determined with certainty. The southern region is heavily populated and this has forced the communities to encroach into protected areas and estates. For example in 2002, communities around Thyolo Forest Reserve encroached into the reserve for settlement and cultivation. To ease pressure on land, the government has embarked on a land reform programme in which families from densely populated districts in the south (Thyolo and Mulanje) would be resettled in designated areas.

As long as the population growth rate remains high, pressure on land for settlements, agriculture and resource use will remain the biggest challenge to achieving sustainable biodiversity conservation.



Figure 4: Deforestation in Malosa Forest Reserve due to cultivation and charcoal burning. Photo by A. Chikuni

Poverty

Malawi is one of the poorest countries in the world being listed 162 out of 175 in the United Nations Human Development Report for the year 2003. The poverty situation in Malawi is critical considering that 52.40% of the population live below the poverty line whilst 22.40% live in dire

poverty. Poverty, therefore, forces people to depend on natural resources for energy (fuelwood), food, construction material, medicine, and fodder. Thus Malawians are forced by this low income base to trade-off long term sustainable resources for short term consumption of stocks since they depend entirely on the existing natural

Rationale for the National Biodiversity Strategy and Actions Plan

Malawi has an international obligation to fulfil its commitments under the CBD, which Malawi signed on 15th June 1992 and ratified on 28th February 1994. This biodiversity strategy and action plan is prepared in response to article 26 of the CBD and Decision II/17 of the Conference of the Parties (COP), which requested Parties to focus the First National Report, as far as possible, on the measures taken to implement Article 6 of the CBD (Box 1). The conservation of biodiversity cannot be separated from the conservation of unique ecosystems and habitats (e.g. wetlands) and as such this strategy attempts to respond to resolution VII of COP4 of the Ramsar Convention which notes with pleasure Decision IV/15 of the 4th meeting of the CBD, to cooperate with other biodiversity-related conventions, and endorses the Joint Work Plan with the CBD, in particular the collaboration and cooperation in the areas

of inland water ecosystems, marine and coastal biodiversity, impact assessment and incentive measures.

Malawi also has a regional obligation to contribute to regional biodiversity conservation initiatives through implementation of various regional protocols that Malawi is party to. Through this strategy, therefore, Malawi would meet its obligations under the SADC Strategy on Food Security, Natural Resources and Environment which calls on member states to institute policy measures and mechanisms to protect the environment and manage natural resources utilisation with a view to achieving optimum sustainable benefits for the present and future generations.

At the national level this strategy is considered a key strategy for sustainable development. It provides strategic guidance

for the implementation of Chapter III, Section 13(d) of the Malawi's Constitution that calls upon the State to manage the environment responsibly in order to prevent the degradation of the environment; provide a healthy living and working environment for the people of Malawi; accord full recognition to the rights of future generations by means of environmental protection and sustainable development of natural resources; and conserve and enhance biological diversity of Malawi. In addition to this the strategy provides guidance for the implementation of the Malawi poverty reduction strategy paper (MPRSP), which was launched in 2002. The PRSP aims at achieving

sustainable poverty reduction through empowerment of the poor by promoting rapid sustainable pro-poor economic growth and structural transformation, enhancing human capital development, improving the quality of life of the most vulnerable, and promoting good governance, while mainstreaming key cross-cutting issues such as HIV/AIDS, gender, environment and science and technology.

On the whole this strategy provides a framework and guidelines for the conservation of the biological resources, the sustainable use of its components and the fair and equitable sharing of benefits arising out of its utilization.

Box 1. The Convention on Biological Diversity

Article 1. Objectives

The objectives of this Convention, to be pursued in accordance with its relevant provisions, are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding.

Article 6. General Measures for Conservation and Sustainable Use

Each Contracting Party shall, in accordance with its particular conditions and capabilities:

- (a) Develop national strategies, plans or programmes for the conservation and sustainable use of biological diversity or adapt for this purpose existing strategies, plans or programmes which shall reflect, inter alia, the measures set out in this Convention relevant to the Contracting Party concerned; and
- (b) Integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies.

Article 26. Reports

Each Contracting Party shall, at intervals to be determined by the Conference of the Parties, present to the Conference of the Parties, reports on measures which it has taken for the implementation of the provisions of this Convention and their effectiveness in meeting the objectives of this Convention.

The National Biodiversity Strategy and Action Plan Process

This NBSAP has been prepared through a broad-based interactive participatory process comprising eight task forces but coordinated by the Environmental Affairs Department. The task forces comprised experts drawn from government departments, non-governmental organizations and parastatal organizations (Annex One).

The task forces collected and collated information to document and assess biological resources covering plants, microorganisms, wild and domesticated animals, ecosystems, domesticated and introduced species, land use issues, socio-economic aspects, and legislation, in order to identify gaps and inadequacies in Malawi's biodiversity knowledge base and management. Issues of biosafety although addressed under a separate initiative were considered an important aspect of NBSAP considering Malawi's obligation to implementing the Biosafety Protocol. Task Forces were guided by a set of objectives for the NBSAP process (Box 2). The objectives were developed on the basis that the NBSAP is the beginning of a continuous process and as such their achievement will be guided by the timeframe of this strategy.

In order to ensure public participation in the preparation of this plan, two national workshops and three regional workshops were organised. Political input was sought through a national consultative workshop and direct contact with senior government officials. Both national and international experts in the field of biodiversity also reviewed the document.

Malawi's biodiversity strategic planning was funded by the Global Environment Facility (GEF) and facilitated by the United Nations Environmental Programme (UNEP). UNEP provided technical expertise to implement the project. Other partners included the World Wildlife Fund (WWF), the African Centre for Technology Studies (ACTS) and the World Conservation Union (IUCN). Supplementary funding was obtained from the SADC Biodiversity Support Programme (SADC BSP) and the Norwegian Government through the Biodiversity Support Programme in order to ensure that the strategic planning included all emerging issues such as Biosafety, the ecosystems approach, regional issues and the Clearing House Mechanism (CHM).

Box 2. The Objectives of the National Biodiversity Strategy and Action Plan Process

The objectives of the NBSAP process were stated at the beginning of the project, as follows:

- To review documentation of the biological diversity of Malawi covering plants, animals, micro-organisms, genetic material and ecosystems;
- To identify gaps in the knowledge-base and existing efforts to conserve and sustainably use biodiversity resources, and to ensure fair and equitable sharing of benefits arising from such use;
- To assess our knowledge of the various components of biological diversity;
- To assess and identify biological resources requiring immediate statutory protection;
- To assess and evaluate current indigenous knowledge systems pertaining to the conservation, sustainable use and the fair and equitable sharing of its benefits;
- To determine the social-economic value of biological diversity and the benefits arising from conservation and sustainable use thereof;
- To assess the capacity of institutions and personnel in meeting the demands imposed by the requirement to conserve, sustainably use, and fairly and equitably share the benefits arising from the use of genetic resources of the country's biological diversity;
- To initiate creation of a database for use in raising public awareness for protection and sustainable use of biodiversity resources in Malawi;
- To promote the integration of biological diversity conservation, sustainable use and the fair and equitable sharing of its benefits into sectoral and cross-sectoral policies, plans and programmes in the country;
- To foster collaboration between neighbouring countries in the conservation and sustainable use of biological diversity, and the fair and equitable sharing of benefits arising from such use.

Chapter Three

Vision, Goals and Guiding Principles for Biodiversity Management in Malawi

The Vision

The vision for this biodiversity strategy is to conserve, protect and manage by the year 2020 all forms of life for all people with full participation of all stakeholder, and to use the biodiversity sustainably and where benefits accrue to share them fairly and equitably.

The vision has been selected to closely parallel that shown in the National Constitution, which requires the government and the people of Malawi, among other things, to strive to prevent degradation of the environment and enhance conservation of biological diversity. This vision thus attempts to describe the overall desired outcome for this strategic plan and also the overall approach to achieving the outcome.

The year 2020 was chosen to coincide with the timeframe for Malawi Vision 2020, which is the overall policy framework for medium term socio economic development. In addition this timeframe is considered

long enough to permit effective implementation of complex strategies and also to allow for revision of this biodiversity strategy plan. The timeframe is also compatible with the Malawi National Strategy for Sustainable Development (NSSD, to the year 2015) formulated following the landmark World Summit on Sustainable Development (WSSD) held in Johannesburg, South Africa, in 2002 as a follow-up to the United Nations Conference on Environment and Development (UNCED) of 1992. The timeframe is also adequate to enable Malawi contribute to the 2010 targets of reducing biodiversity loss by 50% as agreed by the global community, and achieve, by 2015, the Millennium Development Goals which were drawn from the actions and targets contained in the Millennium Declaration adopted at the UN Millennium Summit in September 2000, in particular Goal 7 "Ensure environmental sustainability".

Goals

The goals attempt to highlight Malawi's commitment for biodiversity conservation, sustainable use and equitable sharing of benefits arising from the use of biological diversity at the national, regional and international levels and summarise the outcomes that Malawi intends to achieve through the implementation of this strategy.

Goal one

Actively protect, conserve and maintain protected areas, mountains and species within them; promote restoration of degraded and vulnerable ecosystems and habitats and recovery of rare and threatened species.

Under the CBD Malawi has sovereign rights to conserve its biological resources and has a responsibility to ensure sustainable use of its biological diversity. Goal one provides for an enabling environment to reduce the current rate of biodiversity decline. This goal also recognises that most habitats and ecosystems are degraded and fragmented and species within them are threatened. Thus in keeping with CBD's emphasis on conserving species in nature (in situ conservation) and ex situ, this goal provides for habitat restoration and species recovery programmes.

Most ecosystems and biological resources are represented in protected areas,

mountains, private and customary land. In recognition of this, goal one provides for improved management and conservation of protected areas and mountains, increasing the number of protected areas and involvement of the private sector in biodiversity management.

For this goal to be achieved, however, Malawi must establish its targets in terms of specific species and ecosystems to be conserved.

Goal Two

Enhance sustainable use of biological diversity including agricultural production through active protection and management of biological resources and support initiatives that encourage fair and equitable sharing of benefits arising from the use of the genetic resources.

This goal recognises the emphasis Malawi places on agriculture as the engine of economic development and food security. This goal also recognises that the current agricultural practices appear to contribute to genetic erosion since they favour improved introduced species. In order to ensure that genetic resources continue to steer the economy of Malawi, goal three has provisions for protecting agrobiodiversity against invasive species, genetically modified organisms and biopiracy.

Goal Three

Enhance and improve biodiversity knowledge base through research; strengthen and build human and infrastructure capacity for effective information dissemination and research.

The CBD calls on parties to make inventories of their biological resources. This information is crucial in decision making regarding what to conserve and how much to conserve. The goal, therefore, is a prerequisite for effective implementation of in situ and ex situ conservation of biodiversity elements in relation to sustainable use of genetic resources.

Goal three recognises that current biodiversity information is scattered and is

in the format not accessible by stakeholders. Furthermore, most biodiversity information and data relevant to Malawi is held in foreign institutions. In order to facilitate access to biodiversity information and data, goal three reflects on the focus of CBD in creating a Clearing House Mechanism and on protecting Malawi's indigenous knowledge and access to Malawi's biodiversity data and information.

The biggest challenge for Malawi to achieve this goal is inadequate human and infrastructure capacity. In line with CBD decisions pertaining to technical and scientific cooperation, access to and transfer of technologies, Malawi plans to achieve this goal through institutional collaboration at national, regional and the international levels, and through establishing regulatory frameworks on Intellectual Property Rights (IPR) and Access and Benefit Sharing (ABS).

Goal Four

Enhance community understanding and appreciation of biodiversity, and support coordinated community action and incentives to conserve and sustainably use biodiversity.

Goal four recognises that early management plans that focused exclusively on enforcement contributed to the current biodiversity loss. It also recognises that every Malawian contributed either directly or indirectly to the present situation and thus calls on every Malawian to contribute to conservation and management of biodiversity.

The goal recognises that communities, individuals and organisations can actively participate in biodiversity conservation if they are informed about the importance and values of biodiversity. People are likely to participate more in biodiversity conservation if opportunities and constraints that influence their behaviour towards biodiversity are provided. Thus apart from emphasising on mechanisms for better understanding, information exchange and support, goal four seeks to provide for incentives for biodiversity conservation and community participation.

Guiding principles for biodiversity management

These guiding principles were adopted from the NEP and from the list of unmet needs for biodiversity conservation that were identified during the consultation period.

- (a) Conservation of biological diversity is a form of natural resource management whose primary goal is the maintenance of biological resources to meet the needs and aspirations of both present and future generations.
- (b) Biodiversity has an intrinsic value and is vital for agricultural, medicinal, scientific, research, tourism and other socio-economic developments.
- (c) As custodians and users of biological diversity, local communities have accumulated knowledge, skills and information relating to conservation and management of biodiversity, which can be utilized to promote sustainable management of biodiversity.
- (d) Indigenous knowledge systems provide important knowledge in the agricultural, medical and pharmaceutical industries that has provided a significant proportion of modern technologies and products.
- (e) The conservation of biodiversity both within and outside protected areas including mountains is best done following the ecosystems approach and ex situ conservation is only important to support conservation of rare and threatened species.
- (f) The government is responsible for providing direction and leadership especially in integrating biodiversity issues in sectoral policies, and in the coordinated implementation of existing and new policies and research.
- (g) The conservation of biodiversity should be supported by opportunities and constraints that as much as possible influence the behaviour of individuals and organisations and facilitate conservation and sustainable use of biodiversity.
- (h) Sound decision making on conservation and sustainable use is possible when individuals and policy makers have a better understanding and appreciation of biodiversity.

Chapter Four

Strategies and Actions for Malawi's Biodiversity

Introduction

These strategies and actions are based on the information gathered by the eight task forces on the following issues: microorganisms, wild and domesticated animals, ecosystems, land use, socio-economics, domesticated and introduced species, information and legislation. The information has been organised to address articles or thematic areas of the CBD. Guided by the goals and guiding principles for biodiversity conservation, the strategies and actions are grouped in eleven themes. The relationship between the thematic areas, the goals and the CBD articles is shown in Box 3.

The themes are structured in such a way that each follows the same format. Each theme has the following successive parts: scope; desired outcome by the year 2020; a brief review of the current state; current management regimes; and a summary of issues which highlight major gaps and problems, thus forming the basis for choice of strategies and actions. This layout was preferred because it ensures that each theme is complete and also focussed on responding to specific issues. The strategy outlines the overall objective for each theme, strategies and actions to be undertaken to implement the strategies. Most of the thematic areas address more than one CBD article.

Goals	Thematic Areas	Target CBD Article
Protect, conserve, maintain and restore habitats and species	<ul style="list-style-type: none"> ● Terrestrial biodiversity · ● Aquatic biodiversity · ● Invasive species · ● Biodiversity policies and legislation · ● Malawi's role in global biodiversity conservation 	Identification and monitoring (7) <i>In situ</i> conservation (8) <i>Ex situ</i> conservation (9) Relationship with other international conventions (22) Impact assessment and minimising adverse effects (14) Research and training (12)
Conservation and sustainable use of biological resources	<ul style="list-style-type: none"> ● Sustainable use of biological resources · ● Invasive species · ● Biotechnology · ● Indigenous knowledge, access and benefit sharing 	Sustainable use of components of biological diversity (10) Incentive measures (11) Handling of biotechnology and distribution of its benefits (19) <i>In situ</i> conservation (8) Access to genetic resources (15)
Improve knowledge base, infrastructure and human capacity	<ul style="list-style-type: none"> ● Information, knowledge and capacity · ● Terrestrial biodiversity · ● Aquatic biodiversity 	Exchange information (17) Technical and scientific cooperation (18) Access and transfer of technology (16)
Enhance community participation and appreciation	<ul style="list-style-type: none"> ● Community participation and awareness 	Public education and awareness (13) Incentive measures (11)

Theme One: Terrestrial Biodiversity

Scope

Terrestrial ecosystems (including natural and modified habitats within and outside protected areas) and the indigenous species inhabiting these areas understood and conservation mechanisms put in place.

Desired outcome by 2020

- (a) Significant progress made in the conservation of species, habitats and ecosystems important for terrestrial biodiversity leading to increase in area under protection (such as forests and grasslands) and restoration of degraded areas.
- (b) Significant number of private landowners are managing and protecting species and habitats leading to a reduction in number of species requiring in situ and ex situ conservation.
- (c) A significant increase in the number of protected areas will lead to increased protection of a representative range of ecosystems and species and provision of legal status to some important ecosystems that are currently under customary and private land tenure systems.
- (d) Programmes and mechanisms to prevent establishment of pests including prevention of introductions, control and eradication of alien invasive species identified and implemented, resulting in less frequencies of pests and reduced impact of invasive species on terrestrial ecosystems.
- (e) A clear understanding of threats to biodiversity and ecosystems has been achieved and avoided or mitigated. Malawi's Red Data Lists have been revised and contribute to better decision-making on species recovery programmes and ex situ conservation.
- (f) Clear government guidelines and strategies on the conservation of mountain biodiversity and ecosystems facilitate community participation leading to gazetting more mountains as protected areas.
- (g) An understanding of the extent of Malawi's terrestrial biodiversity through inventories and systematic research has been achieved.

State of terrestrial biodiversity

Terrestrial ecosystems

Several different methods of describing ecosystem-level biodiversity have been applied to Africa e.g. White's vegetation map of Africa of 1983 and Eco-Floristic Zones of Sharma of 1988. These methods are based on the major vegetation type found growing in a particular area. These are perceived to provide an important perspective on large-scale biodiversity in Malawi.

According to White's classification, vegetation in Malawi is represented by three regional centres of endemism. First, the country lies entirely within the

Zambeian regional centre of endemism characterized by different forms of woodland and thicket, within the altitudinal range of 500-2050 m. Secondly, most of the "forest" category is in the uplands and Afromontane elements are the most numerous constituents of the forest vegetation overall, forming the Afromontane Archipelago-like regional center of endemism. The proportion of Afromontane endemic or near-endemic species increases with altitude within the range 500-2450 m. Local factors of mountain size and exposure play a role in determining altitudinal limits of various species. The evergreen bushland/thicket and evergreen shrubland lie within the Afromontane

region, mainly above 1500-1600 m, while grassland is most extensive on some of the high plateaux or in dambos at the lower levels. Thirdly, there are enclaves of lowland rain forest with an important proportion of the "Eastern" elements, forming the Eastern (Forest) regional mosaic, altitudinal range 500-1300 m. This classification as modified by Dowsett-Lemaire (2001) is adopted here, recognize nine major vegetation types, which are summarised in Chapter One, Table 1.

In 1975 about 47% of Malawi was classed as forest but this was reported to have reduced to 28% in 2000. With the ever-increasing population and deforestation rate of 2.8% per annum, Malawi's forest cover is likely to reduce further. There has been extensive deforestation of Miombo woodlands outside protected areas for various reasons e.g. fuelwood for domestic purposes and curing of tobacco, charcoal production for supplying urban areas and clearing for gardens/shifting cultivation (e.g. Chitemene in Chitipa).

Most of the evergreen forests occur in protected areas, such as Forest Reserves, National Parks and Wildlife Reserves. However, those close to the urban areas with valuable timber such as Mulanje cedar (*Widdringtonia whytei*) are prone to extensive exploitation. In areas with high human population some evergreen forests (e.g. Thyolo Mountain) have been clear felled because of encroachment for agricultural activities. Similarly most montane grasslands are under protection in Forest Reserves and National Parks, but wetlands, especially dambos outside protected areas, are subjected to cultivation or overgrazing.

Malawi's topography is dominated by mountains, mountain ranges, plateaux and hills. The highest mountain (Mulanje mountain), Zomba and Malosa mountains comprise the largest highland area east of the rift valley. In the northern region, Nyika and Viphya plateaux cover large areas. Notable mountains in the central region

include Dedza, Ntchisi and Dzalanyama ranges. Mountains of Malawi are important sources of rivers and this was one of the reasons for establishing protected areas such as Mulanje Mountain Forest Reserve, Nyika National Park, Dzalanyama Forest Reserve, etc. Currently, most of the remaining biodiversity is on mountains and some of these, such as Nyika and Mulanje, are biodiversity hot spots in Malawi. However, due to population pressure and agricultural expansion there is extensive encroachment into mountains and some of these have been completely deforested.

Diversity of terrestrial species

The high diversity of terrestrial habitats and ecosystems, ranging from dry miombo to Afromontane peaks coupled with diverse soils and climate support a wide range of plants and animals. A substantial amount of Malawi's indigenous terrestrial species has been documented although many taxa remain poorly documented/known and the total number of species is undoubtedly much higher than the currently recorded numbers. From the available information it is possible to make general statements on species diversity and current status for the following major groups of organisms.

Microorganisms

The term microorganisms often encompasses viruses, bacteria and protists. About 600 species of microorganisms have so far been documented comprising 89 species of viruses, 60 species of bacteria and 23 species of protozoa. Almost all virus species recorded in Malawi are associated with agricultural crops (42 species) and livestock (30 species). This also applies to bacteria most of which e.g. *Agrobacterium*, *Eiwinia*, *Pseudomonas*, *Xanthomonas* are known plant pathogens.

Fungi

Despite their well-known role in decomposition of organic matter and nutrient recycling, fungi are the least appreciated. Only 500 species have been documented most of which are associated

with major economic crops such as maize, rice, cassava, and cotton as pathogens. In addition to contributing to ecosystem stabilisation fungi are also a source of food and income to many rural Malawians considering that over 53 species are edible mushrooms.

Plants

The total number of terrestrial plant species in Malawi is not known but available records indicate that there are approximately 6000 plant species.

Lower Plants

Bryophytes (mosses and liverworts) and algae: A total of 168 bryophytes have been described in Malawi. Only 66 algal species, mostly belonging to Chlorophyta, have been documented. Our knowledge of algal

diversity, despite being primary producers in food webs of all water bodies and a major source of food for fish productivity, is scanty.

Vascular Plants

Pteridophytes (ferns and allies) and angiosperms: A total of 200 species of Pteridophytes belonging to 32 families have been recorded. About 5,500 species of flowering plants have been described in Malawi of which about 4,000 are dicotyledons and about 1,500 are monocotyledons.

Of the total number only 261 species are considered threatened, vulnerable, rare or endangered. Despite the high number of threatened species only eleven plant species have legal protection (Table 2).



Figure 5: Examples of rare, threatened and endemic plants not included in list of protected trees; (a) *Erythrina abyssica*, Photo by A. Chikuni, (b) *Aloe* sp. Source: Lake Chilwa wetland Project, (c) *Widdringtonia whytei*, Mulanje cedar, Photo by Carl Bruessow (MMCT).

Table 2. Plant species that are protected by law in Malawi.

Scientific Name	Common Name	Vernacular Names
<i>Breonadia microcephala</i>	Redwood	Mwenya; Chonya; Mgwenya; Mung'ona; Mwina; Mungwina
<i>Azelia quanzensis</i>	Mahogany Bean	Msambamfumu
<i>Borassus aethiopum</i>	Deleb Palm, Palmyra Palm	Mvumo
<i>Bridelia micrantha</i>	Coast Goldleaf	Mpasa
<i>Burkea africana</i>	Ash	Mkalati; Kalinguti
<i>Colophospermum mopane</i>	Butterfly Tree/Turpentine	Tsanya; Sanya; Mopani
<i>Cordyla africana</i>	Sunbird Tree, Wild Mango	Mtondo
<i>Hyphaene crinata</i>	Doum Palm	Mgwalangwa
<i>Khaya anthotheca</i>	Mahogany	Mbawa
<i>Pterocarpus angolensis</i>	African Taek	Mlombwa
<i>Terminalia sericea</i>	Yellow Wood	Napini; Mpini

Source: National Environmental Action Plan (NEAP, 1994)

Invertebrates

The precise number of invertebrate species in Malawi is not known with any degree of certainty although it is estimated that there are over 8,000 species, including more than 7,000 insect species. Amongst the better-studied taxa, the molluscs contain 47 endemic species from a total of 172 species. Eight species are listed by IUCN as either vulnerable e.g. *Bulinus nyassanus* (Planorbidae), or Endangered e.g. *Lanistes nasutus* (Ampullaridae). Beyond those species of agricultural or forestry interest, very little is known of the population biology of any species.

Nematodes

Approximately 173 species of nematodes have been described in Malawi. Seventy nematode species are plant parasites belonging to such genera as Meloidogyne, Radophous. However, species of free-living helminthes and those that parasitise fish and insects are still unknown.

Insects

An inventory of insects of Malawi is unavailable and as such the total number of insects cannot be estimated with any degree

of certainty. However, a total of 7,805 species have been collected. Coleoptera and Lepidoptera are the best known while Plecoptera and Slvesiptera are the least known. The list of endemic species is unknown.

Vertebrates

Reptiles

There are 140 species of reptiles recorded in Malawi, represented in 22 families but very little is known of their conservation status. Twelve species (*Lygodactylus bonsi* - *Gekkonidae*; *L. chobiensis*; *Rampholeon platyceps*; *R. chapmani*; *Trioceros gotzei nyikae*; *Proscelotes mlanjensis*; *Melanoseps ater ater*; *Mabuya maculilabris maculilabris*; *Panaspis wahlbergii*; *Eumeces anchitae johnstonii*; *Chaemaesaura macrolepis miopropus*; *Platysaurus mitchelli*) are thought to be endemic to Malawi. Distribution of these endemic species is poorly known and hence should be treated as under conservation threat.

In addition to the endemic reptiles, the following species/sub-species are considered to be rare in Malawi: *Rampholeon brachyurus*, *Sepsina tetradactyla*, *Geochelone pardulis babcocki*.



Figure 6: Some reptiles of Malawi; (a) Mozambique spitting cobra, *Naja mossambica* Photo by Carl Bruessow (MMCT), (b) monitor lizard, Source: Lake Malawi Biodiversity Project, (c) crocodile, *Crocodylus niloticus* Photo by S. G. Thorisson.

Amphibians

Frogs (*Rana spp.*) and toads (*Bufo spp.*) are by far the largest group of amphibians (3,500 species) worldwide in distribution and occupy a great range of habitats. There are 74 species of amphibians recorded in Malawi, comprising two species of Apoda (caecilians) and 72 species of Anura (toads and frogs). There are no recorded species of Claudata (salamanders and newts). Few studies have been carried out on amphibians and the current known species richness is probably underestimated.

Amphibians are threatened with habitat destruction. As land is cleared or drained for agriculture their breeding sites disappear, those which are left are often polluted by industrial effluent, and even sites far away from development may be affected e.g. by atmospheric pollution. The removal of insects from the food chain affects amphibians. Regrettably, amphibians do not provide the same response as some other types of threatened animals and very few are protected per se.

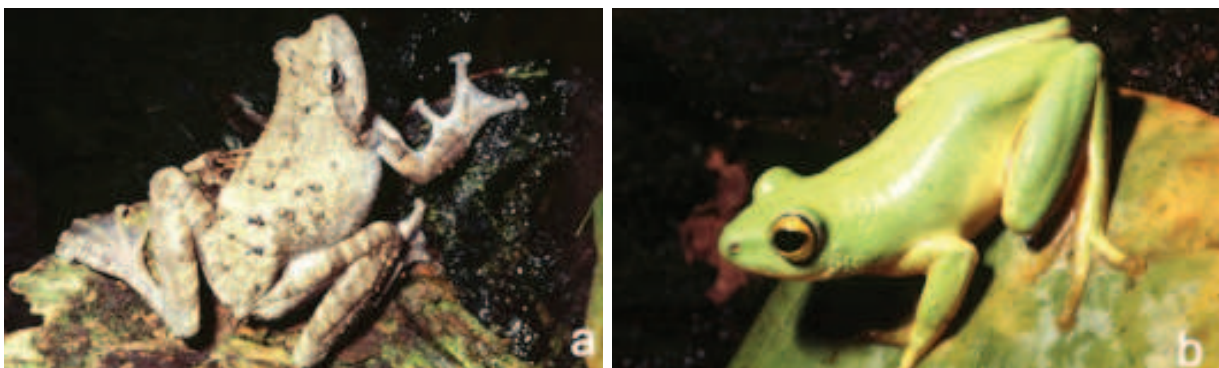


Figure 7: Some frogs of Malawi (a) *Chiromantis Xerampelina* (tree frog) (b) *Hyperolius Sp* (reed frog). Source: Lake Malawi Biodiversity Project.

Birds

About 648 species from 78 families, comprising 456 residents, 94 intra-African migrants of regular occurrence, most of which probably breed in Malawi, plus 77 regular and 12 vagrant Palaearctic species have been documented in Malawi. Over a third of all bird species in Malawi are considered to be uncommon or rare and of long-term conservation concern. Ninety-four birds in Malawi are restricted-range species,

found in only one or a few biomes. There are no true national endemic bird species, but the thrush, *Alethe choloensis*, is found only in south-east Malawi and adjacent northern Mozambique, whilst three other species, the Black-lured Cisticola (*Cisticola nigriloris*), Churring Cisticola (*C. njombe*) and Mountain Marsh Whydah (*Euplectes psammocromius*), are found only in south-western Tanzania and northern Malawi.



Figure 8: Some birds of Malawi: (a) Fish Eagle (*Haliaeetus vocifer*), Source: www.biorsearch.org.uk/gallery/image-14.htm. (b) Sehalow's Turaco (*Tauraco sehalwi*). Photo by S. G. Thorisson, (c) White faced-duck (*Dendrocygna viduata*), Photo by S. G. Thorisson, (d) Masked weaver sp. Photos by S. G. Thorisson.

Mammals

About 188 species of mammal species from 37 families have been recorded in Malawi. Of these seven: *Lycaon pictus* (African Wild Dog), *Acinonyx jubatus* (Cheetah), *Panthera leo* (Lion), *Loxodonta africana* (African Elephant), *Diceros bicornis* (Black Rhinoceros), *Paraxerus palliatus*,

Rhynchocyon cirnei (Chequered Elephant-shrew) are listed in the 1996 IUCN Red Data List of Threatened Animals. Most of these animals are found in protected areas and their long-term survival outside protected areas could be problematic due to human activities.

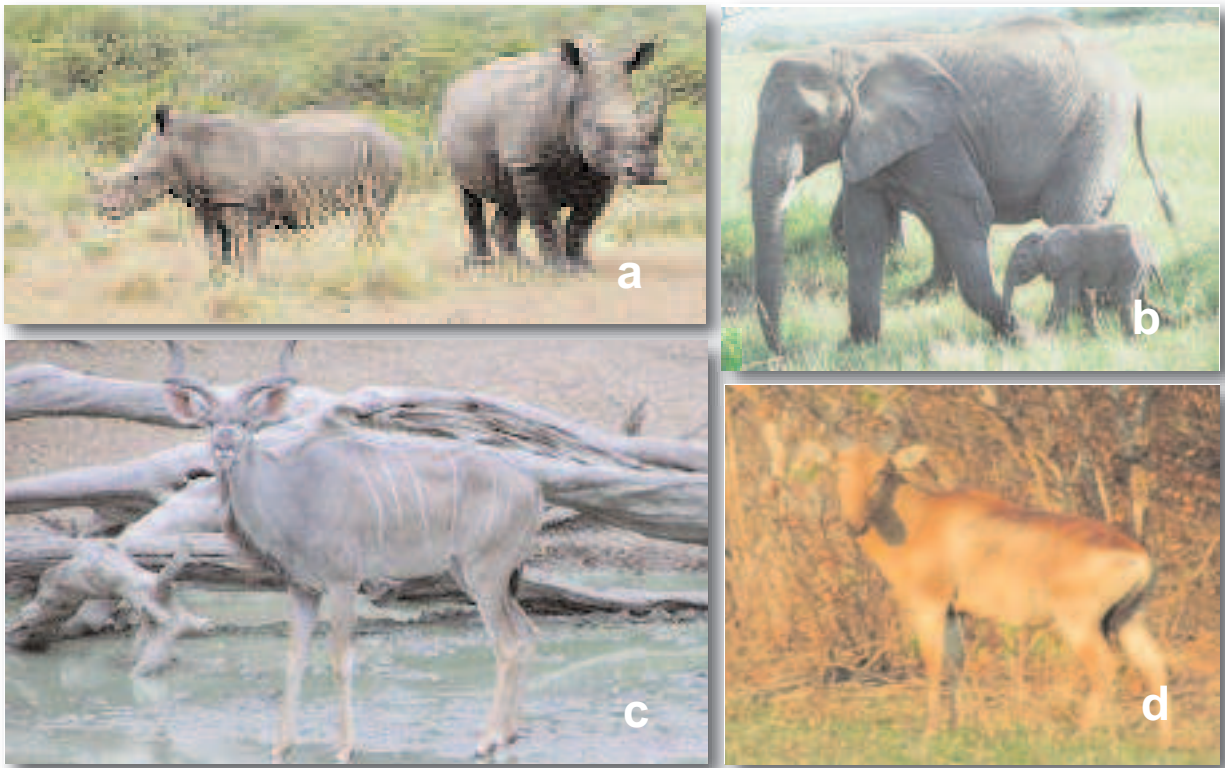


Figure 9. Some threatened mammals of Malawi; (a) Rhino *Diceros bicornis*, locally extinct but reintroduced in Liwonde National Park, Source: www.wildlife-pictures-online.com, (b) *Loxodonta africana* (African Elephant), Photo by Craig Dockrill, (c) Kudu (ngoma) *Tragegelaphus strepsiceros*, Photo by Craig Dockrill; (d) Hartbeest, *Alcelaphus lichtensiteini*, Photo by Craig Dockrill.

Current Management

Management of terrestrial biodiversity is under a number of sectoral policies and acts. These policies are grouped into three broad categories: those related to utilization of biological resources (e.g. forestry, fisheries and wildlife), those related to soil and water conservation, and those that influence biodiversity utilization, e.g. land tenure and liberalization of agricultural production linked to biodiversity and ecosystem management are described in Theme 7 (Biodiversity policies and legislation). Most of these policies were revised in line with the requirements of the NEP that was adopted in 1996 to promote sustainable social and economic development through sound management of the environment in the country.

Terrestrial plants are under the management of the National Forestry Policy of 1996, the National Parks and Wildlife Policy of 2004, and the National Land Resources Management Policy and Strategy of 2000. These policies attempt to protect biodiversity and ecosystems through:

- Identifying and protecting rare and threatened species;
- Identifying and restoring degraded ecosystems; and
- Protecting indigenous species and habitats from alien invasive species.

The terrestrial ecosystems under the customary land tenure system, mostly under subsistence agriculture, are prone to extensive deforestation for various reasons, e.g. fuelwood for domestic purposes and curing of tobacco, charcoal production for supplying urban areas and clearing for gardens/shifting cultivation (e.g. Chitemene in Chitipa). These activities have resulted in fragmentation of forests and misrepresentation of species in protected areas.



Figure 10: Slash and burn (shifting cultivation) in Chitipa District, Northern Region. Photo by Captain Steve Kasomphe.

Summary of issues

Protecting ecosystems, habitats and mountains

Malawi's ecosystems and habitats including mountains, some of which are unique, are under threat and are vulnerable to further loss from such threats as deforestation unhampered policies etc.

To prevent further loss there is need for harmonisation of sectoral policies and legislation dealing with biodiversity.

Deforestation has caused a considerable level of soil erosion resulting into siltation of many of the water bodies, local extinction of indigenous species, and reduction in mountain biodiversity to unsustainable levels

Uncontrolled grazing and in many cases overgrazing has seen the disappearance of many shrub and grass species exaggerating water runoffs and soil erosion.

There is a need to identify and protect significant remnants of natural habitats, ecosystems and mountains through coordinated research and prioritisation of

ecosystems and habitats on private and customary lands.

The current knowledge of terrestrial biodiversity in terms of taxonomy, conservation status, and socio-economic value is inadequate, resulting in poor decision making in biodiversity conservation. In addition the level of understanding of the general populous of the term biodiversity is insufficient, making it difficult for the policy maker to communicate effectively the meaning of biodiversity conservation and the values or gains in biodiversity conservation.

Private land owners, e.g. on tobacco estates, manage remnants of ecosystems and habitats based on existing regulations and out of interest. For sustainable conservation of biodiversity on private land, private landowners need incentives and recognition from government in order to increase their interest and willingness in biodiversity conservation.

Mountains and mountain ranges are hotspots for biodiversity and need particular attention.

Habitat fragmentation

There has been extensive deforestation of the forests within and outside protected areas for various reasons e.g. fuelwood for domestic purposes and curing of tobacco, charcoal production for urban areas and shifting cultivation. This has produced many isolated remnants that are important for diversity but vulnerable to continuing degradation. Evergreen forests and montane grasslands, though fragmented are represented in protected areas. However, those close to the urban areas with valuable timber such as Mulanje cedar (*Widdringtonia whytei*) are prone to extensive exploitation. In areas with high human population some evergreen forests (e.g. Thyolo Mountain) have been clear-felled because of encroachment for agricultural activities. In this regard there is need for greater recognition and action to restore fragmented and degraded habitats.

Threatened species

The number of indigenous species on land known to be at risk from insufficient or degraded habitat, plant and animal pests, or the adverse effects of human activities is not known. Many populations of threatened species continue to decline as attention and funds are focused on a small number of highly threatened, and often most visually appealing indigenous species such as elephants and rhinos.

There is no coherent management of threatened species existing in the country.

The little that exists is not well integrated with habitat protection and management of public land. There is growing interest in harvesting indigenous species on land for cultural and commercial purposes, but policy and mechanisms to effectively manage their use on a sustainable basis are lacking.

Biodiversity knowledge base

Research and information about indigenous terrestrial biodiversity in terms of taxonomy, distribution, and patterns of genetic flow, ecosystem function and managing threats is still rudimentary. This has implications on decision-making, and for interactive learning between research providers and biodiversity managers. As a result the diversity, uniqueness and vulnerability of Malawi's terrestrial habitats, ecosystems and species, and the process that threatens them, are not well appreciated by the general public. Priority setting for biodiversity management cannot be achieved in the absence of such scientific information.

Coordinated transboundary management

Malawi shares her protected terrestrial areas with neighbouring countries, in the same way that she shares her water bodies with these countries. This requires that there are appropriate collaborative transboundary management agreements put in place.

Action Plan

Objective 1.1 Protecting terrestrial species, habitats and ecosystems

Strategy 1.1.1 Enhance the existing network of protected areas and initiate programmes to protect the remnants of important habitats and ecosystems on private and customary lands.

Actions

(a) Initiate and undertake biodiversity survey and assessment to identify habitats and ecosystems of high species diversity and of particular importance for indigenous biodiversity.

(b) Formulating a policy framework that would promote conservation of habitats and ecosystems important but not represented within the existing protected area networks or that are at significant risk of irreversible loss or decline.

(c) Harmonise sectoral policies and legislation related to biodiversity conservation and provide guidelines to district assemblies on the implementation of provisions contained in existing policies.

- (d) Develop and implement programmes for sustainable conservation of ecosystems of biodiversity importance including miombo ecosystems, mountain ecosystems, wetlands and biosphere reserves.
- (e) Promote and support sustainable utilisation of genetic resources as income generating activities.
- (f) Encourage and support a grazing culture (or land carrying capacity) that would promote the improvement of shrub and grass species thereby reducing threats to indigenous biodiversity.

Key players: NHBG, Museum of Malawi, MZUNI, UNIMA, FRIM, MoJ, EAD, FD, DNPW, MoA&FS WESM, MoLGDA

Objective 1.2 Terrestrial habitats and species restoration

Strategy 1.2.1 Restore areas of degraded habitats and ecosystems and support initiatives and programmes that have priority in species restoration, conservation and sustainable use of biodiversity.

Actions

- (a) Develop and manage effectively habitat and ecosystem restoration programmes and initiatives to restore habitats to a healthy functioning state.
- (b) Develop and implement national and locally based restoration strategies identifying priority areas for restoring biodiversity and develop opportunities for collaboration at the local, national and regional levels.
- (c) Encourage and support the protection, maintenance and restoration of areas of particular importance for the conservation of selected indigenous species.

Key Players: EAD, FD, DNPW, MoLG&RD, MoA&FS NHBG, WESM, NGO's and Private Sector.

Objective 1.3 Threatened terrestrial species management

Strategy 1.3.1 Increase the population and distribution ranges of rare and threatened species and prevent additional ones from becoming threatened.

Actions

- (a) Review and strengthen all acts relating to natural resource management in terms of their effectiveness in protecting threatened species and ecosystems.
- (b) Promote and monitor sustainable use of threatened species through provision of licenses.
- (c) Undertake surveys and assessments to identify and document threatened species and revise the Red Data List for Malawi and Malawi's list of protected plants.
- (d) Increase research into, and development of, new technologies techniques and programmes to combat existing and emergent threats to biological diversity and promote increase in population and distribution range of threatened species.
- (e) Conduct and produce inventories of priority species and ecosystems requiring immediate protection and conservation.

Key players: MoA&FS, EAD, Gene Bank, DNPW, Museum of Malawi, NHBG, MoJ, FRIM, WESM, UNIMA, MZUNI, DNPW.

Objective 1.4 Biodiversity knowledge base

Strategy 1.4.1 Enhance the knowledge base of Malawians on the extent of biodiversity and promote sound decision making in biodiversity conservation.

Actions

- (a) Develop appropriate methods for collecting, documenting, identifying, classifying biological resources and promote production of inventories and checklists.

- (b) Develop human, institutional and national capacities to identify, monitor and manage biodiversity and ecosystems through training in such courses as taxonomy, natural resources management, biodiversity assessment and ethnobotany.
- (c) Conduct needs assessment in biodiversity research, prioritise national research needs and undertake research in priority areas.
- (d) Develop and strengthen existing centres of biodiversity conservation and information management.

Key Players: Museums of Malawi, NHBG, UNIMA, MZUNI, FRIM, EAD

Theme Two: Aquatic Biodiversity

Scope

Aquatic ecosystems such as lakes, small water bodies, rivers, marsh and swamp systems, and the species within them understood and conservation mechanisms put in place.

Desired outcome by 2020

- (a) Inventories of all aquatic ecosystems and species available, guidelines to promote research especially in the areas of ecology and taxonomy, and threats to biodiversity developed.
- (b) Increased public knowledge about the importance of aquatic ecosystems and their current threats has been achieved through public awareness and education campaigns.
- (c) Policies and legislation related to aquatic biodiversity and ecosystems are harmonised and strengthened and are supporting conservation and management of aquatic biodiversity.
- (d) Management plans for various types of aquatic ecosystems based on holistic and integrated approach put in place and instituted in a co-management arrangement. This will lead to an increase in number of aquatic protected areas and increase in protection of a representative range of aquatic ecosystems and species.

State of aquatic biodiversity

Aquatic ecosystems

Aquatic ecosystems cover about 26% of the total surface area of Malawi (118,900 km²). Four major types of aquatic ecosystems are recognised: lakes, small water bodies, rivers, marsh and swamp systems. The lakes are the largest constituents of the water systems and most of these comprise the areas occupied by the four major lakes (Lakes Malawi, Malombe, Chilwa and Chiuta). Lake Malawi is the largest water body covering about 20% of Malawi's total area and the most significant water body in terms of fish production and diversity. The main threats to lakes in Malawi are sediment loads, nutrient inputs, pollutants and contaminants, all generated from anthropogenic activities.

Recent water quality studies on Lake Malawi indicate that sediment deposits from rivers that feed into the lake is on the increase and these reduce the habitat of the demersal fish especially the ornamental fish species that utilize the rocky littoral zones.

Sediments also affect the productivity of water by reducing light penetration, thus affecting photosynthetic rates. A high input of certain nutrients such as nitrogen, phosphorous and silicon in the lake is on the increase. This is a symptom of nutrient enrichment derived from agricultural activities in the catchment. If such high concentrations remain unchecked, there may be an increase in the occurrence of noxious algae which may produce toxins harmful to both fish and humans. Contaminants and pollutants arising from urban and rural sources are mostly chemical in origin and enter the lakes via their inflowing rivers and from the atmosphere. Although these do not currently constitute an immediate threat to the lakes environment especially Lake Malawi, they need to be addressed.

The exact number of small water bodies that include lagoons, manmade dams and ponds is not yet known. The largest however, is the Chia lagoon situated in the central region and is the fifth largest water body in

the country. The lagoon is important for fish production since it harbours more than 24 fish species. Artificial water bodies such as manmade dams and ponds are managed for a variety of reasons including irrigation, water supply, and generation of electricity and fish production.

Malawi has six major river systems, the Songwe, South Rukuru, North Rukuru, Dwangwa, Bua, Linthipe and the Shire. All except the Shire River are major river inflows into Lake Malawi. Rivers such as Ruo, Mwanza are major tributaries of the Shire River. Most rivers, for part of their length, flow through farmland and urban areas but for a few rivers some parts of the river systems flow through the protected areas. No river has any form of protection and many rivers are ecologically degraded by invasive species, sedimentation, cultivation and deforestation.

There are numerous marsh/swamp systems recorded in the country and these are associated with lakeshore basins, inland basins, river floodplains and inland valleys. Marshes are important habitats for a wide diversity of plants and animals. Marshes of the northern region (e.g. marshes of Chitipa Hills) are important habitats for waterfowl and large mammals. Most of the marshland has been lost due to cultivation and invasive species. The loss is very pronounced in the central region where over 60% of the marshes and dambos have been lost to winter cultivation. Apart from the loss of swamps and marshes due to anthropogenic activities, invasive species such as water hyacinth are major threats to aquatic biodiversity.



Figure 11. Water hyacinth *Eichhornia crassipes* a major invasive aquatic plant. Photos by A. Chikuni

Aquatic biodiversity

Aquatic life is diverse but the species richness is poorly known mainly due to inadequate research and ineffective information dissemination. However, it is reasonable to make general statements on the biodiversity of such groups as fish, amphibians, reptiles, birds, mammals, invertebrates and aquatic plants.

Vertebrates

Fishes

Fish is the most studied group. The total number of species is estimated at 1,000 species in 14 families and 81 genera, thus representing approximately 15% of the global total of freshwater species and approximately 4% of the world's fishes. Over 800 fish species are found in Lake

Malawi alone although less than 250 species are described. Ninety-five per cent of these species are endemic. The haplochromine cichlids are the most common fish group in Lake Malawi. With over 800 species the lake has the largest number and the most diverse communities of freshwater fish species in the world. The fishes of Lake Malawi are therefore the most remarkably diverse and abundant faunal groups in the world.

Reptiles and Amphibians

Seventy-four species of amphibians have been recorded in Malawi of which 72 are frogs and toads. There are 140 species of reptiles represented in 22 families. Of these reptiles, monitoring lizard, terrapin, turtles and some snakes such as pythons are associated with the aquatic environment.

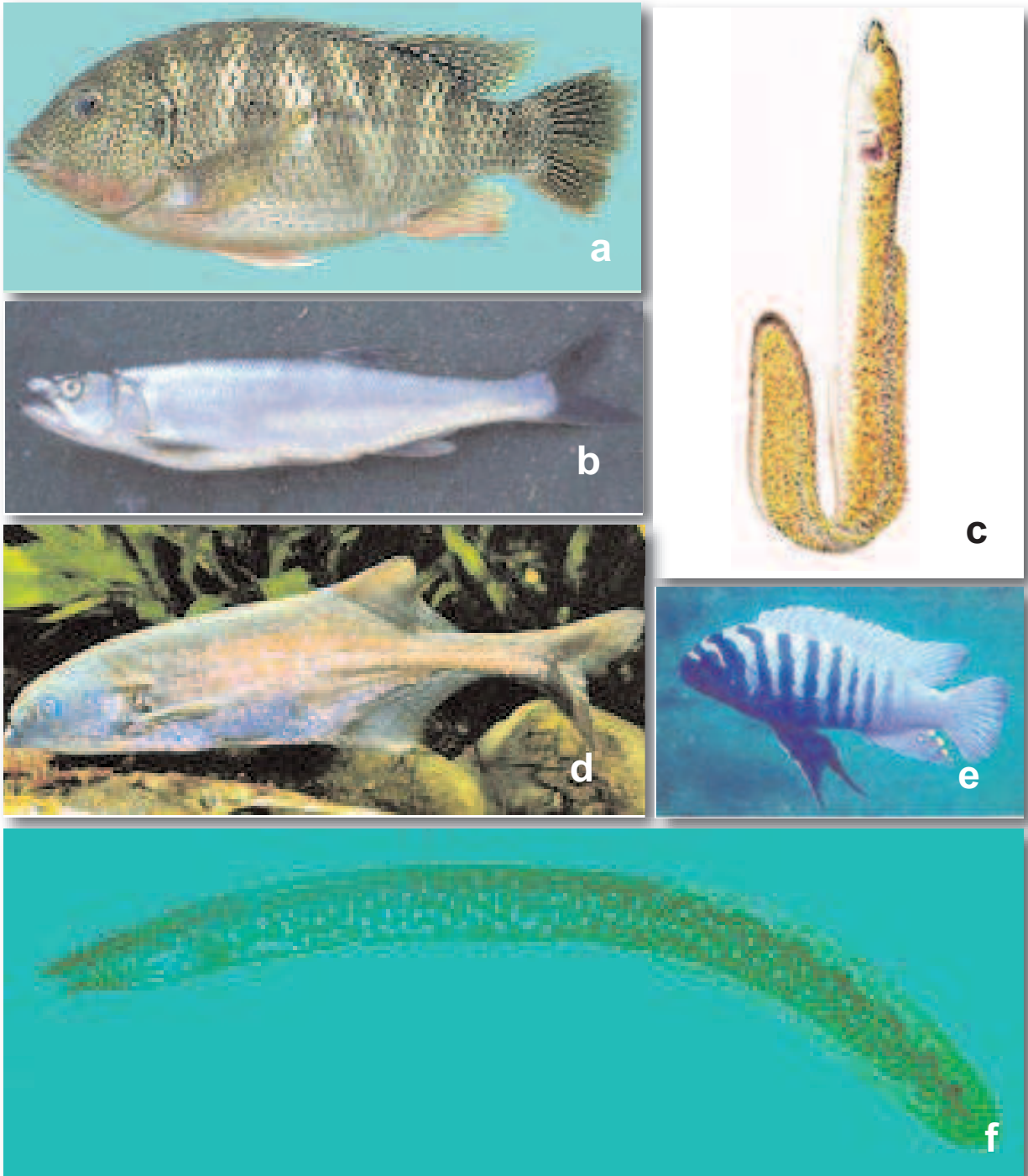


Figure 12: Some fish species of Lake Malawi; (a) *Tilapia rendalli*, (b) *Opsaridium microlepis*, mpasa, photo by G. F. Turner (c) *Anguilla bengalensis labiata* - eel (d) *Marcusenium nyasensis*, (e) *Maylandia zebra* syn: *Pseudatropheus zebra*, (f) *Aethiomastacembelus shiranus* - spiny eel. Source: www.malawicichlids.com, and www.hull.ac.uk/cichhds/fish-nonrich-gallery.html,

Mammals

Of the 188 mammal species recorded in Malawi Hippopotamus, rodents and Otters are the common mammals that have a true affinity for aquatic habitats. Hippopotamus are on the decline due to conflicts with man for habitats and if the present trend continues they may be completely decimated.

Birds

The bird fauna comprises 648 species of which a high proportion has strong affinities for aquatic habitats. Fish eagles, grey-headed gulls, pelicans, open-billed stork, white-breasted cormorant and pied kingfisher are some of the birds found in this country that show strong affinities for aquatic habitats. These birds are valuable ecological components and are attractive to ornithologists and tourists. For instance, the white-breasted cormorants are one of the important predators on Lake Malawi and feeding studies estimated that the 10,000 cormorants consume about 950 tons of fish per year.

Some Lake Malawi islands, such as Boadzulu and Mumbo in the past supported large colonies of white-breasted cormorants, but populations have declined possibly due to deforestation or hunting. The largest density of fish eagles in the world was supported by the Lake Malawi National Park, but currently the population seems to be declining. Monitoring surveys for the populations are needed to track the trends.

Invertebrates

The aquatic invertebrates, broadly divided into insect and non-insect groups, are poorly studied and as a result their species richness is uncertain. Recent studies on non-insect aquatic invertebrates indicate that this group comprises 280 species (93 lacustrine and 187 associated with water). These non-insect aquatic invertebrates include Molluscs, Nematodes, Crustaceans (Copepod, Cladoceran, Crabs, Ostracods, Isopods, small prawns etc), Rotifers, Annelids, Acarins and many others. Chironomids, water mites and nymphs of various insects are the most common amongst the insect group. Although the diversity of molluscs is low, there are endemic species like *Neothauma ecclesi* and *Bulinus nyassanus*.

Vegetation

Aquatic vegetation comprises the vascular macrophytic species, filamentous attached algae, phytoplankton and unicellular demersal algae. The aquatic vascular plants are the true macrophytic components of the system and are categorised in terms of their life-forms as rooted emergent macrophytes (e.g. reeds, bulrush, papyrus, hippogloss), rooted macrophytes with floating leaves (e.g. water lily, water hyacinth), rooted submerged with floating leaves (*Vallisneria spp.* and *Potamogeton spp.*) and free-floating macrophytes (e.g. *Azolla nilotica*). The filamentous algae comprise at least 50 species, but its taxonomy is poorly understood. Phytoplankton and unicellular demersal algae comprise more than 60 species and more species are being discovered.

Current management

Aquatic biodiversity and ecosystems are managed by complex and often conflicting policies and legislations. Water resources are currently managed by the 1994 Water Resources Management Policy (WRMP), which places much emphasis on provision of portable water. The policy fails to address issues pertaining to water resource monitoring, assessment and implementation of strategic plans. The

deficiencies are addressed in the draft Water Resources Management Policy of 2004.

Most aquatic ecosystems are not protected except the southern part of Lake Malawi, Lake Chilwa, Vwaza Marsh, part of the middle Shire River and part of Elephant Marsh. Lake Malawi National Park is the only truly lacustrine park and was

established in 1984 as part of the Government Policy to conserve part of the lake biome, with particular reference to rocky shore habitats and its specialised fish communities. The park was declared a UNESCO World Heritage Site in 1984. Lake Chilwa is a Ramsar site and was designated as a wetland of international importance for waterfowl habitat in 1997.

Some aquatic ecosystems, principally rivers and marshes, are partially protected where some portions fall within or pass through the protected area but Malawi lacks a wetlands policy framework to guide management and conservation of wetland resources.

Fisheries management is under the Fisheries Conservation and Management Act (FCM) of 1997, which seeks to strengthen institutional capacity by involving various other stakeholders in the management of fisheries, including the private sector, local communities and NGOs. The FCM is implemented by the fisheries and aquaculture policy, which among other things encourages conventional management regulations. These regulations have previously been administered through

the top-down approach, with the central government agencies deciding the issues and needs of the fishing industry. Compliance with management regulations, however, is low due to inadequate enforcement of fisheries regulations caused by financial and human resources constraints, and the open entry nature of the fisheries, in particular the small scale fisheries.

In view of the above unsatisfactory management regime, alternative fisheries management arrangements have been initiated especially in Lakes Malombe, Chilwa and Chiuta. The new initiatives involve the formulation of management plans which are being implemented through a more consultative and participatory approach referred to as Participatory Fisheries Management (PFM) approach. Long-term management objectives translated into management actions are the basis for the formulation of the management plans. So far three management plans have been developed under the new initiative: for Lake Malombe fisheries, for Lake Chilwa and for the Chambo fishery. All the three strategies have different objectives and are implemented through PFM approach.

Summary of issues

Conflicting policies and legislation

Aquatic biodiversity and ecosystems are managed by complex and often conflicting policies and legislations, which are compounded by the existing weak institutional arrangements. This calls for development of a comprehensive aquatic biodiversity policy.

Integrated watershed management

The threats to aquatic biodiversity are diverse and pervasive and are linked to growing anthropogenic activities of which poverty and population growth are the root causes. Many land use practices adversely affect the aquatic biodiversity through their effects on the habitats and ecosystem types. Other threats to the aquatic ecosystems are exploitation and pollution. In order to

achieve sustainable integrated management of the aquatic biodiversity the following issues need to be considered:

- Encourage integrated watershed management and minimize the current deforestation, biomass burning and winter cultivation that is wide spread in wetlands and riverbanks; these activities are a source of excessive nutrient enrichment, sedimentation deposits and contaminants which affect ecological health of aquatic habitats. Consequently breeding sites for fish are destroyed, rivers evolve from being perennial to seasonal, and excessive flooding occurs in the lower course.

Sedimentation also results in low productivity of water by reducing light penetration.

- Minimize activities (such as grazing, drainage) that continue to reduce and degrade aquatic habitats and ecosystems. For instance marshes of Lilongwe plain and Bua River are important breeding sites for endangered fish species (mpasa), habitats for waterfowl and large mammals but most of these marshlands have been lost due to winter cultivation, grazing and introduced invasive species.
- Reduce flow of contaminants and pollutants (mostly chemical in nature) arising from urban and rural sources.

Protecting aquatic ecosystems and habitats

Malawi is rich in parks and reserves yet most aquatic ecosystems are not protected fully. The designation of some aquatic ecosystems as protected areas under the National Parks and Wildlife Act will ensure that many distinctive natural habitats with unique species that are threatened will be protected from continuing degradation. This will also increase our knowledge of the distribution and taxonomy of aquatic species and will facilitate sustainable use of biodiversity and identification of threatened species.

Our knowledge of aquatic biodiversity

Our current knowledge of aquatic biodiversity and the ecological functions of the aquatic ecosystems are still rudimentary mainly due to the fact that many of aquatic taxa remain undescribed. Furthermore, threats to aquatic ecosystems are not well

understood. This low knowledge base affects sound decision making on conservation of aquatic biodiversity.

Habitat fragmentation

Due to population growth, new farmlands are opened up for cultivation and settlements. This has created islands of remnants of aquatic ecosystems, mainly dambos. Intensification of riverbank cultivation has resulted in rivers being unprotected and becoming seasonal. These islands of aquatic habitats require well-designed restoration programmes in order to restore them to their original ecological health.

Coordinated management

Management of aquatic systems presents special challenges because of the need to integrate land, water, forestry, fisheries and animals and to coordinate the use of a range of policy and management tools. Currently, the shared responsibilities are not properly articulated and this calls for mechanisms to ensure coordination of these activities. Malawi also shares her water bodies with neighbouring countries, in the same way that she shares protected terrestrial areas with these countries. This requires that there are appropriate collaborative transboundary management agreements put in place.

Open access

Aquatic ecosystems are open access where property rights are virtually absent. This makes management of the aquatic ecosystems difficult. Currently, it is government responsibility to manage these aquatic ecosystems.

Action Plan

Objective 2.1 Protecting aquatic species, habitats and ecosystems

Strategy 2.1.1 Promote protection of the existing network of aquatic protected areas and initiate programmes to provide legal protection to other aquatic habitats.

Actions

- (a) Review existing policies and legislation and create enabling policy framework and harmonise existing policies to promote conservation of aquatic habitats and ecosystems not represented within the existing protected area networks.

- (b) Create and support alternative income generating activities that can take away pressure from the unstable areas such as wetlands and dambos and by so doing preserve the ecosystem.
- (c) Develop guidelines and programmes to promote integrated watershed management and community participation in conservation and sustainable use of aquatic biodiversity.
- (d) Establish a permanent office to be responsible for the collection, collation, storage and dissemination of aquatic biodiversity conservation information.

Key Players: Museums of Malawi, UNIMA, MZUNI, FRIM, MoJ, EAD, FD, DNPW, MoA&FS, DoF, NRCM.

Objective 2.2 aquatic habitat restoration

Strategy 2.2.1 Restore degraded aquatic habitats and ecosystems and support initiatives and programmes that have priority in sustainable use of aquatic biodiversity.

Actions

- (a) Develop and manage effectively aquatic habitats and ecosystems restoration programmes and initiatives to restore aquatic ecosystems to a healthy functioning state.
- (b) Develop and implement national and locally based aquatic restoration strategies identifying priority areas for restoring biodiversity and develop opportunities for collaboration at the local, national and regional levels.
- (c) Develop guidelines and programmes for the compilation, inventory and prioritisation of degraded habitats and aquatic ecosystems that require priority management and restoration.

Key players: EAD, MoA&FS, NPGRC, FD, DNPW, DoF, MoLGRD, MoLPPS.

Objective 2.3 Threatened aquatic species management

Strategy 2.3.1 Increase the population and distribution ranges of rare and threatened aquatic species and prevent additional ones from becoming threatened.

Actions

- (a) Undertake surveys and assessments to identify and document aquatic threatened species and revise the Red Data List for Malawi.
- (b) Increase research into, and development of, new technologies and techniques to combat existing and emergent threats from plant and animal pests to indigenous biodiversity.
- (c) Develop guidelines and programmes for *in situ* and *ex situ* conservation of rare and threatened aquatic species.
- (d) Promote private sector and community participation in fish farming programmes.

Key players: MoA&FS, EAD, MoJ, UNIMA, MZUNI, DoF, MOLPPS.

Objective 2.4 Improve aquatic biodiversity knowledge

Strategy 2.4.1 Enhance the knowledge base on the extent of aquatic biodiversity and develop enough human, institutional and national capacity to monitor, identify and manage aquatic biodiversity.

Actions

- (a) Develop appropriate methods for collection, documentation and curation of aquatic biodiversity.
- (b) Develop human, institutional and national capacities to identify, monitor and manage aquatic biodiversity and ecosystems through training in such courses as taxonomy, conservation and sustainable use.

- (c) Develop and or strengthen existing centres of activity in biodiversity conservation and information management.
- (d) Enhance research on biodiversity conservation, sustainable use and equitable sharing of the benefits arising from the use of the biodiversity.

Key Players: EAD, FD, DNPW, DoF, UNIMA, MZUNI, NHBG.

Theme Three: Sustainable Use of Biological Diversity

Scope

Sustainable use of Malawi's biodiversity components is supported by a strong and enabling national policy; and strong indigenous and local community participation.

Desired outcome by 2020

- (a) Guidelines and procedures for conservation and sustainable use of forest, fish, and wildlife biological diversity are in place and are resulting in the improvement in ecological functioning of forests and aquatic ecosystems.
- (b) Mechanisms for stakeholder participation in collection, characterisation, research and storage of biological resources, including programmes for public awareness and education on the role and importance of pollinators, soil flora and fauna in maintaining the agricultural diversity are contributing substantially to maintenance of domesticated and indigenous species important for agricultural production and food security.
- (c) Integrated policy and institutional framework are encouraging and facilitating a coordinated approach to conservation and sustainable use of biological diversity.
- (d) Guidelines and procedures to enhance, protect and encourage customary use of biological resources in keeping with traditional practices that are compatible with sustainable use of biological resources are in place.
- (e) Mechanisms and guidelines to enhance research, human and institutional capacities are promoting investigations into the relationships between sustainable use and conservation of biological resources, and subsequently leading to realisation of the full potential of Malawi's biological diversity in socio economic development.
- (f) Guidelines and mechanisms to promote and facilitate on-farm management, utilisation and conservation of biological diversity are developed and are encouraging conservation of biodiversity on customary land.

State of sustainable use of biological diversity

Biodiversity components that are directly relevant to sustainable use can be grouped into five categories; agricultural biodiversity, forestry, fisheries, wildlife and non woody forestry products.

Agricultural biodiversity

The driving force of Malawi's agricultural sector is the rich agrobiodiversity (which is defined as the variability among living organisms associated with cultivated crops and domesticated animals and the ecological complexes of which they are a part). Agrobiodiversity is often placed in two broad categories: domesticated plants and animals. Domesticated plants may be

categorised as cereals, legumes, commercial/industrial crops, fruits and vegetables, and roots and tubers.

Cereals

Maize, sorghum (*Sorghum bicolor*), rice, millet (*Pennisetum* spp. and *Eleusine coracana*) are major cereal crops of Malawi. Originally Malawi was a country of sorghum and millet but these have been marginalized with the introduction of maize (*Zea mays*). Very few sorghum and millet materials are currently being held *ex situ* because inadequate storage facilities do not allow long-term storage of genetic material.

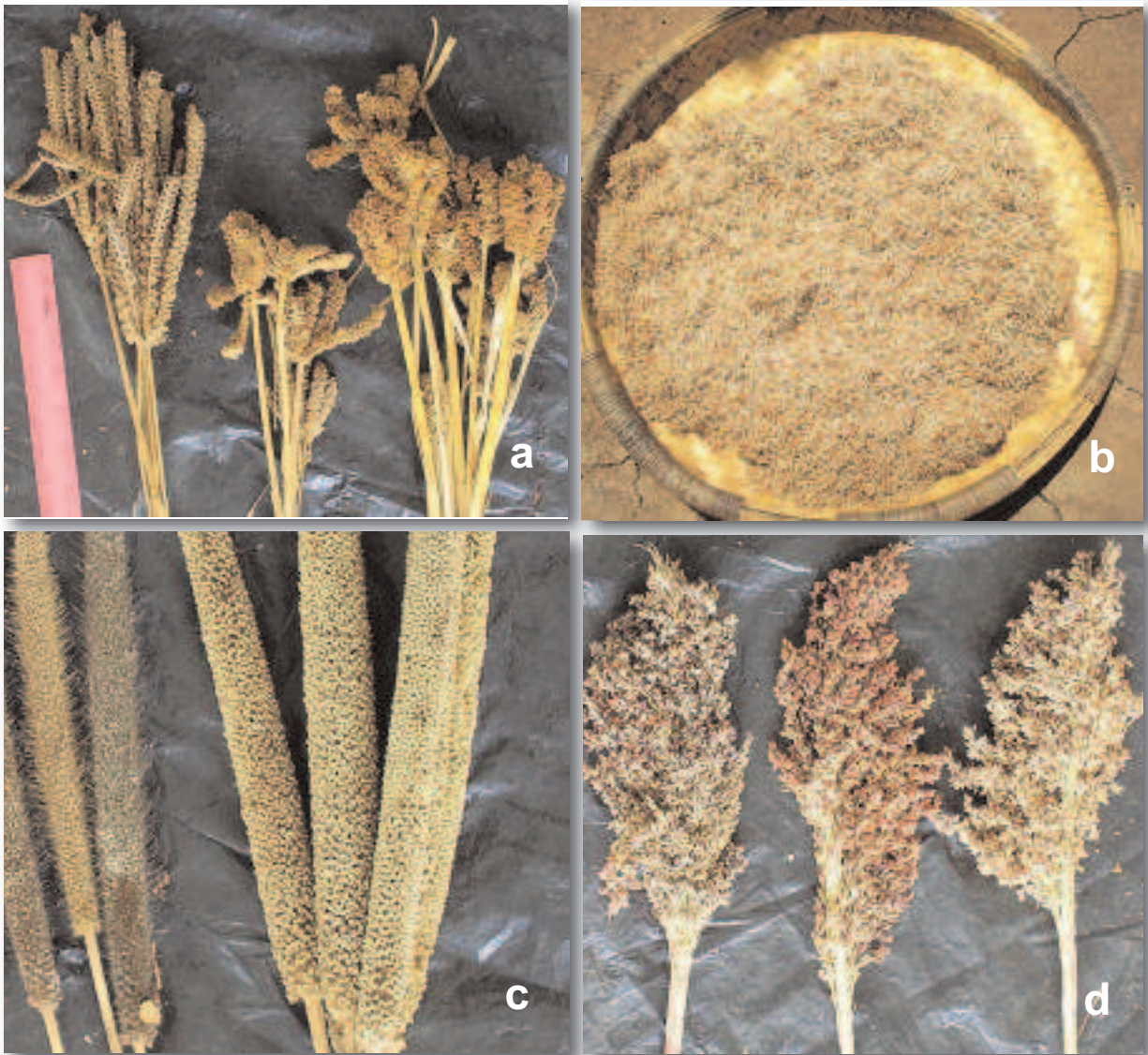


Figure 13: Traditional cereals of Malawi; (a) figure millet, mawere, (b) germinated figure millet grain chimela (*Eleusine coracana*), (c) pearl millet, mchewere (*Pennisetum glaucum*), (d) Sorghum (*Sorghum bicolor*, mapila). Photos by A. Chikuni

Legumes

Major leguminous crops grown in Malawi include common beans, cowpeas, bambarra beans, peas, groundnuts and pigeon peas. The common beans (*Phaseolus vulgaris*) have the greatest diversity in morphological and agronomic characteristics. The northern and central regions have the greatest diversity but their diversity in the south is eroded due to market forces that demanded red kidney classes. Other species of beans such as *Phaseolus lunatus* and *Phaseolus coccineus* are also grown.

The diversity of groundnuts (*Arachis hypogaea*) is not as extensive but over five varieties are commonly grown. There is

only one released variety of cowpea (*Vigna unguiculata*), possibly an introduction called Sudan 1. Cowpeas are grown in most places that are warmer and more suitable than for the common beans. Most of the cowpea materials are prostrate landraces. Newer materials from IITA that are upright are available and are being tested. Similarly, there is only one pigeon peas (*Cajanus cajan*) released variety called ICP 9145 while there are many local types, similar in growth habit to ICP 9145 that are grown.

Malawi has a little over a hundred different types of bambarra groundnut (*Vigna subterranea*, formerly *Voandzeia subterranea*). This is referred to as a 'crop of our ancestors' and up to now it is associated

with some taboos. It is more nutritious than the groundnut and it also contributes more biologically fixed nitrogen than the groundnuts. But it is not widely grown in the country and its production is in localised communities.

Soya beans (*Glycine max*) is a fairly new legume. There are about ten released varieties but all of them have the requirement for inoculation with Rhizobium. Peas (*Pisum sativum*) are grown off-season along the river valleys. The bulk of the crop is probably that which is grown in Zomba, Chiradzulu, Thyolo, Ntcheu (Tsangano) and Mwanza districts. The velvet bean (*Mucuna pruriens*), locally known as kalongonda, is grown in the southern and central regions but is not widely consumed and as a result no systematic collections are available.

Commercial crops

There are 8 major industrial crops namely, sunflower, tobacco, sesame, cashew nut, macadamia, coffee, tea and sugar cane.

Burley and flue cured tobacco (*Nicotiana tabacum*) are commonly grown in Malawi, but there is lack of genetic biodiversity for all tobacco types. Tobacco is the most important foreign exchange earner. Most tobacco germplasm is maintained at the Agricultural Research and Extension Trust (ARET), on estates and smallholder farms.

There are many clones of tea (*Camellia sinensis*) produced, grown and maintained at the privately owned Tea Research Foundation. The genetic material of coffee varieties (*Coffea arabica*) however are maintained at Lunyangwa Research Station. Most of the coffee grown in Malawi originated from Ethiopia, Brazil and Portugal.

Sunflower (*Helianthus annuus*) is a crop that has been grown in the country over many recent years by smallholder farmers. The materials grown are mostly tall traditional types. The traditional types were once collected but the germplasm was lost in storage due to poor storage facilities.

Several varieties of sugarcane (*Saccharum officinarum*) are grown in Malawi. The sugar estates grow improved varieties whilst local farmers cultivate local varieties, which are quite diverse, but very little characterisation has been done.

Domesticated fruits and vegetables

The introduced fruits like the pineapple (*Ananas sativus*), pawpaw (*Carica papaya*), Chimwela (*Citrullus lanatus*), oranges, lemons (*Citrus spp*), mangoes (*Mangifera indica*), apples (*Malus domestica*), banana (*Musa paradisiaca*), Magalagadea, (*Passiflora edulis*), apricot (*Prunus armeniaca*), peach (*Prunus persica*), guava (*Psidium guajava*), and others are playing a major role in the nutrition of Malawians. Similarly introduced vegetables such as tomato (*Lycopersicon esculentum*), tanaposi or mpiru (*Brassica chinensis*), cabbages (*Brassica oleracea*), lettuce (*Lactuca sativa*), spinach (*Spinacia oleracea*) also contribute to the nutrition of Malawians. The genetic resources are often maintained by various horticultural organisations and departments.

Roots and tubers

Cassava (*Manihot esculenta*), sweet potatoes (*Ipomoea batatas*) and irish potatoes (*Solanum tuberosum*) are among the widely cultivated root and tuber crops. There are many varieties of sweet potato most of which are improved. Most of the local varieties are maintained on farm. The 24 varieties of Irish potatoes, which are mostly grown in high altitude areas, are a source of cash and food to most rural communities especially in areas such as Tsangano, Neno, Dedza, Shire highlands, Viphya Plateau, Ntchisi, Phoka and Misuku hills. All the varieties of potatoes grown in Malawi are introduced.

Many varieties of cassava are cultivated in Malawi most of which are improved varieties. Cassava is a staple food for about 30% of the population especially along the Lakeshore areas.

In addition to these there are also many wild edible tubers and the most popular

ones include buye (*Plectranthus esculentus*) and terrestrial orchids. Orchid tubers are often processed into a meat substitute called chikande. The habitat for most of the indigenous tubers is severely restricted and as such most of them have become rare. Lack of collection and management programmes means that most of the indigenous tubers will become locally extinct.

The diversity of domesticated animals

Animal genetic resources comprise ruminant livestock, mammalian monogastrics and avian monogastrics, which come in many breeds and varieties. Ninety percent of these are of the indigenous type, with pure exotics and crossbreeds making up the remainder.

Livestock production contributes about 36% to agricultural production and is dominated by cattle and poultry production. Cattle population in Malawi is dominated by Malawi Zebu type, which is mainly a beef animal. Indiscriminate crossbreeding with exotic types e.g. Brahman, Sussex, Africander and Charolais has seriously diluted the genetic diversity of the Malawi Zebu.

There are four main genotypes of goats (*Capra hircus*) in Malawi: the indigenous (local types), which is typically a meat breed, the Boer goat an introduced dual-purpose goat from South Africa, the Boer crosses (which are kept for meat), and the Saanen goat.

The sheep (*Ovis aries*) is present in three genotypes, the long-tailed (natulised) and mainly kept for mutton - the Dorper, an introduced breed from South Africa, and the Dorper crosses that are also kept for mutton. The Kasikidzi Sheep Improvement Centre in Kasungu, under the Malawi Germany Livestock Development Programme used to keep Merinos (wool breed) and Van Rooy (Mutton breed) but these are no longer found.

There are five breeds of rabbits (*Oryxtolagus cuniculus*), the New Zealand white and New

Zealand Red, the Flemish Giant and the California. All breeds are used for meat.

Local pigs (black types) are maintained on farms and a few are maintained at research stations and commercial farms. The indigenous black pig is basically a scavenger and its meat is often shunned and as a result it has received limited characterisation. Only large white and landraces are bred for porkers.

There are five breed types of domesticated and introduced birds (*Gallus domesticus*): the Indian River and Cobb-Cobb for meat, Hy-line for eggs, Black Australorp for both eggs and meat, Black Australorp and local crosses for egg and meat production and the local for egg and meat production. Broiler types are less abundant than the Black Australorp and its crosses that are more abundant. The local variety is diverse and includes dwarf, frizzle, the naked neck, the spotted, the helmeted and long-legged types. Among the local types the frizzle and long-legged types are extremely rare and are feared locally extinct.

Pigeons or doves (*Columna livia*) of all types of plumage are highly abundant in Malawi. They are a neglected species that has attracted very little or no attention from researchers. The common duck (*Anas platyhynchos*) is a local mostly kept for the table.



Figure 14: Common and naturalised livestock types; (a) Cattle, (b) pigs, (c) goats (*Capra hircus*), (d) sheep (*Ovis aries*). Photos by A. Chikuni.

Forest biological diversity

Approximately 38% of total land area of Malawi is under forest cover. Of these about 11% is under national parks and wildlife, 10% are gazetted forest reserves and the remaining 17% is natural woodlands on customary land. Currently there are about 87 gazetted forest reserves and approximately 80 are under consideration to be gazetted. Forests are important as they contribute towards environmental protection, soil and water conservation. They mitigate against climate change since they are a major sink for greenhouse gases, in particular carbon dioxide, and contribute towards reduction of pollution. Forests also play a major role in nutrient recycling and in maintaining microclimate for other organisms. Over half of Malawi's terrestrial species diversity including threatened species are associated with forests (both protected and unprotected), thus forests are a refuge for a wide range of biological resources ranging from vertebrates, invertebrates, mushrooms and plants.

Utilisation of biological resources, especially in forests adjacent to villages, is extremely important to local communities since the forests are sources of livelihood. For example, grass and papyrus are used extensively for thatching, especially in rural areas. Wood fuel (firewood and charcoal) remains the dominant source of energy, accounting for approximately 90% of the household and industrial energy requirement. At the household level wood is also used for construction, timber, farm implements such as axe and hoe handles. Local communities also harvest different fruits, mushrooms, roots and tubers for household consumption and for sale. Forest resources therefore contribute substantially to food security and poverty reduction.

Wildlife resources

Malawi has five National Parks and four Wildlife reserves. Like forests, national parks and wildlife reserves contribute to environmental protection. They are the only habitats where Malawi's endangered large

mammals receive full protection, without which species such as elephants, lions, crocodiles, zebras, buffalos, hippopotamus, antelopes, kudus, and common duiker would have been locally extinct. This has also encouraged reintroduction of species, which were once extinct such as the black rhino. The actual and potential benefits of wildlife resources are many but include economic, aesthetic, scientific and cultural. At present the contribution of wildlife to the socio-economic development is very small largely because the potential for tourism has not been fully exploited.

Wildlife maintained in forest reserves is source of protein to the surrounding communities. Hunting, for the past decades, constituted the major use of wildlife resources and is probably the oldest subsistence and livelihood use of biological resources in Malawi. In areas where human population is small and game is common, nearly all animal protein consumed by the local population is derived from wildlife.

Fisheries resources

Approximately 50,000 tons of fish are caught annually from Malawi's lakes (Lakes Malawi, Malombe, Chilwa and Chiuta) and river systems (e.g. Shire River) of which 60% are caught by commercial fisheries in Salima and Mangochi. It is estimated that 250,000 people along the major fishing areas depend on fish as a source of food and livelihood. It is also estimated that the fisheries sector provides 60-70% of total animal protein in Malawi.

Fisheries in Malawi have experienced considerable decline in the 1990s after a relative stability in the preceding years. The catches have declined from an average of 60,000 metric tons in the period of 1976-1990 to 49,000 metric tons in 1991-2001. This decline is mainly caused by declining fisheries in the smaller water bodies such as Lakes Malombe, Chilwa and Chiuta (Fig. 13). For instance, *Oreochromis* species (e.g. *Oreochromis karongae*, locally known as chambo), a highly valuable, famous and popular fish, supported an important

fishery in the southern part of the lake in the 1980's, but it is presently overexploited. The chambo landings for both Lakes Malawi and Malombe averaged 11,000 metric tons during the period 1976-90 and declined to an annual average of 3,400 metric tons during the period 1991 to the present. The decline of the chambo stocks is most pronounced in Lakes Malombe and Malawi and the trend is also observed in other natural water bodies such as Lake Chilwa (Fig. 16).

There is also a growing ornamental fish trade that utilises the Lake Malawi cichlids, particularly targeting the export market to satisfy the demand for aquarium fish. The amount of ornamental fish being exported has not been established nor its contributions to the economic growth.

Non-woody forestry products

The potential value of such biological resources as fungi, algae, microorganisms, and invertebrates is not well known. The role invertebrates play as pollinators appears not to be appreciated since no deliberate policy or mechanisms are in place to protect them. This also applies to soil microorganisms that play a crucial role in nutrient recycling and soil fertility. This lack of knowledge in terms of their economic potential, distribution and diversity leads to undervaluation of less known biological resources and has often times facilitated free access by foreign investors to biological resources (e.g. medicinal plants) and unsustainable exploitation of the same resources.

Numerous indigenous edible fruits have been recorded but the commonly used ones include baobab, (*Adansonia digitata*) masuku (*Uapaca kirkiana*), bwemba, (*Tamarindus indica*); masawu (*Ziziphus mucronata*). Some of the indigenous fruits such as masuku (*U. kirkiana*, Marula (*Sclerocarya birrea*) etc are being characterised through various agroforestry programmes for domestication. Through a community based natural resources management project, communities in Mwanza are producing

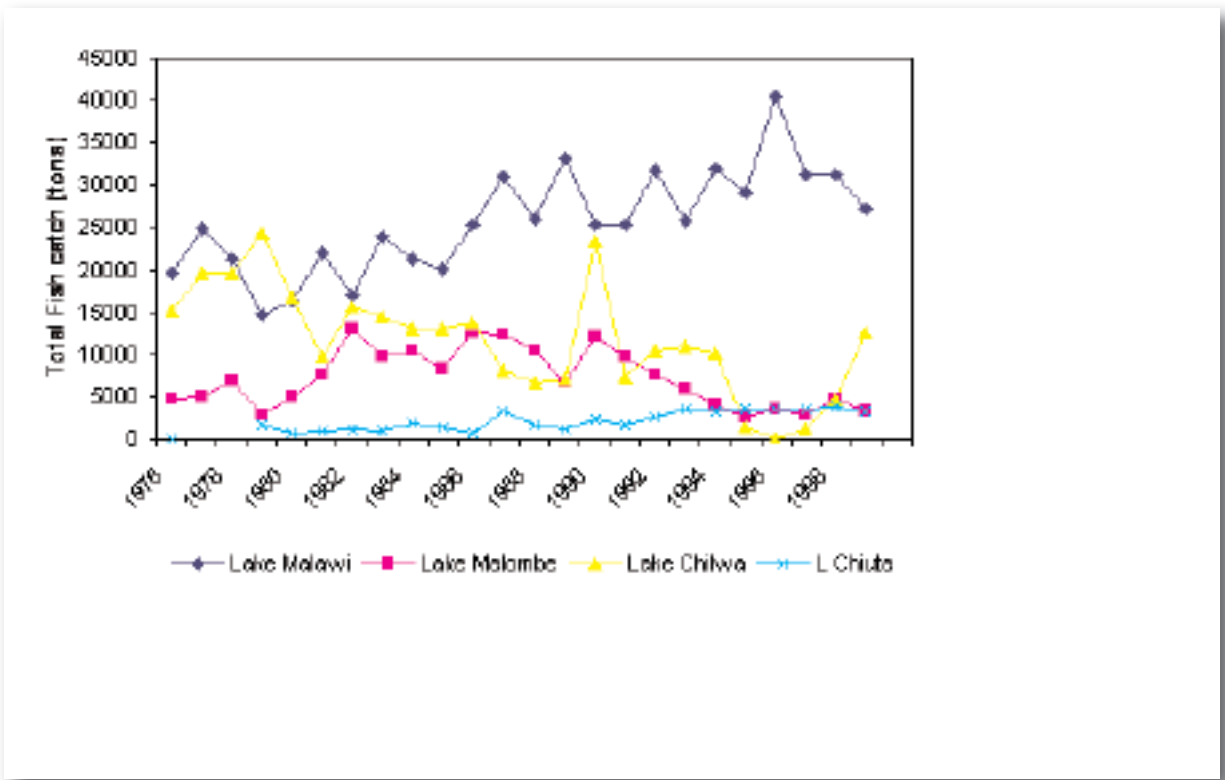


Figure 15: Summary of total fish catches in major waters of Malawi; *Source:* Fisheries Research Unit.

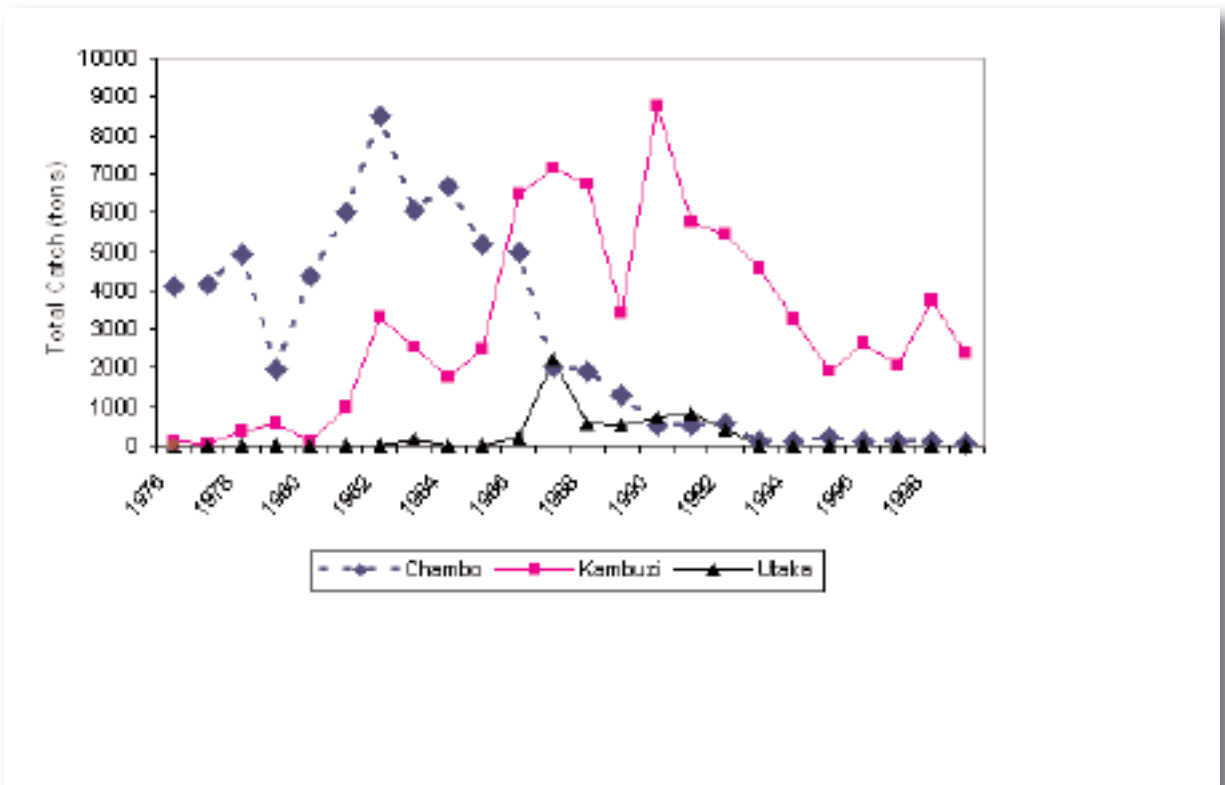


Figure 16: Analysis of fish catch in Lake Malombe; *Source:* Fisheries Research Unit.

juice from *Tamarindus indica* and *Adansonia digitata*.

Malawi has many edible indigenous vegetables. Some of the popular indigenous vegetables include denje (*Corchorus triocularis*), limanda (*Hibiscus acetosella*),

Bonongwe (*Amaranthus spp.*), luni or cat whiskers (*Gynandropsis gynandra*). Programmes to collect and characterise indigenous vegetables are under way at Bunda College of Agriculture.

Current management

Malawi's active participation in the conservation of biological diversity started as early as 1912 when the first forest reserve was established. To date Malawi has a network of protected areas comprising 87 forest reserves, five national parks and four wildlife reserves. The bulk of the indigenous genetic diversity is conserved *in situ* in the network of forest reserves and national parks. A substantial amount of biodiversity is conserved *in situ* and *ex situ* on customary and private land.

Collections of indigenous and introduced genetic material (both plants and animals), is the responsibility of both private and public research stations, botanic gardens, the universities and private estates. The National Plant Genetic Resources Centre collects, characterises and maintains indigenous crop plants and wild relatives of cultivated plants. Forest trees, on the other hand, are collected and characterised by Forestry Department especially the National Tree Seed Centre at the Forestry Research Institute of Malawi (FRIM). The

botanic gardens have a living collection of introduced and indigenous species.

In line with the requirements of the EMA and NEP, sectoral legislation and policies on environment and natural resources were revised to incorporate provisions for community participation in natural resource management. This has resulted in various co-management arrangements of forest resources through Village Forestry Areas (VFAs), fisheries resources through the Beach Village Committees (BVCs) and wildlife resources through the Wildlife Management Areas.

Many government departments and organisations e.g. the National Herbarium and Botanic Gardens, wildlife reserves, Gene Banks and the Universities participate in global conservation and recovery programmes of threatened and rare species only. Such programmes are often part of government obligations to implement international and regional conventions which Malawi is party to.

Summary of issues

Major issues that Malawi should take into consideration in its effort to achieve sustainable use of biological diversity include the following:

Conservation of biological resources in protected areas

Protected areas were primarily created to conserve soil and water since most of them are catchments for major water bodies. Conservation of other forms of biodiversity appears to be secondary since no efforts were made to ensure moderate

representation of species diversity in forest reserves.

Conservation of Malawi's agricultural biological diversity

Erosion of genetic diversity within domesticated, cultivated and wild and harvested species is widespread and is largely due to a number of factors some of which include preference to improved varieties. For example over-emphasis on maize has contributed to the marginalisation of sorghum (*Sorghum*

bicolor) pearl millet (*Pennisetum glaucum*) and figure millet (*Eleusine coracana*) which were once staples in some parts of Malawi. Similarly, the heterotic benefits that crossbreeding offers have not been realised since most of the indigenous crops and local breeds of animals have lately been neglected, leading to genetic erosion of the local plants and animals. In order to reverse the current trend the remaining varieties and breeds/strains should be characterised, protected and multiplied in a way that best utilises them in the short term and maintained for the long term.

The agricultural diversity is dependant upon a number of other related biological resources such as pollinators and soil flora and fauna without which loss of the genetic resources would be inevitable. In this regard conservation of agrobiodiversity should as much as possible integrate programmes that enhance conservation and identification of pollinators and soil organisms.

Commercialisation and bioprospecting of indigenous biological resources

Over 90% of Malawi's population rely on natural resources as a source of livelihood (for food and income). Mushrooms, wild vegetables and fruits, caterpillars, medicinal plants are collected for food and as a source of income. Currently a significant amount of the biological resources especially medicinal plants is exported to the outside market, but this is currently unregulated.

There appears to be potential for bioprospecting especially from medicinal plants, judging from requests institutions and individuals continuously receive from big pharmaceutical companies to supply samples of medicinal plants. If well developed, bioprospecting can lead to development of commercially viable products and thus contribute to poverty reduction. If unregulated, however, bioprospecting can encourage unsustainable use of biological resources and can lead to biopiracy.

Inadequate policies, laws, regulations and institutional framework

Progress towards sustainable use of biological resources requires political will to create an enabling environment. Despite the existence of a number of multisectoral policies, laws and regulations that in one way or another deal with sustainable use of biological resources, lack of a streamlined policy and legislative framework that clearly articulates strategies on how biological resources can be used sustainably is to some extent contributing to unsustainable use of biological resources. The existing policies and legislation often conflict and are often not harmonised and synergised with international and regional frameworks.

Operationalisation of sustainable use programmes requires an enabling institutional and administrative structure at all levels. Currently frontline workers in different sectors dealing with sustainable use of biological resources infrequently collaborate on the ground in their effort to conserve biological resources. With each sector working independently, duplication of efforts is common. The current institutional framework, therefore, requires significant funding in order to build critical human capacity required to effectively implement programmes.

Inadequate research and information

Research on the relationship between conservation and sustainable use of biological resources including valuation of biological resources is rudimentary. This is constrained by inadequate human and infrastructure capacity. This inadequate research capacity means that information is either unavailable, inadequate or is scattered around and is not in the format easily accessible by the users. This unavailability of information may affect sound decisions on sustainable use of biological diversity.

Action Plan

Objective 3.1 Sustainable use of agrobiodiversity

Strategy 3.1.1 Design, develop and implement *in situ* and *ex situ* agricultural diversity conservation programmes with full participation and involvement of local communities.

Actions

- (a) Conduct public and political awareness campaigns on the role of agrobiodiversity in poverty reduction and economic development and the role of communities through active farmers clubs in agrobiodiversity conservation.
- (b) Collect all agrobiodiversity, including their wild relatives, threatened and/or endangered species, with full participation of communities and preserve them on farm, in field gene banks, seed banks and botanic gardens.
- (c) Document indigenous knowledge on the utilisation and conservation of agrobiodiversity of Malawi through ethnobiological surveys.
- (d) Strengthen and build the capacity of national centres for the collection, characterisation and maintenance of agrobiodiversity using clear guidelines and procedures.

Key Players: NHBG, UNIMA, EAD, FD, DoF, DNPW, WESM, MoA&FS, NPGRC, MZUNI.

Strategy 3.1.2 Enhance human and research capacity on conservation and sustainable use of agrobiodiversity.

Actions

- (a) Develop and implement research guidelines and programmes for sustainable use of agricultural diversity, paying particular attention to gender and HIV/AIDS

mainstreaming, and issues that have direct impact on agricultural biodiversity such as pollinators and soil organisms.

- (b) Conduct research and promote domestication of wild plants and animals with emphasis on estimating genetic variation of target species using modern molecular biological techniques and participatory plant breeding.
- (c) Train staff and farmers on collection, characterisation, conservation and storage of agrobiodiversity.
- (d) Develop mechanisms and facilities to improve storage of germplasm in gene banks, seed banks, botanic gardens and agricultural research stations.

Key Players: UNIMA, EAD, FD, DoF, DNPW, WESM, MoA&FS, NPGRC, NHBG, NGOs.

Objective 3.2 Promote sustainable use of forest biological diversity

Strategy 3.2.1 Develop appropriate guidelines, methodologies and procedures and technologies that fully utilise the concepts of ecosystems approach and enhance sustainable use of forest biological diversity.

Actions

- (a) Develop and implement guidelines and/or technologies for applying ecosystems approach in forest ecosystems.
- (b) Promote mechanisms for the participation of all stakeholders in the conservation of forest biodiversity.
- (c) Promote activities that minimise the impact of fragmentation of forest biological diversity such as agroforestry and forest restoration.

Key Players: FD, EAD, MoLG, MoLPSS, NGOs.

Strategy 3.2.2 Develop and implement mechanisms to prevent and mitigate the adverse effects of forest fires on biological diversity.

Actions

- (a) Strengthen the existing measures and mechanisms on forest fire management, including developing guidelines that promote community participation in fire prevention activities.
- (b) Strengthen policies and institutional infrastructure that address fire prevention and ensure that such policies are integrated into other sectoral policies.
- (c) Promote participatory research on forest fire management.

Key Players: FD, CBOs, MoLGRD, DNPW, MMCT, WESM, CURE.

Strategy 3.2.3 Enhance conservation of forest biological diversity through promotion of sustainable use of resources.

Actions

- (a) Develop guidelines and programmes to document and evaluate the economic importance of forest biodiversity especially in sustaining the livelihoods of local communities.
- (b) Develop, support and promote programmes and initiatives that address the sustainable use of timber and non timber products.
- (c) Strengthen the capacity of local communities to develop and implement community based programmes on conservation and sustainable use of forest biological diversity.

Key Players: FD, FRIM, MoLGRD, NGOs, NHBG, WESM, DNPW.

Objective 3.3 Promote sustainable use of fish biological diversity

Strategy 3.3.1 Promote sustainable harvesting and management of Malawi's fish resources especially chambo, and heavily exploited and under exploited fish species through implementation of relevant strategies and action plans.

Actions

- (a) Develop a national wetlands policy to guide and ensure the protection and sustainable use of fish biodiversity.
- (b) Undertake *ex situ* and *in situ* conservation of threatened or endangered fish species and other aquatic organisms.
- (c) Promote and support fish farming and develop enabling regulatory framework for private sector investment in commercial fish farming.
- (d) Establish a permanent committee that will regularly meet and discuss matters pertaining to conservation of aquatic biodiversity including fish farming.
- (e) Review and implement fisheries management strategies and plans for chambo in Lakes Malawi, Chilwa and Malombe.

Key Players: EAD, FD, DNPW, DoF, UNIMA, MoIWD, MoLGRD, NHBG, NGOs.

Objective 3.4 Public awareness and community participation

Strategy 3.4.1 Raise the awareness of the importance of promoting conservation and sustainable use of biological resources as sources of livelihood to poor Malawians.

Actions

- (a) Document and promote knowledge, innovations and practices of local communities relevant to

conservation and sustainable use of biological resources.

- (b) Provide a spectrum of alternative livelihood opportunities and include them in national strategies and CBNRM programmes.
- (c) Develop incentives for local level and private sector participation in biodiversity conservation and sustainable use.
- (d) Study and understand factors affecting sustainable use of biological resources and provide effective mechanisms for mitigating against the problems.
- (e) Introduce the concept of sustainable use of biological resources in both formal and informal education systems.
- (f) Develop methodologies and guidelines for economic valuation studies of the environmental services of biological resources.
- (g) Promote the involvement of local communities through various CBNRM institutions such as VNRMCS, VNRCs, BVCs and Wildlife Clubs.

Key Players: NHBG, UNIMA, EAD, FD, DoF, DNPW, WESM, MoA&FS, NPGRC, MoE

Objective 3.5 Promote and regulate bioprospecting

Strategy 3.5.1 Develop guidelines and strengthen existing procedures, policies and laws to promote and regulate bioprospecting and international trade on endangered species.

Actions

- (a) Conduct surveys to identify and prioritise biological resources requiring commercialisation and bioprospecting.
- (b) Strengthen institutional capacity to collect and maintain genetic

resources in gene banks, botanic gardens, national parks, herbaria, museums and zoos to facilitate decision making about bioprospecting.

- (c) Develop or strengthen existing regulations and institutional framework on conservation and sustainable use of rare and endangered taxa including international trade on endangered species.
- (d) Promote reintroduction of endangered biological resources of economic potential through *ex situ* and *in situ* programmes.

Key Players: NHBG, UNIMA, EAD, NRCM, Museums of Malawi, FD, DoF, DNPW, WESM, CURE, MMCT

Objective 3.6 Strengthen policies, law and institutional frameworks

Strategy 3.6.1 Study sectoral policies and legislation and as far as possible integrate considerations of sustainable use into sectoral policies and if necessary develop an enabling and comprehensive policy on sustainable use of biological diversity

Actions

- (a) Review relevant sectoral policies and legislation and develop an integrated policy on sustainable use of biological diversity that takes into consideration issues of common property rights.
- (b) Develop and implement effective monitoring systems to ensure that the concept of sustainable use is applicable to all sectors.
- (c) Harmonise national laws and regulations with international and regional instruments paying particular attention to removing provisions that have negative impacts on sustainable use.
- (d) Integrate local customs and traditions including customary law,

by laws into existing policies and regulations.

- (e) Build the human capacity through training and recruitment of relevant staff to implement and enforce laws, policies and regulations.

Key players: MoJ, EAD, FD, DoF, UNIMA, NGOs

Objective 3.7 Promote research and information management

Strategy 3.7.1 Promote and support interdisciplinary research on all aspects of sustainable use of biological resources and make the information available to biodiversity users.

Actions

- (a) Develop research guidelines on the management of biological components that promote their sustainable use.
- (b) Develop cooperation between researchers and biodiversity users (private and local communities) especially involving local communities as research partners.
- (c) Make research results available in a form which decision makers can use and other stakeholders can apply.
- (d) Strengthen and develop sustainable infrastructure on sustainable use research.

Objective 3.8 Promote indigenous knowledge systems

Strategy 3.8.1 Promote indigenous knowledge systems (IKS) for sustainable management and use of biodiversity.

Actions

- (a) Study and document indigenous knowledge systems and traditional practices for biodiversity conservation and integrate them into mainstream biodiversity management activities.

- (b) Promote recognition of the value of local indigenous knowledge about conservation of biodiversity by:

- Empowering local people to control local biodiversity resources;
- Sensitising local communities on their intellectual property rights;
- Compensating local people for indigenous knowledge on conservation of biodiversity; and
- Promoting formation of indigenous knowledge systems groups.

Key players: MoMNRE, NHBG, MoH, MoA&FS, UNIMA, MZUNI, MMCT, VDCs, Museums of Malawi, EAD, FD, DoF, CURE, WESM.

Theme Four: Traditional knowledge, access and benefit sharing

Scope

Traditional knowledge, innovations and practices of indigenous or local communities are governed by enabling policies, laws and institutional frameworks that are facilitating and promoting regulated access.

Desired outcome by 2020

- (a) Guidelines for the enhancement of preservation and maintenance of indigenous knowledge and the innovations and practices of indigenous and local communities are promoting sustainable use of biological resources and equitable sharing of benefits arising for the use of biological resources.
- (b) Policy guidelines and legislation that have provisions to facilitate the implementation of Article 15 of the CBD and integrate the Bonn Guidelines on access to genetic resources and fair and equitable sharing of the benefits arising out of the use of genetic resources are promoting access to genetic resources, utilisation and bioprospecting in accordance with international conventions and national regulations.
- (c) Guidelines and procedures on public awareness on access and benefit sharing and on utilisation of indigenous knowledge are empowering local communities and are enabling them to have bargaining power to negotiate fair and equitable terms of access and benefit sharing both at national and international levels.
- (d) Biological resources, products and processes other than plants and animals are protected by patents and plant varieties are protected by some form of IPRs.
- (e) Guidelines and procedures to ensure equitable and fair distribution of benefits to Malawi stakeholders are in place.

State of traditional knowledge, access and benefit sharing

(a) Access and Benefit Sharing

Formal access and benefit sharing mechanisms are recent in Malawi and appear to be restricted to co-management arrangements in forestry, fisheries and wildlife sectors. In the forestry resources, through co-management arrangements communities are allowed some access to local forestry resources and are also entitled to 20% to 60% of forest revenues. For example through a World Bank Project communities around Chimaliro Forest Reserve in the Northern region were entitled to 40% of the

revenue from exploitation of forest reserves and 60% revenue from exploitation of the surrounding customary land forests. In Mwanza, forest By Laws allow community groups in liaison with forest officials to confiscate charcoal. When the confiscated charcoal is sold, community groups are entitled to 25% of the sales.

As is the case with Forestry Department, the Fisheries Department has mechanisms for entering into co-management agreements with local communities, including the duties and responsibilities of the management

authorities, where communities are allowed access to and utilization of fisheries resources. Beach Village Committees (BVCs) have been established following these regulations and are being constituted as legal entities through which the activities and interests of BVCs can be articulated and represented. Through this agreement the Department of Fisheries seeks to transfer to the fisheries management authorities (the associations) specific rights of use and management of the aquatic environment and other aquatic resources for the duration of the agreement. This would seem to create exclusive user rights in favour of the association and would therefore curtail rights of communities outside the membership of the association. The reason for creating exclusive rights and duties in favour of community institutions is to improve fisheries management and not necessarily to exclude others from access.

The Department of National Parks and Wildlife also has mechanisms for collaborative management of wildlife between the local communities and the private sector. Through this provision the department has entered into agreements with Wildlife Management Authorities (WMAs), which are defined as any local community or private organization established to promote local community participation in wildlife conservation and management. In Nyika/Vwaza, Lengwe, Liwonde and Kasungu national parks, WMAs have been established and they have facilitated sustainable use of park resources where local communities are allowed to harvest certain wildlife products such as mushrooms, thatch grass, caterpillars, medicinal plants, reeds, and other products mainly for domestic use. Government has agreed to share 50-50 with the communities but this arrangement is yet to be implemented. Privately owned Wildlife Reserves Kuti Wildlife Reserve in Salima promotes community participation in conservation programmes. In return communities are entitled to 70% of the revenue through project activities.

WESM, one of the NGOs actively involved in the implementation of NRM programmes, with support from GTZ is implementing a programme to promote sustainable management of indigenous forest resources in Kamwamba, Mwanza District. A number of CBNRM activities such as production of indigenous fruit juices, honey and cane furniture are being implemented as income generating activities. The programme gives back to the communities 20% of the income through employment and 40% through project activities. The programme has since developed into a community owned company, Village Hands Ltd and the revenues shall continue to be shared with communities either through support to community project or through employment.

(b) Traditional knowledge, innovations and practices

Traditional access and benefit sharing systems have existed in most communities from time immemorial. In agriculture genetic resources has been distributed within and between geographical regions through exchange of seeds and knowledge on use and propagation methods. Farmers have also exchanged animals with desirable traits to improve productivity of their livestock through cross breeding. Despite playing a role in the conservation of agrobiodiversity traditional knowledge systems in agriculture have not been adequately documented.

Collection and maintenance of agrobiodiversity is the responsibility of the Ministry of Agriculture and Food Security. Through the National Genetic Resources Centre, MoA&FS in collaboration with the SADC Genetic Resource Centre in Zambia collects and maintains plant genetic resources. Recognising the weak legislative framework on sharing of benefits that may arise when a new plant variety is developed based on resources collected from farmers, MoA&FS is in the process of developing the Plant Breeders Bill which will regulate access.

Traditional knowledge systems related to traditional healing appear to be the most studied systems in Malawi. Most rural communities benefit from traditional healing through treatment of various diseases for a small fee either in kind or cash. Despite traditional medicine complementing the national health care services, traditional healing is not regulated by any kind of legislation and is not officially recognised by the Ministry of Health. In order to promote a harmonious working relationship between conventional medical practice and traditional healers, a code of ethics for traditional health practitioners, traditional medicine policy and a draft Traditional Health Practitioners Bill have been prepared, all in consultation with and collaboration between the Traditional Healers' Associations and Ministry of Health. In particular, the Policy seeks to promote research into traditional

medicine and increase capacity in the area of medicine including industrial development and production of traditional medicine for local and export market. It provides for conservation of biodiversity and preservation of indigenous knowledge. It also seeks to protect IPRs of individuals and institutions involved in research and development and promote bilateral and multilateral agreements between traditional health practitioners and users of their products for equitable sharing of benefits. The draft traditional medicine policy does not provide for issues of regulating access to traditional medicine and knowledge by researchers or mechanisms for sharing benefits from technological exploitation of samples of genetic resources or knowledge obtained from traditional health practitioners. Further the draft does not provide for protection of Indigenous Knowledge Systems.

Current management

Access to genetic resources in Malawi is partially provided for in Environmental Management Act. Sectoral laws and policies were revised in keeping with EMA and as a result they all have provisions for community participation in management of natural resources. Access to genetic resources by researchers and other users is currently guided by Procedures and Guidelines for Access and Collection of

Genetic Resources in Malawi (2002) and Procedures and Guidelines for the Conduct of Research in Malawi (2002). Realising that these guidelines are inadequate because they do not indicate type of benefits to be shared and have not been promulgated into rules or regulations under the existing legislation, Malawi has drafted access and benefit legislation.

Summary of issues

Traditional Healers are among the most organised systems of indigenous knowledge in Malawi. They have associations through which they articulate their interests. In addition policies and draft legislation on traditional healing have been prepared including a code of conduct. These need to be improved since they appear not to provide clear direction on access and benefit sharing mechanisms. If enacted, adopted or implemented in the current form genetic resources will continue to be exported or collected by other users without

adequate safeguards.

Authority responsible for administration of access and benefit sharing arrangements rests in sectors such as the fisheries, forestry, agriculture and national parks. The National Research Council of Malawi provides the coordination mechanisms by providing permits in consultation with responsible sector agencies. The GRBC of the NRCM provides technical expertise and makes the recommendations for permits to be granted. The GRBC has no statutory

mandate; hence if granting of a permit is refused based on its recommendations, such a decision could easily be challenged for lack of mandate.

A condition for granting the permit is that the researcher should be affiliated to a recognised institution. In this way the institution would monitor compliance with the conditions of the permit including the collections made. However, most institutions are unable to provide well qualified assistants due to constraints in human resources and as such, compliance monitoring can hardly be satisfactory. This clearly shows that capacity to implement and monitor compliance with the procedures and guidelines for access to genetic resources and the general regulatory regime is inadequate since there is no mechanism for monitoring use of genetic resources once approval has been granted for research or collection of samples. This makes determination of benefits to be obtained from use of genetic resources collected from Malawi difficult. Secondly, despite the existence of the procedures and guidelines, these regulations are not always followed.

An important aspect with regards to access and benefit sharing mechanisms is the use of intellectual property rights. The relevant IPR legislation in Malawi is the Patents Act, which principally deals with industrial inventions and was not designed to cater for issues such as community, farmers and breeders rights or indeed with specific

attention to biological resources. The IPR framework is designed in such a way that indigenous knowledge systems commonly perceived to be in the public domain would not be protected on the ground that it may not be a new invention or capable of industrial application. According to the Act, an application for a patent must be in relation to an invention and by the inventor, his legal representative or assignee. As currently defined most of the indigenous technologies which passed from generation to generation may not be considered 'new'. Nevertheless when the same knowledge is utilized in manufacturing in the conventional sense it will pass under the Act because the 'mechanization' will be 'new' and not obvious. The Patent Act is also problematic because most indigenous knowledge systems with legal representative cannot enforce rights under the common law. This calls for a new regime for recognition and protection of such knowledge and to ensure that those who claim benefits from indigenous knowledge can be protected just as those who do so under the common law. Malawi therefore needs to develop *sui generis*. In addition regional instruments such as the African Model Legislation for the Protection of the Rights of Local Communities, Farmers and Breeders, and for the Regulation of Access to Biological Resources (the Model Legislation) should be integrated into the Plant Variety Bill being drafted by the Ministry of Agriculture and Food Security.

Action Plan

Objective 4.1 Mainstream indigenous knowledge systems into biodiversity conservation.

Strategy 4.1.1 Identify relevant working IK practices, raise their value, and integrate them into conservation activities.

Actions

(a) Conduct a survey and produce an inventory of new and existing IK

practices in Malawi.

(b) Identify relevant working IK practices and raise their value, through the development of a natural resource based enterprise.

(c) Raise awareness among the communities on the value of IK and build their capacities to recognise, document and mainstream the IK

into natural resource management practices.

- (d) Build human and institutional capacity for IK research and development.

Key Players: UNIMA, NHBG, THAs, MoMNRE, MoIWD, MoLGRD, MoA&FS, NRCM, NGOs.

Objective 4.2 Strengthen legal and policy framework for access and benefit sharing

Strategy 4.2.1 Develop binding framework to regulate access to genetic resources and the sharing of the benefits by integrating the procedures and guidelines for access to and collection of genetic resources into EMA.

Actions

- (a) Develop and implement regulations for access to and equitable sharing of benefit arising from the use of genetic resources.
- (b) Review and enhance the existing institutional framework and improve coordination between the regulatory agency for approval of permits for access to genetic resources and sector agencies that grant permits to researchers and collectors.
- (c) Prepare guidelines and procedures for prior informed consent, mutually agreed terms and conditions for access to and benefit sharing mechanisms.
- (d) Clarify the roles and responsibilities of traditional leaders with regard to access to and benefit sharing of genetic resources from customary land including the governance systems for IKS and traditional medicine.

Key Players: UNIMA, EAD, FD, DNPW, WESM, MoA&FS, NRCM, MoJ, NPGRC

Objective 4.3 Raise awareness of the importance of access and benefit sharing

Strategy 4.3.1 Promote community participation, public awareness and capacity building of state actors and the private sector on access and benefit sharing.

Actions

- (a) Conduct awareness campaigns for all stakeholders emphasizing on duties and responsibilities of traditional leaders, traditional healers and the local communities, especially those adjacent to biodiversity hotspots, and on access and benefit sharing and the importance of their participation in ABS programmes.
- (b) Conduct studies to determine values for most sought after genetic resources and develop guidelines for sustainable harvest and equitable sharing of benefit accruing from their use.
- (c) Develop training programmes on principles of access and benefit sharing and on intellectual property rights for the community, the private sector and the informal education sector.
- (d) Develop well-defined property rights regimes.

Key Players: UNIMA, EAD, FD, DNPW, WESM, MoA&FS NPGRC, NRCM, MoJ, LSM, NHBG.

Objective 4.4 Regulating access to genetic resources and benefit sharing

Strategy 4.4.1 Promote and regulate access to biodiversity and equitable sharing of benefits arising from the use of biodiversity through provision of Intellectual Property Rights regimes.

Actions

- (a) Enact *sui generis* policy and legislation to regulate access to and benefit sharing of genetic resources with special emphasis on protecting farmers' rights.

- (b) Clarify property rights and access regimes for various stakeholders and for different types of utilization under sector legislation such as fisheries, forestry, national parks and wildlife and agriculture.
- (c) Review existing controls and legislation at the national and regional levels regulating bioprospecting of indigenous genetic resources and develop a more integrated framework for managing bioprospecting and distributing its benefits.
- (d) Revise and develop a national policy framework for traditional medicine and medicinal plant research and use.
- (e) Undertake collaborative research into institutional systems that tend to influence the way biodiversity resources are managed, allocated and used.

Key Players: NHBG, UNIMA, EAD, FD, DNPW, WESM, MoA&FS, NPGRC, NRCM, MZUNI.

Theme Five: Biotechnology

Scope

Develop enabling mechanisms to enhance the wise use of biotechnologies without overlooking their potential adverse effects on conservation and sustainable use of biological diversity, human health and socio-economic issues.

Desired outcome by 2020

- (a) A definitive biotechnology policy governing the development and handling of biotechnology in Malawi is developed and implemented.
- (b) The Cartagena Protocol on Biosafety and the Biosafety Act of 2002 are enforced fully for the creation of an enabling environment for the environmentally sound application of biotechnology.
- (c) Guidelines are available to guide public awareness programmes on biotechnology and its products and biosafety issues surrounding the technology.
- (d) Human and infrastructure capacity is developed in the field of biotechnology.

State of biotechnology in Malawi

Biotechnology is a collection of techniques that utilise biological systems or derivatives thereof to create, improve or modify plants, animals and microorganisms for specific use. Biotechnology has traditionally been used for many centuries in agriculture and manufacturing industry to produce food, chemicals, medicines and many other products that have been of benefit in many areas including nutrition, human and animal health. In Malawi both modern and traditional biotechnologies are available.

Traditional biotechnology has been in use in this country for many centuries. Some of traditional technologies available in Malawi include:

- Fermentation: This uses bacterial fermentations on dairy industries and yeast fermentations in breweries (e.g. Chibuku);
- Plant and Animal breeding;
- Biofertilizer production; and

- Biological control in pest management.

These traditional biotechnologies have succeeded in producing a wide variety of useful plants and animals. For example, farmers have been altering the genetic make up of crops and animals through selection for features such as faster growth and higher yields.

Modern biotechnologies are used by government research institutions, the health and agricultural sectors for various purposes. For example, the DNA Laboratory at Chancellor College, in the Molecular Biology and Ecology Research Unit (MBERU), has equipment for characterization of species at DNA level and so far Malawi Zebu cattle, selected breeds of dairy cattle and species of fish have been studied. The Central Veterinary Laboratory under the department of Animal Health and Industry uses ELISA techniques to conduct animal disease diagnosis. The laboratory also produces a tick borne disease vaccine

for the SADC region. In addition Bunda College of Agriculture, Bvumbwe and Lunyangwa Agriculture Research Stations are involved in micro-propagation using

tissue culture techniques. In the health sector PCR based techniques and other diagnostic kits are used for disease diagnosis including malaria.

Current Management

Biotechnology programmes are currently regulated by the Biosafety Act, which was developed and enacted in 2002 in response to the Cartagena Protocol on Biosafety of the CBD. The Biosafety Act provides for formulation of regulations and guidelines to govern the development, importation, and utilisation of GMOs. Regulations and guidelines for management of GMOs have been drafted and these will be supported by sectoral regulations and guidelines in such sectors like agriculture, health, environment, trade and commerce.

The Biosafety Act provides for the existence of National Biosafety Advisory

Committee, National Biosafety Regulatory Committee, Biosafety Desk Officer, Inspectors and Reviewers. Individuals serving in these positions will need to be trained in biotechnology and their respective responsibilities. The Biosafety Act therefore provisions for regulations for development, importation and utilisation of GMOs. However the Biosafety Act is currently not supported by a single policy. In recognition of this Malawi is in the process of developing a comprehensive biotechnology policy which will guide implementation of all issues of biotechnology including GMOs.

Summary of issues

Genetic modification might contribute toward socio-economic development through improved crop production and medicine. However concerns have been raised on the effects of the transgenic plants to the environment. For example, concerns have been expressed that GM crops will hybridize with related species and result in the merging of the GM crops with their weedy relatives. This means that GM crops may transfer that trait to the weedy relatives to make them "superweeds". Another concern is that widespread use of GM crops, being 'unnatural', may lead to secondary or indirect ecological effects with undesirable consequences.

The release and widespread cultivation of GM crops with pest or disease resistance has raised concerns that this will impose intense selection pressure on pest and pathogen populations to adapt to the resistance mechanism, resulting in the development of super pests and super diseases that would be difficult or of GM

impossible to control. In addition to this use crops may result in the conventional non-GM crops receiving transgenes from GM crops, resulting in situations that are either undesirable or unlawful. The potential inadvertent mixing of GM and non-GM crops through pollen dispersal and seed is a particular concern for the organic farming industry. GM crops can also have an influence on biodiversity because they could threaten the centres of crop diversity or outgrow a local flora to the detriment of the native species.

Issues of biotechnology especially GMOs are complex and as such parties are encouraged to apply the precautionary principle (Articles 10.6 & 11.7 of the Cartagena Protocol) and methodology for biotechnology risk assessment and management. Such methodologies are outlined in several documents including the UNEP International technical Guidelines for Safety in Biotechnology and the Cartagena Protocol. Each of these documents includes

the following steps that, together, identify potential impacts and assess the risks:

- Identify potential adverse effects on human health and/or the environment;
- Estimate the likelihood of these adverse effects being realised;
- Evaluate the consequences should the identified effects be realised (the risk);
- Consider appropriate risk management strategies;
- Estimate the overall potential environmental impact, including a consideration of potential impacts that may be beneficial to human health and environment.

However, application of the precautionary principle and risk assessment and management methodologies would be possible if the following have been put in place:

Enabling biotechnology policy

The importance of an enabling policy framework in biotechnology was appreciated in 2002 when Malawi and its southern Africa counterparts received food aid from USAID in form of maize consignment, which was said to contain genetically modified maize (GM maize). When the GM maize consignment arrived in Malawi, concerns were raised as to the effect of the maize on local varieties if planted by recipients. The issue centred on the transfer of 'foreign genes' from the GM maize through cross pollination to local maize varieties. Realising this, the Ministry of Agriculture decided to reduce the risks by distributing the maize in flour form. The government, however, distributed whole grain especially after the planting season. It is likely, though, that some farmers planted the maize out of ignorance despite the huge campaign. Thus there are chances of the

'foreign' genes escaping into the indigenous gene pool of maize. Effects of such genes to biodiversity are yet to be seen. Malawi, however, has limited human and infrastructure capacity to monitor and identify the foreign gene.

Human and infrastructure capacity in biotechnology and biosafety issues

While recognising a few individuals who have capacity in biotechnology and biosafety issues, the general trend is that human capacity in biotechnology and biosafety is limited. This also applies to infrastructure capacity although there are a few laboratories, have basic equipment, which can be used in biotechnology and biosafety related research.

Public awareness campaigns on biotechnology and biosafety issues

There is little or no awareness of biotechnology and biosafety among the rural masses and a small proportion of urban population know very little about biotechnology and biosafety. Modern biotechnology is a new field in Malawi and it has not yet been fully incorporated into primary and secondary school curricula though a few techniques that fall under traditional biotechnology are taught in schools. The education system in Malawi, therefore, generally produces people that have not been introduced to biotechnology.

Enhance research and training in the field of biotechnology

Although tertiary education curricula in Malawi has recently introduced some elements of both traditional and modern biotechnology in its biological sciences courses, biotechnology does not have the same recognition as other disciplines that fall under biology such as biochemistry. There are also few research institutions that conduct research in biotechnology related fields.

Action Plan

Objective 5.1 Strengthen policy and legal framework

Strategy 5.1.1 Strengthen legal and institutional structures on biotechnologies.

Actions

- (a) Develop and implement a broad based biotechnology policy.
- (b) Implement and enforce the Biosafety Act at institutional and national levels.
- (c) Develop harmonised sectoral legislation and policy frameworks and procedures for identification, monitoring and risk assessment and management of biotechnologies.
- (d) Develop guidelines to control the transboundary movement of GMOs.
- (e) Develop guidelines to facilitate the sharing of benefits arising from the use of Malawi's biodiversity in the development of biotechnology products.
- (f) Formulate regulatory biosafety safeguards to address biodiversity conservation.

Key Players: EAD, NRCM, MoA&FS, MoT&PSD, MRA, MoH, FD, DNPW, NHBG, MoH, DoHRMD, MZUNI, UNIMA, NGOs, MoLG.

Objective 5.2 Strengthen human and institutional capacities

Strategy 5.2.1 Enhance development of human and institutional capacity for identification, monitoring and risk assessment and management of biotechnologies and research.

Actions

- (a) Strengthen existing scientific institutions in terms of human and

infrastructure development to monitor, identify GMOs and undertake risk assessments and train staff on precautionary principle and gene transformation.

- (b) Train border control system personnel to minimize introduction and illegal exportation of undesirable biotechnologies.
- (c) Clarify responsibilities of different institutions involved in biotechnology management in Malawi.

Key Players: EAD, FD, MoA&FS, DNPW, NHBG, UNIMA, MZUNI, MoE, NRCM, DoHRMD, DoF, MoJ, MoT&PSD, MoH, MoIT&C, NGOs, MoLG.

Objective 5.3 Research and Information Management Systems

Strategy 5.3.1 Promote research and disseminate user friendly information on relevant biotechnologies, emphasising on risk assessment, identification of GMOs, and socio economic impact.

Actions

- (a) Assess national research needs and conduct research in the field of biotechnology and biosafety.
- (b) Develop guidelines to promote the participation of the private sector and communities in biotechnology and biosafety research.
- (c) Develop procedures and guidelines to enhance cooperation between agencies and encourage information sharing on biotechnology and develop Biosafety Clearing House Mechanism.
- (d) Develop research guidelines and methodologies and conduct research and surveys on socio- economic impact of biotechnologies.

Key Players: EAD, FD, MoA&FS, DNPW, NHBG, UNIMA, DoF, NRCM, MoT&PSD, DoHRMD, MoH, MZUNI, MRA, MoE, NGOs, MoJ, MoMNRE, MoLGRD.

Objective 5.4 Community participation and Public awareness

Strategy 5.4.1 Enhance public awareness and community participation in identification, assessment, management and information dissemination on biotechnology and biosafety.

Actions

- (a) Develop guidelines to enhance and strengthen public awareness campaigns and community participation in biotechnology and biosafety issues.
- (b) Integrate biotechnology issues into primary, secondary and tertiary school curricula.

Key Players: NRCM, EAD, FD, DNPW, NHBG, MoIT&C, UNIMA, MZUNI, MoT&PSD, MoA&FS, MoE, MoH, NGOs, DoHRMD, MoLGRD.

Theme Six: Invasive Species

Scope

Malawi's efforts to prevent introductions, control or eradicate alien invasive species is guided by a strong policy that is backed by appropriate legal and institutional framework and effective invasive species management plans that are linked strongly to sectoral activities.

Desired outcome by 2020

- (a) Education, training and public awareness programmes have been developed and are operational and have made the Malawi public more aware about the biology, impacts (economic, social and environmental) and ecology of invasive species including risks posed by them.
- (b) Standardised procedures and guidelines for identification, risk assessment, socio-economic impact assessment, reporting systems, prevention, control and eradication methodologies of invasive species are in place and are contributing to the reduction in number of invasive species and or establishment of new alien invasive species as well as minimizing the spatial distribution and frequency of introductions of invasive species.
- (c) Significant progress is made in the development of mechanisms for transboundary cooperation, multilateral cooperation and coordination of national programmes including establishment or strengthening of a coordinating unit to coordinate invasive species programmes.
- (d) In line with CBD guiding principles for the prevention, introduction and mitigation of impacts of alien species, enabling policies and legislation including institutions are developed and are guiding national management and surveillance of invasive species programmes and research; invasive species considerations are integrated into sectoral policies and programs.
- (e) Research guidelines are in place and are promoting coordinated research and community participation in invasive species research.

State of invasive species

A range of invasive plant and animal species exist in Malawi, some indigenous but most of them exotic or alien. Table 3 presents a summary of the key invasive species that have been recorded in Malawi most of which are alien having been introduced accidentally or deliberately for various purposes. Some of the alien species include multipurpose trees, ornamental and food species which were brought in to provide economic and recreational gains.

Unfortunately, the benefits come at the expense of costs often catastrophic to native species and ecosystems. This is because some of these invasive species degrade biodiversity by replacing indigenous species and bringing significant habitat transformation that leads to reduction of ecosystems services, changes in microclimate, changes in fire regime of vegetation which in turn increases the cost of biodiversity conservation. In Malawi,

invasive species are regarded as the second largest threat to conservation of biodiversity after direct habitat destruction.

Malawi is particularly prone to alien invasive species due to its geographical position, pantropical climate and agriculturally based economy and also the country relies heavily on imported products. For example, the (*Xanthium pungens*) has been introduced into Malawi accidentally through maize consignments that were purchased to feed Mozambican refugees and to feed communities that were affected by the famine of 2001/2002. A number of invasive species have been introduced by tourists, smugglers, cargo and sometimes researchers.

While there is currently limited published and consolidated information on invasive species in Malawi, the invasion of important ecosystems such as mountains and aquatic ecosystems has been well documented. For example, Mulanje Mountain, a major centre of diversity is endangered or threatened by the invasion of alien Himalayan yellow raspberry (*Rubus ellipticus*) and the Mexican pine (*Pinus patula*). The Central American mesquite (*Prosopis juliflora*) present at Swang'oma, on the plains of Lake Chilwa in Phalombe District and in the Lower Shire Valley is a threat, particularly to the biodiversity of the wetlands. Its strong tendency for allelopathic-induced monocultural growth and its prolific seed production efficiently spread by browsing animals are the major factors that have enabled this species to take over large areas of the habitats that it has invaded.

Malawi's inland freshwater bodies that are home to endemic and unique aquatic flora and fauna are also threatened by invasion of alien species. For instance, Lake Malawi which is known for its high endemism (over 700 endemic cichlid species) and the Lake Chilwa wetland, a Ramsar site, which supports important populations of 153 species of resident and 30 species of palearctic (*migratory*) water birds are threatened by the water hyacinth (*Eichhornia crassipes*), giant salvinia (*Salvinia molesta*),

water lettuce (*Pistia stratiotes*), and red water fern (*Azolla filiculoides*). The precise impact of these alien aquatic invasive species on the affected aquatic ecosystems and other species dependent on them is not yet fully understood, although the massive mats of interlocked plants that they form are bound to change the water chemistry, impede the penetration of light and decimate indigenous flora, and negatively affect fish and invertebrate biodiversity, and overall aquatic ecosystem integrity.

Major alien invasive invertebrate species have largely been agricultural and forestry pests. For instance, the accidental invasion of the alien cassava mealybug (*Phenacoccus manihoti*) in the Malawian cassava agroecosystem in the mid 1980s led to the recruitment of a diverse range of parasitoids and predators, and even pathogens whose impact on indigenous arthropod biodiversity remains to be studied. A similar situation was observed with the advent of the neotropical cassava green mite (*Mononychellus tanajoa*) that also attracted a diverse range of predatory mites most of which were indigenous and probably feeding on other indigenous arthropods. Also, the introduction of the larger grain borer (*Prostephanus truncatus*) occurred through the importation of unfumigated relief maize during the 1991/92 major drought that hit southern Africa. In the forestry ecosystem, there have recently been an accidental introduction of four conifer aphid pest species; the cypress aphid (*Cinara cupressivora*) in 1986, the pine woolly aphid (*Pineus boernerii*) in 1984, the pine needle aphid (*Eulachnus rileyi*) in 1984 and the giant pine aphid (*Cinara pinivora*) in 2001 which have caused various levels of damage and economic losses to conifer trees, including the valuable and nationally prestigious Mulanje cedar (*Widringtonia cupressoides*).

The introduction of aquaculture has increased the distribution of fisheries in Malawi and this has also led to the deliberate introduction of alien fish species that are unfortunately potentially invasive. During the initial stages of aquaculture for

example, the common carp (*Cyprinus carpio*) was the choice species. This species is, however, known to reduce water quality by increasing turbidity, a situation that can cause the extinction of native species. In the 1940s, the invasive black bass (*Micropterus salmoides*) was deliberately introduced in dams and ponds in Malawi. Other alien fish species such as rainbow trout (*Salmo gairdnerri*) have also been introduced in ponds in and around Zomba and Mulanje mountains. It is, however, not known whether these potentially invasive fish species are presently still confined to the foci of their introduction or if they have invaded other natural water bodies.

There are no recorded invasive genetically modified organisms in Malawi. There is however a possibility that genetic material of the genetically modified maize that was donated to Malawi during the 2001/2002 famine escaped into the local gene pool since some of this maize was planted. Although genetically modified organisms are considered to have economic value they also have the potential to alter the local genetic resources through interbreeding and thus can transfer the traits to weedy species, which may become invasive. The Genetically modified organisms themselves may adapt better to the environment than the native species and become potential invasive species.

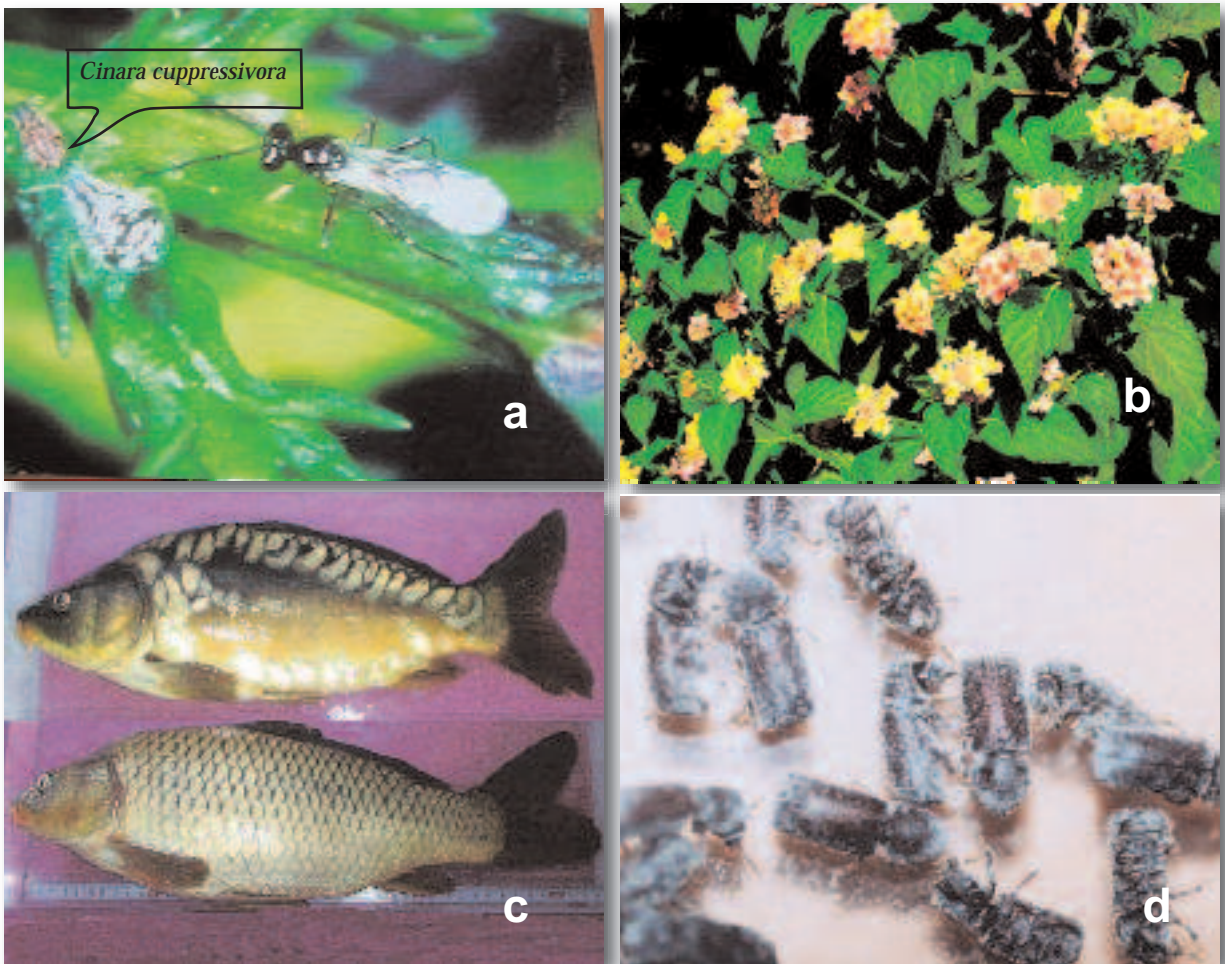


Figure 17: Common and notorious alien invasive species recorded in Malawi; (a) *Cinara cupressivora*. Source: FRIM, (b) *Lantana camara*, photo by A. Chikuni, (c) *Cyprinus carpio* (Common carp). Source: Jica Aquaculture Project, National Aquaculture Centre, Domasi, (d) *Prostephanus truncatus* (larger grain borer), photo by A. Chikuni.

Table 3: An inventory of key alien invasive species recorded in Malawi

Name of Invasive species	Suspected/known Reason for introduction	Origin
(a) Invasive invertebrates of forestry or agricultural ecosystems		
<i>Phenacoccus manihoti</i> (cassava mealy bug)	Accidental on cassava cuttings	Americas
Name of <i>Mononychellus tanajoa</i> (cassava green mite)	Accidental	Americas
<i>Prostephanus truncatus</i> (larger grain borer)	Accidental on maize grain	Americas
<i>Chilo partellus</i> (spotted stalk borer)	Accidental	India/Pakistan
<i>Cinara cupressivora</i> (cypress aphid)	Accidental (conifer tree pest)	North America
<i>Cinnara pinivora</i> (giant pine aphid)	Accidental (conifer tree pest)	North America
<i>Eulachnus rileyi</i> (pine needle aphid)	Accidental (conifer tree pest)	Europe
<i>Heteropsylla cubana</i> (Leucaena psyllid)	Accidental on Leucaena plants	Tropical America
<i>Pineus boernerii</i> (Pine woolly aphid)	Accidental (conifer tree pest)	North America and Europe
(b) Invasive plants of fresh water ecosystem		
<i>Eichhornia crassipes</i> (water hyacinth)	Ornamental	South America
<i>Salvinia molesta</i> (Kariba weed)	Ornamental	South America
<i>Pistia stratiotes</i> (Water lettuce)	Ornamental	South America
<i>Azolla filiculoides</i> (red water fern)	Ornamental	South America
(c) Invasive plants of terrestrial ecosystem		
Mimosa pigra	Ornamental	Mexico, Cuba
<i>Tithonia diversifolia</i> (Mexican sunflower)	Ornamental	Mexico
<i>Pinus patula</i> (Mexican pine)	Aforestation for timber and as nursery crop for Mulanje cedar.	Central America
<i>Prosopis juliflora</i> (Mexican mesquite)	Fodder/agroforestry, live fencing	South America
<i>Eucalyptus terreticornis</i> (Blue gum)	Aforestation for timber	Australia
<i>Leucana leucocephala</i> (Leucaena)	Agroforestry (mostly fodder)	Tropical America
Lantana camara	Ornamental, hedging	Central and South America
<i>Caesalpinia decapitala</i> (Mauritius thorn)	Ornamental, security hedging	Asia
<i>Acacia mearnsii</i> (Black Wattle)	Aforestation, agroforestry	Australia and Tasmania
<i>Bauhinia variegata</i> (Orchid Tree)	Ornamental	Asia
<i>Rubus ellipticus</i> (Himalayan raspberry)	Ornamental, horticultural	Asia (edible fruits)
<i>Pteridium aquilinum</i> (Bracken fern)	Accidental	
(d) Potential invasive fish		
<i>Cyprinus carpio</i> (common carp)	Aquaculture (fish)	Europe
<i>Micropterus salmoides</i> (black bass)	Aquaculture (fish)	North America
<i>Salmo gairdnerri</i> (rainbow trout)	Aquaculture (fish)	North America

Current Management

There is no single policy and legislation on the management of invasive species in Malawi although issues of invasive species are covered in sectoral policies and legislation dealing with biodiversity. The Plant Protection Act, 1970 (Cap. 64:01) and the Noxious Weed Act, 1970 (Cap. 64:02) aim to prevent the introduction of alien weeds, invertebrate and microbial pests and provide for the eradication of pests, diseases and weeds that are destructive to plants and other habitats. These Acts further prevent the importation, culturing, distribution, selling and exportation of any plant forms and growth media such as rooting compost and soil without an official permit issued by the National Plant Protection Services. Unfortunately, the Acts are seriously outdated, considering that there exist a wider range of alien invasive species today than what was recognised when the Acts were published. The enforcement of the Acts is also very weak to the extent that many invasive species are currently being imported and distributed in Malawi often without the knowledge of the Plant Protection Services. The fisheries policy has provisions for prohibiting the introduction of exotic species and also has the mandate to monitor and control the spread of aquatic weeds specially water hyacinth using biological and other control measures in collaboration with communities and the private sector. Similarly the wildlife policy mandates the wildlife sector to maintain the ecological and aesthetic quality of protected areas by preventing and controlling among other things introduction of exotic plants and animals. The Ministry of Agriculture and Food Security is perceived to be the responsible body to coordinate invasive species programme but the coordination has

not been effective and as a result implementation of invasive species programme continue to be fragmented along the sector.

In response to Article 8 (h) of the CBD, which calls on parties to prevent the introduction of, control or eradicate, those alien species which threaten ecosystems, habitats, or species, Malawi started various national initiatives and programmes which have largely based on the concepts of classical biological control that seek to recreate an ecological balance in the new environment between an alien invasive species and its natural enemies. Examples of such initiatives are the control of (i) *Aleurothrixus plocosis* (in citrus fruit trees), (ii) *Monoinchelus tanagoe* (in cassava) (iii) *Prostephanis truncatus* (which attacks stored grain), (iv) *Tetramyphis evancea* (which attacks tomatoes and potatoes) (v) *Cinara cupressi*, *Eulachnus rileyi* and *Pineus boernerii* (conifer aphids which attack Mulanje cedar and other conifer trees, (vi) *Chilo partellus* (the spotted stem borer).

Private sector participation in prevention, control and eradication of invasive species is minimal and often triggered by economic losses the invasive species pose on their businesses. For example, the Electricity Supply Commission of Malawi (ESCOM) has recently intensified manual removal of water weeds along upper shire river as one way of protecting the hydropower stations. Further programmes have mainly been project oriented. Both the Blantyre and Lilongwe city assemblies are also involved in manual removal of the Kariba weed *Salvinia molesta* that is threatening their water reservoirs.

Summary of issues

Invasive alien species pose serious threats to ecosystem functioning and the survival of indigenous species in many natural areas. Problems of invasive species are pervasive

and widespread, and in many cases the invasive species are increasing in both number and distribution. The cost of their control is high, and insufficient resources

currently limit control efforts. These problems may be due to the fact that there is scientific uncertainty about the environmental, social and economic risk posed by a potentially invasive alien species. This coupled with the lack of certainty about the long-term implication of an invasion are the reason why eradication, containment or control measures against the introduction of potentially invasive alien species are often delayed or postponed.

Current programmes are uncoordinated, none cost effective and do not give priority to prevention of introductions. This is made worse by current weak border control and quarantine measures and inadequate human and infrastructure capacity to effectively implement and coordinate programmes.

Institutional framework and policies that would have facilitated control and spread of potentially invasive species within Malawi and between its neighbours are not in place. This is compounded by unavailability of guidelines and procedures for risk assessment, economic and social impact assessment that are required as part of the evaluation process before a decision is made on whether or not to authorize a proposed introduction. Unavailability of a designated organisation to coordinate invasive species programmes means that sectoral activities, such as fisheries, agriculture, forestry,

horticulture, construction projects, landscaping, ornamental aquaculture and tourism which are potential sources of unintentional introductions of alien invasive species are very often not subjected to rigorous study and assessments.

Although recognizing that research and monitoring are key to early detection of new alien species, Malawi's capacity to undertake such research which among other things should concentrate on documenting the history of invasions (origin, pathways and time-period), characteristics of the alien invasive species, ecology of the invasion, and the associated ecological and economic impacts and how they change over time is rudimentary. As a result of this, information on invasive species is often scattered about and incomplete and does not contribute to decision making regarding actions to be taken in the context of any prevention, introduction and mitigation activities on alien species that have potential to threaten ecosystems, habitats or species.

Education and public awareness programmes of the risks associated with the introduction of alien species, including mitigation measures, are not in place. Thus local communities and appropriate sector groups are not aware of the impact of the invasive species. This may have contributed to the lack of public participation in current invasive species programmes.

Action Plan

Objective 6.1 Eradication, prevention and control of invasive species

Strategy 6.1.1 Develop a balanced and objective nation-wide invasive species management plan to facilitate coordination and cooperation among agencies but mindful of the fact that there are many frequently competing public and private interests.

Actions

(a) Produce a comprehensive inventory of invasive species and evaluate their economic, social and environmental impacts.

(b) Develop invasive species management plans that place much emphasis on prevention of introductions, control and eradication of invasive species.

(c) Develop systems and tools for effective monitoring and evaluation of invasive species.

(d) Develop and create mechanisms to coordinate and manage invasive species programmes which focus on invasive species prevention, eradication, research and enforcement.

Key players: FD, DoF, MoA&FS, UNIMA, MZUNI, FRIM, DNPW. EAD, NHBG, MoIWD, ESCOM, WESM, MMCT, NGOs.

Strategy 6.1.2 Develop mechanisms to prevent the introduction and establishment of new invasive species and identify current and potential conditions that promote introduction of new invasive species.

Actions

- (a) Strengthen and introduce border control and quarantine measures to ensure that intentional introductions are subject to appropriate authorisation.
- (b) Produce and develop training programmes for border control officers including focusing on a comprehensive list of invasive species in Malawi and surrounding countries.
- (c) Develop programmes, procedures and guidelines for risk assessment and management for first time introduced species.
- (d) Develop and implement rapid response procedures appropriate for the prevention of new and potential invasive species.

Key Players: FD, DoF, MoA&FS, UNIMA, MZUNI, FRIM, DNPW. EAD, NHBG, WESM, MMCT.

Strategy 6.1.3 Develop cost effective invasive species management programmes.

Actions

- (a) Conduct needs assessment studies and develop effective management programmes on prioritized areas.
- (b) Identify invasive species problems and recommend management actions to private landowners, NGOs and government departments.
- (c) Develop methodologies to monitor, prevent and arrest the spread of invasive species in shared

ecosystems, including early detection and coordinated management efforts at the community, national and regional levels.

Key Players: FD, DoF, MoA&FS, UNIMA, MZUNI, FRIM, MRA, DNPW, EAD, NHBG, NGOs, MoLGRD.

Objective 6.2 Public awareness and community participation

Strategy 6.2.1 Promote awareness of the threat to biological diversity and related ecosystem goods and services posed by invasive species.

Actions

- (a) Develop guidelines and implement a coordinated public awareness campaign programme about the impact of invasive species.
- (b) Develop and compile national database of invasive species, identification guides and make available the information to the stakeholders.
- (c) Strengthen the capacity of and provide appropriate support to media organisations to participate in information dissemination in close collaboration with local communities and private sector about the impact of invasive species.
- (d) Provide support to education institutions to incorporate into their curricula issues of invasive species, emphasizing identification, prevention and eradication.
- (e) Support the involvement of all stakeholders especially the private sector, local communities as well as government departments and policy makers in alien invasive species management programmes.

Key Players: FD, DoF, MoA&FS, UNIMA, MZUNI, FRIM, MRA, DNPW. EAD, NHBG, NGOs, MoLGRD.

Objective 6.3 Improved human and infrastructure capacity

Strategy 6.3.1 Enhance and facilitate coordinated research and monitoring of invasive alien species.

Actions

- (a) Assess the degree of success and movement of invasive species by using quantitative assessment methods and develop maps of distribution of the most important invasive species.
- (b) Conduct research on characterization of invasive species; vulnerability of ecosystems and habitats; environmental, social and economic implications; prevention, control and eradication methodologies; and use the results to produce research guidelines.
- (c) Review research needs on invasive species and formulate and implement a prioritized research agenda.
- (d) Review human, institutional and national capacity to facilitate results-oriented research on invasive species.
- (e) Promote community-based research especially promoting the use of traditional knowledge in the development and implementation of measures to address invasive species problems.
- (f) Strengthen and broaden existing governing agencies and authorities and train staff to effectively implement and coordinate national invasive species programmes.

Key Players: FD, DoF, MoA&FS, UNIMA, MZUNI, FRIM, DNPW. EAD, NHBG, NRCM, MMCT.

Objective 6.4 Strengthen policies, legal and institutional framework

Strategy 6.4.1 Review relevant policies, legislation and institutions and as appropriate adjust or develop enabling policies, legislation and institutions.

Actions

- (a) Harmonise sectoral rules and regulations relevant to invasive species and use the information to formulate policy and legislation for the control of introductions, movement and management of alien invasive species.
- (b) Establish an institution or strengthen an existing one to coordinate and implement the policy framework especially to coordinate research, management and eradication of alien invasive species.

Key Players: EAD, FD, DoF, MoA&FS, MoJ, MZUNI, UNIMA, MoWD, WESM, NHBG, CBOs, NGOs.

Theme Seven: Biodiversity Policies and Legislation

Scope

Government continues to facilitate broad based policy direction and national guidance for conservation and sustainable use of biodiversity.

Desired outcome by 2020

- (a) Roles of government, NGOs and the private sector in biodiversity conservation and sustainable use have been identified, defined and prioritised.
- (b) Biodiversity objectives as defined in the NEP and relevant sections of international conventions and treaties have been reviewed and incorporated into all sectoral policies and legislation.
- (c) Government has mandated a technical department under an independent Environmental Protection Authority to implement and enforce biodiversity policies and legislation.
- (d) Significant political will has been created leading to a significant improved government leadership in fulfilling international conventions and treaties.
- (e) Increased public awareness of various biodiversity-related policies and legislation.
- (f) Significant progress is made to identify and harmonise conflicting and non-complementing sectoral policies.

State of biodiversity policy and legislation

Malawi has no comprehensive structural and legal framework for the conservation of biodiversity but rather follows a sectoral approach focus. Most of the sectoral policies and legislation have been reviewed to be consistent with NEP and EMA. The main features of the National Environmental Policy and sectoral policies and acts are described below.

The National Environmental Policy (NEP)

The NEP was adopted in 1996 in order to promote sustainable social and economic development through sound management of the environment. It provides an overall framework against which relevant sectoral environmental policies can be developed and revised to ensure that these are consistent with the principle of sustainable development. However, as a result of policy gaps, conflicts and duplication, which have adversely affected effective implementation

of the policy, the 1996 NEP has been revised. The revision was necessary to ensure that the NEP remains current and responsive to new challenges and incorporates lessons learned. The revised NEP contains a section on the conservation of biological diversity, which is general in nature. It seeks to manage, conserve and utilise biological diversity (ecosystems, genetic resources and species) for the preservation of national heritage. It also contains sections, which deal specifically with fisheries, and parks and wildlife among other things and these contain strategies on conservation of specific species. However, the NEP does not include a section which deals specifically with conservation of species.

The NEP is backed by the Environment Management Act (EMA), which was enacted in 1996 in order to remove the lack of an overarching statute providing general environmental protection. Sectoral policies

therefore (e.g. policies on land, water, fisheries, waste, forestry) are required to be consistent with the National Environmental Policy. The EMA makes provisions for preparation of NEAP, conducting of EIAs, control of pollution and discharge of waste, and also has provision for the establishment of environmental protection areas and conservation of biological diversity, access to genetic resources, waste management and protection of the ozone layer. The Act, however, lacks provision for the protection of endangered species. In view of this, there is need to include in the Act issues of endangered species such as list of endangered species, designated critical habitats, regulations for access and utilisation of endangered species and penalties.

The Forestry Act

The principal legislation that governs forestry matters is the Forestry Act [No. 11 of 1997], which provides for participatory forestry, forest management, forestry research, forestry education, forestry industries, protection and rehabilitation of environmentally fragile areas and international cooperation in forestry. The Act has provisions relating to co-management of forest areas such that local communities can assist in the implementation of a mutually acceptable management plan.

One major weakness of the Act is that it was developed without extensive consultation and without specific reference to EMA. It may be necessary to harmonize the two Acts, particularly with regard to provisions relating to declaration and revocation of forest reserves and environmental impact assessment. There is also need to harmonize the Forestry Act with Land Act, the Electricity Act (Cap. 73:01), the Local Government Act and the National Parks and Wildlife Act [No. 11 of 1992] since their provisions affect, directly or otherwise, forestry issues. For example, the Local Government Act gives powers to local authorities to carry out reforestation

programmes and manage forests in their areas of jurisdiction. It appears that these powers may be exercised independent of and exclusive from the Department of Forestry. Such uncoordinated cross-sectoral responsibilities cannot be properly executed and possibly account for the fact that these statutory provisions have largely remained unenforced.

The National Forestry Policy (NFP) was adopted in 1996 in order to address problem areas contained in the Forestry Act such as non recognition of individuals or communities to own, manage and utilise forest resources and inadequate framework to encourage private sector involvement in forest conservation for the benefit of the nation by:

- Allowing all citizens to have regulated and monitored access to some forest products;
- Contributing towards improving the quality of life in the rural communities and providing stable economy; and
- Establishing appropriate incentives that will promote community-based conservation and sustainable use of forest resource as a means of poverty reduction.

The National Fisheries and Aquaculture Policy (NFAP)

The fisheries and aquaculture policy was adopted in 2001 in order to improve the efficiency of all aspects of the national fisheries industry, the production and supply of existing fisheries products, as well as development of new products to satisfy local demands and potential export markets. The policy thus aims at controlling and monitoring fishing activities to enhance quality of life for fishing communities.

The principal statute governing fisheries is the Fisheries Conservation and Management Act, 1997, which seeks to strengthen institutional capacity by involving various other stakeholders in

the management of fisheries, including the private sector, local communities and non-governmental organizations. The Act promotes community participation in the protection of fish and provides for the establishment and operation of aquaculture. The establishment of aquaculture is an important step in order to reduce pressure on natural fisheries. It is noteworthy, however, that the Act does not provide for any incentives to aquaculture farmers to encourage them to engage in fish farming.

The National Wildlife Policy (NWP)

The policy was adopted in 2000 with a goal to ensure proper conservation and management of wildlife resources in order to provide for sustainable utilization and equitable access to the resources and fair sharing of the benefits from the resources for both present and future generations of Malawi. To achieve this goal the policy seeks to:

- Adequately protect representative ecosystems and their biological diversity through adopting sustainable land management practices;
- Raise public awareness and appreciation of the importance of wildlife conservation and management;
- Provide enabling legal framework to control poaching;
- Encourage wildlife-based enterprises; and
- Develop a cost-effective legal, administrative and institutional framework for managing wildlife resources.

The principal legislation dealing with management of wildlife resources is the National Parks and Wildlife Act [No. 11 of 1992], which repealed the Game Act, the Crocodile Act, the Wild Birds Protection Act and the National Parks Act. The Act provides for wildlife management, including identification of species which

should be designated for protection. It also has provisions in section 28 to declare any area of land or water within Malawi as a national park or wildlife reserve.

The national parks and wildlife amendment bill, now before parliament, is a legal expression of the wildlife policy adopted in 2000. In particular, the amendment bill seeks to:

- Promote community and private sector participation in the management of wildlife resources;
- Provide for stiffer penalties;
- Promote international cooperation;
- Promote equitable sharing of benefits; and
- Promote general stakeholder participation.

Water Resources Policy

The 1994 Water Resources Management Policy (WRMP) placed much emphasis on provision of portable water but failed to address issues pertaining to water resource monitoring, assessment and implementation of strategic plans. These deficiencies are addressed in the draft Water Resources Management Policy of 2004. The draft policy, however, does not provide policy guidelines for the conservation and sustainable use of aquatic biodiversity.

The management of water resources has to contend with two distinct though related issues: provision of wholesome supply and the removal and disposal of contaminated liquid wastes and in that regard has a bearing on waste management. The Water Resources Act, 1969 is the major statute dealing with management of water resources. The Act is intended to make provision for the control, conservation, apportionment and use of water resources of Malawi.

National Land Resources Management Policy and Strategy

The policy was approved in 2000 in order to promote the efficient, diversified and sustainable use of land-based resources both for agriculture and other uses. In addition, the policy was put in place in order to avoid sectoral land use conflicts and enhance sustainable socio-economic growth for the conservation of biodiversity in objectives dealing with technology development in land management. The objectives include the development of technologies that are economically viable, ecologically sound and socio-culturally acceptable, especially in environmental fragile areas such as steep slopes, stream banks, watershed areas, swamps and dambos; and the promotion of the management, conservation and utilization of natural resources in order to ensure sustainable land and ecosystem productivity. The National Land Resources Management Policy, however, is very broad, does not offer a radically new approach to solve land use problems and as such is considered unremarkable. Land in Malawi is administered and

<p>Box 4 Legislation associated with land management and biodiversity</p> <ol style="list-style-type: none"> 1. Land Act [Cap. 57:01] 2. Registered Land Act [Cap. 58:01] 3. Land Acquisition Act [Cap 58:04] 4. Land Surveys Act [Cap. 59:03] 5. Customary Land (Development) Act [Cap. 59:02] 6. Adjudication of Title Act [No. 18 of 1971] 7. Town and Country Planning Act [Cap. 23:01] 8. Local Government Act (No. 42 of 1998) 9. Mines and Mineral Act [No. 18 of 1971] 10. Petroleum (Exploration and Production) Act [Cap. 61:02] 11. Public Health Act [Cap. 43:01] 12. Tobacco Act [Cap. 65:02] 13. Plant Protection Act [Cap. 64:01] 14. Public Roads Act [Cap 69:02] 15. Control of Goods Act

regulated under a set of sectoral Acts presented in Box 4. The National Herbarium and Botanic Gardens Act

The Act was established in 1987 and provides for the development and management of herbarium and botanic gardens as national heritage for Malawi and

the establishment of the National Herbarium & Botanic Gardens of Malawi. Among other things the NHBG was established to:

- Establish herbaria and botanic gardens as a centre for assemblage, growth, curation and classification of plants of Malawi;
- Conduct investigations and research into the science of plants and related subjects and disseminate the results;
- Provide advice, instructions and education in relation to those aspects of the science of plants; and
- Keep the collections as national reference collections and ensure that collections are available to interested persons for the purposes of study.

Other policies and Legislation

Although Malawi has sector policies and legislation dealing with endemic and endangered species, including those relating to forestry, fisheries and wildlife, there is need, however, to provide for harmonization of these to ensure that they achieve similar objectives and there is cross sector coordination. Further, Malawi has no policy or legislation specifically dealing with community, farmers and breeders rights for plant and animal genetic resources as they relate to food and agriculture. A draft plant variety bill is under consideration in the Ministry of Agriculture and Food Security. It is necessary that this policy framework be developed, including regulation of intellectual property rights.

Malawi is also party to a number of international and regional treaties and conventions some of which are highlighted in Theme Eleven (Malawi's Role in Global Biodiversity Conservation). Efforts have been made to integrate provisions from

Current Management

Enforcement and implementation of policies and legislation dealing with biodiversity conservation is fragmented along the Energy and Natural Resources departments (agriculture, lands, forestry, water, fisheries, national parks and wildlife etc). These sectors are responsible to ensure that their sectoral policies, plans, strategies and programmes are in line with EMA and

NEP. The Ministry of Mines, Natural Resources and Environment through the EAD is responsible for the coordination of the cross-sectoral environment and natural resources programmes through a network of stakeholders and a number of coordinating committees such as the National Council for Environment and National Biodiversity Committee.

Summary of issues

By engaging in an environmental policy review and reform process Malawi is responding to her obligations under the Convention on Biological Diversity, the Cartagena Protocol on Biosafety, the World Trade Organization Trade Related aspects of Intellectual Property Rights (WTO/TRIPS) and the International Treaty on Plant Genetic Resources for Food and Agriculture. In this respect the AU Model Legislation on Community, Farmers and Breeders Rights provides useful guidelines for domesticating these international instruments in the context of the peculiar needs of developing countries in general and the African countries in particular. In addition this policy process is indicative of

Malawi's overall commitment to provide guided direction for conservation and sustainable use of biodiversity. However, for effective monitoring and implementation of environmental policies there is need to strengthen the capacity of institutions in terms of infrastructure and human capacity and develop an effective mechanism with such institutions to monitor and implement policies and regulations related to biodiversity conservation and sustainable use. Furthermore there is also need to develop a comprehensive policy framework for the biodiversity sector. This will promote a more coordinated implementation of conservation activities.

Action Plan

international and regional conventions into the national laws and policies.

Objective 7.1 Strengthen policies and legislation

Strategy 7.1.1 Develop biodiversity policy and act

Actions

- (a) Provide strategic direction and guidance to review and harmonise relevant policies and legislation and develop a broad based Biodiversity policy.
- (b) Study and assess the existing policies and revise them accordingly, paying

particular attention to incorporating emerging international and regional conventions and obligations.

- (c) Evaluate and strengthen of existing laws and policies to address issues of endemic biodiversity, access and benefit sharing, indigenous knowledge and intellectual property rights.
- (d) Develop appropriate mechanisms for co-existence of the customary and statute laws given the difficulty to combine the implementation of the two types of laws especially in relation to property rights.
- (e) Review and harmonise existing

policies and legislation and integrate international conventions and treaties and customary laws into national laws and policies.

Protection Agency.

Key Players: MoE, EAD, MoMNEA, MoJ, NRCM, NHBG, MoA&FS.

Key Players: EAD, NRCM, MoMNRE, MoJ, MoLGRD, MoLPPS, NHBG, MoA&FS.

Objective 7.2 Strengthen Institutional capacities of biodiversity sectors

Strategy 7.2.1 Provide mechanisms to strengthen institutional infrastructure and human capacity to monitor and implement environmental policies and legislation.

Actions

- (a) Strengthen environmental education especially in the areas of environmental law, economics and science.
- (b) Undertake training and community awareness campaigns on access and benefit sharing and biodiversity related intellectual property rights.
- (c) Establish alternative enforcement mechanisms, which will minimise resource expenditure and encourage close collaboration between sectors.
- (d) Enhance enforcement of biodiversity sector agencies including the police, judiciary, immigration and customs and excise authorities.
- (e) Provide policy guidelines for creation and strengthening of financing mechanisms for biodiversity programmes through the national budget.
- (f) Promote enforcement and compliance to policy, legislation and international conventions through the creation and empowerment of an independent Environmental

Theme Eight: Community Participation and Awareness

Scope

The involvement and participation of the private and public sectors, communities and NGOs in the conservation sustainable use and equitable sharing of benefit of biological diversity appreciated and understood.

Desired outcome by 2020

- (a) Communities participate in planning, management and implementation of biodiversity programmes and law enforcement through natural resources community associations.
- (b) Primary, secondary and tertiary curricula revised and strengthened to incorporate issues of biodiversity conservation and sustainable use.
- (c) The public, especially the children, are more aware of the value of biodiversity through schools and community programmes.
- (d) Local stakeholders including researchers, professionals and private resource managers have adequate information about biodiversity in their areas and that indigenous knowledge is incorporated into biodiversity management programmes.
- (e) The private sector actively participates in biodiversity conservation and sustainable use through provision of adequate financial resources at the local community level.
- (f) Guidelines and programmes for gender and HIV/AIDs mainstreaming in Biodiversity conservation are promoting participatory and appropriate research.

State of community participation and awareness

The Malawi government recognises that environmental education is the major and remedial and preventative measure of the current environmental. This is confirmed by the NEP of 1996 revised in 2004, which seeks to promote sustainable social and economic development through, among other things, enhanced public and political awareness and understanding of the need for sustainable environmental protection, conservation and management. Following the publication of the Environmental Policy, sectoral policies affecting biodiversity such as the Forestry; Fisheries and Aquaculture; and the National Parks and Wildlife policies, were amended to include provisions that encourage community participation and provision of appropriate incentives that will promote community based natural resources management.

To enhance public awareness and compliance, the government of Malawi in 1996 put in place a national environmental education and communication strategy whose main objective is to raise public consciousness to the complexity of natural resources management at all levels. Guided by environmental strategic planning, a wide range of environmental education activities (from formal to informal) are being undertaken by different organizations. Informal environmental education is undertaken by the civil society, such as the WESM, COMPASS, and CURE. Through its wide network of clubs whose membership mostly comprise the youth, WESM is assisting the government instil the environmental culture in the youth of Malawi, through distribution of leaflets, CBNRM activities, etc. Government

departments such as the Environmental Affairs Department, Fisheries Department, and Forestry Department reach out to various stakeholders through radio and television programmes, sensitisation and training sessions of focus groups such as journalists, artists, club patrons, politicians and local leaders, or through CBNRM activities. Sensitisation of journalists resulted in the establishment of Forum for Environmental Communicators (FECO) in 1999 and Coalition of Journalists for Environment and Agriculture (COJEA) in 2003. These forums have improved the capacity of the print and electronic media to increasingly disseminate environmental information to the public and therefore contribute to informed decision making about the wise use and management of biodiversity and other natural resources.

Formal education institutions (e.g. Chancellor College, Bunda College, the Polytechnic, Mzuzu University) have introduced new courses in environment which are offered at bachelors and

masters levels. The secondary and primary school curricula, incorporate elements of environmental education in the syllabi. However, teaching and learning materials are very limited, teacher training courses have not yet been reviewed to integrate environmental issues and the teachers in the field are not oriented to enable them effectively teach environmental education in the carrier subjects.

The legal requirement of stakeholder and public consultations in the preparation process of environmental impact assessment (EIA) for prescribed projects is contributing to the raising of environmental awareness. For instance, through public hearing on proposed development projects supported by either government, NGOs as well as the Malawi Social Action Fund (MASAF), communities are made aware of environmental issues affecting them and the importance of their effective participation in addressing environmental problems.

Current Management

Implementation of environmental education and community participation programmes are the responsibility of government sectors dealing with environmental management such as Agriculture, Water, Forestry, National Parks and Wild Life. In line with the requirements of NEP most sectoral policies and legislation were revised and now have provisions for community participation. The existing national institutional framework for environmental education and community participation is coordinated by the Ministry of Mines, Natural Resources and Environment through the EAD. Within the EAD environmental education is coordinated through Education and Outreach section.

In line with the decentralisation programme various mechanisms have been established to promote community participation at the local level. At the Assembly level natural resources management is facilitated through

the District Executive Committee, especially the District Environment Sub-Committee (DESC) a technical sub-committee to provide advice to DEC. At the local level there are Area Development Committees that facilitate community led planning and implementation of projects and also promotes community participation in natural resources management. The decentralisation programme therefore has provisions for empowerment of local communities to actively participate in environmental management and the institutions created under it, providing viable mechanism for the integration of environmental concerns identified at local levels into district plans then into national plans.

The Department of Local Government is the key institution to the implementation of decentralisation programme and as such has established Environmental Unit, which assists and advises all Local Authorities on

matters of the environment. The EAD, on the other hand, is responsible for the coordination of the cross-sectoral environment and natural resources

management. Co-ordination Unit for the Rehabilitation of the Environment (CURE) coordinated implementation of NGO environmental education.

Summary of issues

By putting in place various environmental programmes, Malawi is moving toward the right direction to implement Article 13 of the Convention on Biological Diversity on Public education and awareness. The successful implementation of this programme, however, will depend on the active involvement of the people and their commitments to biodiversity conservation. Major issues relating to community participation and awareness include:

- Much indigenous knowledge about Malawi's biodiversity among the local communities remains untapped with the exception of a few loose linkages with a limited number of herbalists. Most of this indigenous knowledge is passed on orally from generation to generation and unless there is a deliberate attempt to document this some of it is likely to be lost.
 - There exists in Malawi a wide range of cultural beliefs and practices that have over the years contributed towards conservation of certain components of biodiversity. However, these are not well understood, not adequately documented and not incorporated into the current environmental management programmes.
 - Despite all the available policies and legislation dealing with biodiversity conservation, Malawi still experiences environmental degradation, which is linked to unsustainable use of natural resources. This is due in part to the lack of general understanding and appreciation by the communities of the importance of biodiversity in sustaining life. This is also compounded by low literacy rate and
- use of English as the official language for documenting policies, legislation, plans and reports that limit community participation especially in planning, monitoring, and implementation of environmental programmes and enforcement of environmental laws.
- Government departments (e.g. Forestry, Fisheries, Lands, Agriculture, National Parks and Wildlife) and NGOs such as WESM are involved in a number of formal and informal environmental education initiatives, but the programmes are not well coordinated and integrated, therefore, not most effective, resulting in duplication of effort and fragmentary information distribution. There is, therefore, need to mainstream biodiversity concepts into broader environmental education programmes and to make biodiversity information more relevant to the people's local needs. Existing environmental education curricula need to be reviewed and where necessary develop new ones to target the youth.
 - There is limited involvement of the private sector in environmental management in general and biodiversity conservation programmes in particular, which is compounded in part by limited access to biodiversity information, lack of appreciation of the relevance of biodiversity to their business and the impact of their activities on the local biodiversity.
 - Although National Environmental Policy provides for mechanisms for

the implementation of environmental education and public participation, Malawi does not have a stand alone Environmental Education Policy. With support from

ICUCN Netcab, however a process to develop an Environmental Education Policy was initiated but the policy is yet to be finalised.

Action Plan

Objective 8.1 Raise awareness on the value of biodiversity

Strategy 8.1.1 Raise the appreciation of the communities on the value of biodiversity in sustaining life.

Actions

- (a) Develop, revise and coordinate the implementation of an effective public awareness strategy.
- (b) Make information about biodiversity available to people by developing, promoting and implementing an effective information exchange and sharing strategy.
- (c) Develop a public awareness programme about Malawi's lesser known ecosystems, habitats and species that are of biodiversity conservation importance.
- (d) Prepare simple extension messages, visual aids, radio programmes on the conservation and wise use of biodiversity for dissemination to stakeholders.

Key Players: MoA&FS, MoNRE, MoH, WESM, CURE, NHBG, UNIMA, VNRMC, MoLGRD, MZUNI, MMCT, NGOs.

Objective 8.2 Strengthen linkages between stakeholders on biodiversity conservation and sustainable use

Strategy 8.2.1 Strengthen the participation of communities and the private sector as equal partners in biodiversity conservation and sustainable use and equitable sharing of benefits.

Actions

- (a) Involve communities, NGOs and the

Private Sector in international and local negotiations in order to ensure that indigenous knowledge is not subject to political manipulation and is not lost through excessive bureaucracy.

- (b) Promote the involvement of the local communities, local leaders and NGOs in decision-making regarding the management of biological diversity and ecosystems through village natural resources management committees.
- (c) Promote and support establishment of local groups and associations on sustainable use of natural resources and promote community participation in biodiversity research.
- (d) Develop training guidelines and programmes for community participation and strengthening.

Key Players: MoJ, MoMNRE, WESM, CURE, MoA&FS, FD, DoF, EAD, NGOs, CBOs, MoLGRD, Museums of Malawi, MMCT.

Objective 8.3 Biodiversity knowledge base in education system improved

Strategy 8.3.1 Promote and strengthen the teaching of biodiversity in Malawi's education system.

Actions

- (a) Instil biodiversity culture in the youth of Malawi by developing guidelines on environmental education and by reviewing and developing new curricula for schools so that issues of biodiversity are addressed through folk stories and textbook readings.

- (b) Establish, promote and support in-service training programmes for teachers and assist training institutions identify their environmental education needs and strategies.
- (c) Promote informal biological diversity education programmes through community natural resources management programmes, outreach programmes and adult literacy programmes.

Key Players: MoE, MoLVT, EAD, UNIMA, MZUNI, MoLG&RD, WESM, DNPW, NHBG, Museums of Malawi, FD, DoF, NRC, MMCT.

Objective 8.4 Mainstream HIV/AIDS and gender

Strategy 8.4.1 Integrate issues of Gender and HIV/AIDS in biodiversity programmes, policies and practices.

Actions

- (a) Address socio-economic and cultural obstacles that pose challenges in biodiversity conservation and equitable sharing of benefits.
- (b) Involve communities in gender and HIV/AIDS awareness in order to promote participation in biological conservation and promote the involvement of women in biodiversity programmes.
- (c) Address the impacts of HIV/AIDS on biodiversity and initiate research on how biodiversity can best be managed amidst HIV/AIDS pandemic.
- (d) Integrate issues of HIV/AIDS and gender and biodiversity conservation into the school curricula.

Key Players: EAD, FD, MoA&FS, DNPW, DOF, NAC, NGOs, MZUNI, UNIMA, CBOs, VNRMC

Objective 8.5 Strengthen policies, legal and institutional frameworks

Strategy 8.5.1 Provide enabling policy, legal and institutional frameworks for Environmental Education and Public Awareness.

Actions

- (a) Strengthen and establish mechanisms for effective coordination, monitoring and implementation of environmental education and public awareness programmes.
- (b) Develop an enabling policy on environmental education and public awareness and integrate issues of Environmental education into existing sectoral policies and strategies.
- (c) Develop guidelines and programmes for enhanced existing institutional capacity including environmental focal points and coordination units.

Key Players: EAD, WESM, MoLG&RD, FD, DOF, DNPW, NHBG, CURE, MoA&FS.

Theme Nine: Information, Knowledge and Capacity

Scope

The provision of adequate information, knowledge and capacity for the conservation and sustainable use, and sharing of benefits arising from the use, of

Desired outcome by 2020

- (a) Biodiversity information is readily available and in a format and language most appropriate to the end user.
- (b) Inventories of Malawi's taxonomic groups maintained and regularly updated to facilitate efficient monitoring and identification of biodiversity.
- (c) Sufficient progress is made in filling the existing scientific information gaps in the following areas: species identification and classification, natural products research including medicinal plants, ecosystems management and systematics.
- (d) Noticeable progress in the collection, classification, identification and management of biological collections of different taxonomic groups, with emphasis on understudied taxonomic groups, such as invertebrates, leading to accurate identification of crop pests and to improved food security.
- (e) Guidelines and mechanisms for information sharing and exchange are enhancing information sharing between institutions and organisations.

State of information, knowledge and capacity

Malawi has a number of different biodiversity information sources in form of gray and published literature, databases and biological collections. Literature on the biodiversity of Malawi is particularly inadequate although available information shows that a considerable amount of study and research has been carried out in the country over the past 135 years. Results of the research were either published in foreign journals or are unpublished and as such are inaccessible to users. In order to address these problems and improve on availability, accessibility and information flow at national level, Cabinet in 1996 approved a policy on library, documentation and information services. Despite being broad and comprehensive, and advocating and recognizing the importance of information technology, communication patterns and indigenous knowledge systems, the policy was never adopted. Government is in the process of

developing an Information and Communication Technology Policy (ICT) to guide the utilization and development of ICT to enhance information access, sharing and dissemination.

Biological collections, such as herbarium specimens, living and zoological collections, and museum specimens are a primary source of taxonomic, ecological and biodiversity information. The National Herbarium maintains over 100,000 plant specimens of which 50% have been databased. A representative sample of Malawi's mammals, birds, reptiles and invertebrates are housed at the National Museums. It would appear, however, that most collections are in foreign museums and are inaccessible to local users. Specimens of fishes of Malawi are housed at the Fisheries Research Unit, Monkey Bay. Presently, the major invertebrate collections, each containing 10,000-20,000

(insect) specimens, are housed with the Bvumbwe Agriculture Research Station, the Department of Biology, Chancellor College, and the Forestry Research Institute of Malawi. Other institutions, such as the Museums of Malawi; Crop Sciences Department, Bunda College; Makoka Research Station; and Chitedze Agricultural Research Station, have smaller but still valuable collections.

Malawi's biological collections are often not well managed, misidentified and are scattered about. In addition the information contained on specimen labels is in a format not easily accessible to users and hence unavailable to the users.

Most of Malawi's biodiversity information has never been consolidated, repackaged and made available to the users. Apart from a few checklists of selected taxonomic

groups the biological collections have never been databased and this forces users to physically visit the institutions. This has been one of the factors that have affected information exchange and sharing between and among institutions at the national, regional and international levels. In addition unresolved concerns on issues of Intellectual Property Rights (IPR), inadequate terms and procedures for information exchange and data sharing, and lack of fully fledged data standards and classification systems that are applicable to custodians of biodiversity information, have affected data exchange and sharing. Information on Malawi's biodiversity would certainly be effectively shared and exchanged if some of the information was available on line or in designated information centers such as existing national libraries.

Current management

Management of biodiversity and its related information in Malawi is the responsibility of specific government departments and institutions such as fisheries, forestry, national parks, agriculture and lands although much emphasis is placed on the conservation of the biodiversity and very little is done to manage the information, literature and biological collections. This is evidenced by the lack of provisions within the existing policies pertaining to management of biodiversity information and associated biological collections. Gray literature held by these organizations has never been consolidated and the institutions do not have functional libraries. The proposed Clearing House Mechanism when fully operational would assist to collect, manage and disseminate biodiversity information. Considering that the CHM would sometimes be dealing with gray literature, it might be necessary to develop or revise the existing legislation to include

regulation on access to biodiversity information and biological collections.

Despite the fact that loss of biodiversity is highlighted in NEAP as one of major problems the country is facing, financing of biodiversity management activities through the national budget is inadequate. Apart from the Malawi Environmental Endowment Trust (MEET) and the Mulanje Mountain Conservation Trust, there is no mechanism to finance biodiversity programmes. The Environment Fund Frame developed and approved by Cabinet in September 2003 proposes allocation of the funds to some environment and natural resources sectors at national and district levels. Ironically, the Environment Fund has not included Biodiversity as a sector that would get a share of the funds for implementation of biodiversity activities including information management.

Summary of issues

Malawi through the Science and Technology Policy of 2001 recognizes the importance of scientific information in socio-economic development. However, effective information management, sharing and exchange appear to be affected by some of the following factors:

Inadequate capacity

Currently institutions holding biodiversity information have inadequate capacity in form of infrastructure, human capacity and sustainable financing mechanisms, and as such are unable to maintain information sources as part of their work programmes. This has resulted in information material being scattered within the institutions, which makes information gathering, retrieval and selective dissemination difficult. Efforts must therefore be made to:

- Build human capacity capable of collecting, packaging, interpreting and dissemination biodiversity information;
- Build infrastructure capacity in form of purpose built herbaria, museums, information centers, research equipment, etc;
- Strengthen training institutions on biodiversity research and dissemination; and
- Develop sustainable financing mechanisms to support information management activities including information dissemination.

Lack of an enabling policy

Malawi currently has no clear policy on management of biodiversity information and as such most activities are haphazard and result in inefficient collection, management and dissemination of quality scientific information. In addition, the inadequate policy leads to inadequate appreciation by policy makers of the value of biodiversity information. As a result

inadequate budget allocations towards herbarium, museums, and library activities are made. Policy makers are unable to appreciate the value of Malawi's biodiversity because the biological resource and its diversity has not been systematically measured to determine its economic value. This calls for reliable and credible means of measuring the benefit and costs of biodiversity.

Lack of information management standards

Biodiversity information maintained by various institutions is often in a format that cannot be easily understood and accessed by resource users, and shared between the custodian institutions. In order to make such information available to users there is need to put in place mechanisms to repackage and or reorganize the information and present it in the format and language appropriate to potential users. Malawi's commitment to achieve this is manifested through its commitment to establish a Clearing House Mechanism that is designed to face the challenge of setting a national biodiversity information network of experts and institutions. The network will improve information flow and a means for resource sharing and technology transfer at national, regional and international levels. Thus, the network will endeavor to promote awareness on the available information resources and their sources. The network will also attempt to sensitize resource centers to provide tailor-made services.

Inadequate biodiversity information

Very little is known about Malawi's biodiversity. In particular there are scientific gaps in the knowledge of taxonomy, distribution, population variations and viability, socio-economic importance, classification and ecosystems functioning. There is therefore need to initiate processes to identify knowledge gaps and recommend ways of filling up the gaps.

Lack of sustainable financing mechanisms

Financing of biodiversity activities including biodiversity information management has tended to depend on external sources which are routed through projects. The over dependency on external sources has impinged severely on data collection, dissemination and distribution of biodiversity information as most of the activities have not continued once

external support stops. Efforts should be made to develop innovative financing mechanisms to strengthen existing institutions in management of the clearinghouse mechanisms, herbaria, museums and biodiversity information centers. The starting point would be to ensure that a portion of the Environmental Trust Fund is allocated to biodiversity programmes through a biodiversity secretariat.

Action Plan

Objective 9.1 Develop Human, infrastructure, financial and institutional capacity.

Strategy 9.1.1 Build the capacity of institutions to collect, interpret, manage and disseminate quality and relevant biodiversity information and biological collections effectively and efficiently.

Actions

- (a) Ensure that herbaria and museums have adequate infrastructural capacity to collect, classify and identify biological collections.
- (b) Ensure appropriate skills training and education to enhance the capacity of people and relevant agencies to manage biodiversity information and knowledge.
- (c) Establish national biodiversity information centers using existing infrastructures such as national libraries or other resource centers.
- (d) Establish formal and informal collaborative linkages with regional and international centers of taxonomic excellence to ensure accurate identification, classification and management of biological collections and exchange and access to biological information not available in Malawi.
- (e) Ensure that innovative financing mechanisms are established to support biodiversity information management

and awareness programmes and ensure that the Environment Fund deliberately include a component on support to management of biodiversity information.

Key Players: NRCM, NHBG, MoMNRE, FRIM, Museums of Malawi, UNIMA, MZUNI, MoA&FS, DISTMS, NSDC.

Objective 9.2 Develop Information sharing mechanisms.

Strategy 9.2.1 Develop, consolidate and share existing and new biodiversity information, methods, technologies and management experiences.

Actions

- (a) Document and database existing and new biodiversity data and information and make it available to users through various media.
- (b) Compile a list of core datasets and establish metadatabases to capture core datasets of key biodiversity information and make it available in the national biodiversity information centers as pointers to key information sources.
- (c) Establish a standardized information system capable of tracking relevant Malawian biodiversity literature through cross-referencing keywords.
- (d) Create, strengthen and implement the existing CHM institutional structure.

- (e) Promote the use of ICT in biodiversity information management.

Key players: NRCM, NHBG, MoMNRE, Museum of Malawi, UNIMA, MZUNI, MoA&FS, DISTMS, NSDC.

Objective 9.3 Strengthen policy, law and institutional capacity

Strategy 9.3.1 Develop and review existing policy and legislation on exchange and sharing of biodiversity scientific knowledge, technologies and management practices.

Actions

- (a) Develop and review the existing policies for access to biological information and data including gray literature, published literature and oral literature and biological collections.
- (b) Establish mechanisms for effective repatriation of biodiversity data and collections maintained in foreign institutions.
- (c) Establish mechanisms for effective monitoring and implementation of policies and regulations on sharing and exchange of biodiversity information and knowledge.

Key Players: NRCM, MoMNRE, MoA&FS, MoJ, DISTMS, NSDC, LSM.

Objective 9.4 Increase scientific knowledge and research capacity

Strategy 9.4.1 Identify and fill critical gaps in scientific knowledge, including applied research and coordinate future research to address key issues and threats to biodiversity.

Actions

- (a) Assess knowledge gaps, prioritize critical research areas requiring urgent attention and identify and motivate appropriate institutions to research on the prioritized areas.
- (b) Develop resources and a system that

promotes coordination of research activities and promotion of knowledge sharing.

Key Players: NRCM, NHBG, Museums of Malawi, UNIMA, MZUNI, MoA&FS, LSM.

Theme Ten: Incentive Measures

Scope

Mechanisms for creating incentive measures are promoting stakeholder participation in biodiversity conservation, sustainable use and equitable sharing of benefits arising from the use of biological resources.

Desirable outcome by 2020

- (a) Policies, laws and institutional frameworks are revised or developed to remove or minimize potential perverse incentives.
- (b) Guidelines and procedures to regulate creation of incentives and promote community participation in biodiversity conservation are in place.
- (c) Significant progress is made in developing and or adopting tools and methodologies for valuation of biodiversity and biological resources.
- (d) Institutional framework is established to facilitate implementation and effective monitoring, enforcement and evaluation of incentive measures.

State of incentive measures

Causes of biodiversity loss appear either directly or indirectly linked to economic gains of the societies. Therefore, to achieve sustainable biodiversity conservation, there is need to create or develop relevant incentive measures which may be in form of economic, regulatory and investment incentives.

The National Environmental Policy (2004) provides for mechanisms for economic incentives for sustainable environmental in section 3.2. The concept of incentive measures in biodiversity conservation however is relatively recent and not true incentive measures in biodiversity conservation have been recorded in Malawi.

The only measure that are providing some kind of incentives to the rural communities on sustainable use of natural resources are those related to access and benefit sharing. For example, since the late 1990s Malawi government has on a pilot basis gone into collaborative management of forest reserves with communities living close to the forest reserves. Co-management activities have given back to communities some stake in forest conservation and use, have been source of income to the communities through sharing of revenues earned from

confiscation of illegal forest produce and income-generating activities (IGAs) as an economic incentive such as bee keeping, guinea fowl rearing and juice making.

Another example of CBNRM related incentive measures for conservation of biodiversity has been through the border zone project around Nyika-Vwaza in northern Malawi. The project took an old approach used under the Integrated Conservation Development Projects (ICDPs) initiated by conservation organisations throughout the world in the 1980s. This takes the form of socio-economic investment through support to community development projects (community schools and clinics, boreholes, agricultural and enterprise development, credit and income generating activities) for communities bordering parks.

A project implemented by the Wildlife and Environmental Society of Malawi (WESM) also following a similar approach. The project developed strategies for sustainable harvesting of non-timber forest products, processing and marketing with an emphasis on sustainable management of indigenous forest resources to ensure continued availability of benefits to communities.

The other reason was to arrest deforestation, by providing alternative sources of income to local communities. The activities involved include bee keeping, guinea fowl rearing, indigenous fruit processing, bamboo furniture making and fire briquette making for both home and commercial purposes.

The private sector has been involved in provision of indirect incentive measures for biodiversity conservation to both rural and urban populations in Malawi. They have

provided technologies that provide alternative sources of energy to both local communities and low-income urban residents. These include solar energy, biogas, gel fuel, solid fossil fuel (coal), ethanol and electricity. These energy sources provide alternative sources of energy to fuelwood and biowaste from agricultural fields, thus conserving biodiversity. The provision of electricity in rural areas (rural electrification) may be considered an investment incentive measure for natural resources management.

Current Management

Overall guidance on incentive measures is provided for in the NEP (2004). In addition to this Forestry, Fisheries and National Parks and Wildlife policies and legislation have provisions that provided an enabling environment to advance the paradigm of provision of incentive measures. The policies have put the interests of local communities as being central to the management of forests, fisheries and wildlife. These policies however do not

cover the issues of incentive measures adequately.

Private sector involvement in provision of incentive measures is almost non-existent probably due to high investment costs. NGOs especially the Wildlife and Environmental Society of Malawi have been active in providing incentives for conservation of biodiversity through CBNRM programmes. These programmes however are donor supported.

Summary of issues

Inadequate policy and legal framework

Sectoral policies such as forestry, fisheries and national parks lack specific provisions for incentive measures although comanagement arrangements provides some kind of incentives for biodiversity conservation. Implementation of comanagement programmes however has been very slow and is still monopolized by government control which encourages encroachment and unsustainable use of natural resources.

Other policies, such as the economic growth policy, trade policy, public roads policy, agriculture and livestock policy which encourage development of one sort, may directly or indirectly have negative impacts on biodiversity and ecological functioning systems. For instance, price controls and

high taxes in such commodities as paraffin and electricity force people to depend on fuel wood for domestic uses.

Policies and legislation that would promote incentives are simply unavailable. For example lack of legislation on intellectual property rights mean that genetic resources and indigenous knowledge are exchanged freely and as such the potential resulting commercial and technological benefits do not trickle down to the local communities. Malawi therefore needs to undertake a comprehensive study of various policies and legislation to identify policy areas and develop a streamlined policy that clearly articulate issues of incentive measures.

Economic policy and market failure

Malawi's biodiversity is inadequately valued, resulting in poor pricing of

biological resources. This when coupled with ill-defined, disputed or non-existent property rights and missing or incomplete markets for biological resources results in over exploitation of the resources. In addition, the low prices of natural resources products are a discouragement to communities to invest in natural resources management as an economic activity.

Weak Institutional framework

The concept of incentive measures has not been integrated into the existing institutions and as such human capacity to implement programmes is inadequate resulting in ineffective implementation of programmes that have elements of incentives. A good example of institutional failure in the implementation of incentives is the Blantyre

City Fuelwood Project (BCFP), which established forest plantation by transfer of land usufruct rights from local communities to the project through compensation. When the plantations were later given back to local communities, the question of who should get back the forest plantations had to be addressed especially in cases where communities adjacent to the plantations were without traditional rights to forest land. In order to ensure sustainable use of the resources, plots were allocated to all villages living along the plantation without taking into consideration the original boundaries. This has caused a number of conflicts, which have resulted in unsustainable harvesting by communities that feel unfairly treated.

Action Plan

Objective 10.1 Improve knowledge and understanding of incentive measures

Strategy 10.1.1 Promote the participation of the private sector and local communities in identification of practices that promote perverse incentives and identification and implementation of incentives

Actions

- (a) Assess and identify available incentive measures important for biodiversity conservation, sustainable use as well as benefit sharing and promote the adoption of best practices.
- (b) Carry out biodiversity valuation to determine potential economic uses of biodiversity resources in Malawi.
- (c) Develop mechanisms to regulate and promote the transfer of innovative technologies.

Key Players: UNIMA, NRCM, FRIM, MZUNI and MoLG&RD, CBOs, NGOs, NHBG

Objective 10.2 Promote public participation and awareness

Strategy 10.2.1 Develop guidelines for promoting public participation and awareness on importance of removing policies and practices that promote perverse incentives.

Actions

- (a) Undertake an inventory of incentive measures being practiced and promote the adoption of best practices.
- (b) Carry out community and private sector awareness campaigns on available and innovative incentive measures.
- (c) Undertake community training on innovative measures for biodiversity conservation and sustainable use.

Objective 10.3 Develop policies and regulatory framework for incentive measures

Strategy 10.3.1 Identify policies and practices that generate perverse incentives and formulate appropriate policies that encourage conservation through provision of incentives.

Actions

- (a) Study, critically review and evaluate existing policies and practices that potentially contribute to biodiversity loss.
- (b) Harmonize sectoral policies and legislation that have a bearing on biodiversity with a view to minimizing their conflict and impact on the promotion of incentive measures at local and national level.
- (c) Develop guidelines and mechanisms to promote periodic quantitative evaluation of the effectiveness of policy instruments and an assessment of any incentives created.

Key Players: MoMNRE, NRCM, UNIMA, MZUNI, DNPW, DoF, CBOs, MIRTDC, MoJ.

Objective 10.4 Enhance institutional capacity

Strategy 10.4.1 Enhance capacity of institutions to undertake biodiversity valuation, research, and monitoring and evaluation of policy reforms and programmes.

Actions

- (a) Undertake institutional needs assessments and enhance their capacity to monitor and implement programmes.
- (b) Develop and implement research guidelines on incentive measures.
- (c) Undertake skills development training programmes for the community cooperatives and other low-income groups in collaboration with the private sector.
- (d) Develop guidelines and mechanisms for sustainable financing of programmes to identify policies and practices promoting perverse incentives.
- (e) Establish a coordinating mechanism for implementation of incentives.

Key Players: MZUNI, UNIMA, NHBG, FD, DoF, DNPW, MoA&FS, MoE, MIRTDC, EAD

Strategy 10.4.2 Develop markets for the agricultural and natural resource products (including non timber and wildlife products).

Actions

- (a) Conduct socio-economic surveys to establish new potential products and facilitate local market development.
- (b) Improve existing products and their marketing locally and internationally.
- (c) Establish the monetary value of Agriculture and Natural Resource Products.
- (d) Encourage development of community cooperatives for agricultural and natural resource products.
- (e) Provide credit schemes to support local community cooperatives and other low-income groups.
- (f) Promote multiplication distribution and marketing of indigenous genetic material of plants with high commercial value.

Key Players: FD, DNPW, MoA&FS, MEPC, MoTPD, VNRMC, NGOs

Strategy 10.4.3 Develop Sustainable Financing Mechanisms

Actions

- (a) Undertake an inventory of available financing mechanisms and document lessons and experiences.
- (b) Develop innovative sustainable financing mechanism strategies as incentives to biodiversity conservation.
- (c) Undertake community training and awareness campaigns on sustainable financing mechanisms.

Key Players: EAD, FD, DNPW, MoA&FS, NGOs, VNRMC

Theme Eleven: Malawi's Role in Global Biodiversity Conservation

Scope

Malawi's international role and responsibilities with respect to the goal of conservation and sustainable use of biodiversity and furthering of national biodiversity goals as spelled out in the Malawi constitution.

Desired Outcome by 2020

- (a) Malawi contributes to a global vision of implementing the biological resources management by participating in international fora, sharing information and expertise and fostering bilateral and multilateral cooperation in biodiversity conservation efforts.
- (b) Malawi continues to play an important role in protecting biodiversity nationally regionally and globally.
- (c) Malawi makes significant progress to implement the CBD in harmony with relevant treaties and conventions related to biodiversity and natural resources.

State of Malawi's Role in Global Biodiversity Conservation

Malawi's commitment to global biological conservation dates back four decades ago when Malawi signed the Convention on Fishing and Conservation of the Living Resources of the High Seas (1958). This was followed by the signing of the Convention on Wetlands of International Importance Especially as Water Fowl Habitat (Ramsar Convention, 1971) in 1971, the African Convention on the Conservation of Nature and Natural Resources (1968) in 1973, the Plant Protection Convention (1951) in 1974, the signing of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973) in 1975 and its ratification in 1982, the signing of the Convention on Protection of World Cultural and National Heritage Sites (1972) in 1975 and its ratification in 1982, and the signing of the Convention on the Conservation of Migratory Species of Wild Animals (1893) in 1983. The signing of the 1992 United Nations Framework Convention on Climate Change (UNFCCC) in 1992 and its ratification in 1996, and the signing and ratification of the Convention on Biological Diversity 1992 also confirms Malawi's continued

commitment to the international efforts to contribute towards conservation of biological diversity, sustainable use and equitable sharing of benefits of biological diversity.

In conformity with some of the above conventions, Malawi has designated the following sites for the protection of biodiversity: Lake Chilwa was designated a Ramsar Site in 1997; Nankumba Peninsula was declared the Lake Malawi National Park and further declared a World Heritage Site (UNESCO) in 1984 and Mulanje Mountain was declared a Man and Biosphere Reserve (UNESCO) in 2000.

In addition to the international conventions that she is party to, Malawi also contributes to biodiversity conservation at the regional level. Malawi was the secretariat for biodiversity activities in the SADC region before SADC activities moved to the SADC secretariat in Botswana. This gave Malawi the opportunity to manage and implement regional biodiversity projects such as the Southern African Biodiversity Programme,

SADC Wetlands Project etc. Recognising the transboundary nature of Malawi's biological resources, Malawi signed regional protocols on shared Watercourse systems, Wildlife Conservation and Law Enforcement, the Environment, Forestry and tourism development.

With a view to incorporating relevant aspects of the international conventions into national laws and policies, Malawi for the past decade was engaged in a review and reform of environmental and natural resources management policies and legislation. The reform was also in response to the requirements of the CBD. In addition, the reforms were driven by the recognition of two deficiencies in the existing policy and legislation regime: the over reliance on central government control over the use of natural resources and lack of community participation in natural resource management. Thus in 1994, Malawi prepared its first NEAP and further made environmental management a national policy priority by including in the constitution section 13 (1) which empowers the state to promote the welfare and development of the people by adopting

and implementing policies and legislation that manage the environment responsibly. This was followed in 1996 by the NEP and the Environmental EMA, which is the legal instrument for the implementation of the principles of environmental and natural resource management contained in the NEP. These documents are cross-cutting in nature and, therefore, provide structure and legal frameworks for sustainable management and conservation of biological resources.

Most sectoral legislation has been revised to be consistent with EMA. Furthermore, the majority of Acts have provisions that make an express commitment to international cooperation. This commitment is put into effect through an elaborate system of rules, regulations and procedures.

In line with regional and international conventions that Malawi is party to, Malawi has participated in a number of regional and international biodiversity projects such as SADC Biodiversity Support Programme, Southern Africa Botanical Network (SABONET) and Lake Malawi Biodiversity Project.

Current Management

The Ministry of Mines, Natural Resources and Environment through the EAD is the national focal point for conventions and protocols dealing with natural resources management and as such is charged with following up and implementation at the national level. Furthermore some issues that fall under different conventions but have strong relationship to the CBD are generally coordinated by local agencies and focal points. For example coordination of CITES is the responsibility of the Department of National Parks and Wildlife.

To ensure effective implementation of the CBD and other conventions dealing with natural resources management various institutions have been given key implementing responsibilities. For example Forestry Department, Department of

National Parks and Wildlife and the National Herbarium and Botanic Gardens of Malawi are key lead implementing institution for the CBD whilst the department of Forestry is the implementing institution for the UNCCD (Table 4). However, EAD lack capacity to effectively coordinate implementation of obligations of various conventions at the national level.

Table 4. A sample of biodiversity related conventions and protocols that Malawi is party to.

<i>Regional or international treaty</i>	<i>Date of Signing or Institutions</i>	<i>Key lead Implementing Institutions</i>
African Convention on the Conservation of Nature and Natural Resources	15 Sept. 1968	DNPW
Convention on Wetlands of International Importance Especially as Water Fowl Habitat	2 Feb. 1971	DNPW
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	3 March 1973	DNPW
Convention on the Conservation of Migratory Species on Wild Animals	23 June 1979	DNPW
United Nations Framework Convention on Climate Change	9 May 1992	Meteorological Department
Convention on Biological Diversity	22 May 1992	FD, NHBG, DNPW
United Nations Convention to Combat Desertification and Drought	17 Jan. 1995	FD

Summary of issues

Malawi's commitment to global biodiversity conservation and sustainable use confirmed through the ratification of the Convention on Biological Diversity is complemented by a number of national legislation and policies. The inclusion of section 13(1) in the constitution implies a responsibility to provide guidance and leadership in biodiversity issues.

There is need to establish a national framework that harmonises all the sectoral Acts and policies. The framework should establish biodiversity goals and priorities to conserve the biodiversity and also integrate the role and responsibilities of the private sector and NGOs. Appropriate mechanisms to enforce policies and Acts to conserve and sustainably use the biodiversity

need to be developed and used by relevant institutions.

There is need to strengthen the existing CBD focal points in international negotiations and to undertake meaningful collaborative research with international organisations. In addition there is need to strengthen institutions dealing with biodiversity in management of bilateral and multilateral funding with international donor agencies.

There is need to harmonise and enhance collaboration in the implementation of other conventions and treaties related to the CBD. This will ensure sustainable use of natural resources at regional and international levels including issues related to biodiversity conservation and sustainable use and international trade.

Action Plan

Objective 11.1 Participate and contribute to intergovernmental negotiations on biodiversity conservation and sustainable use

Strategy 11.1.1 Build consensus on and present critical biodiversity issues that are

important to Malawi in international fora and treaties.

Actions

- (a) Promote the participation of different government agencies and collaboration with international

organisations in programmes and activities to fulfil Malawi's obligations to the CBD and related treaties and protocols.

- (b) Review policies and legislation that address the international conventions, protocols and treaties on conservation and sustainable use that Malawi is a party to.
- (c) Participate in the international negotiations, in priority areas for Malawi as appropriate on the development of international provisions and instruments relevant to the conservation and sustainable use of biodiversity such as WTO, WIPO, Biosafety that are related to the CBD.
- (d) Promote the development and use of supportive trade and environmental policies for the conservation and sustainable use of biodiversity in international trade and other forums.
- (e) Provide the international experts lists to assist in the drafting of the different articles.

Key Players: MoMNRE, MoLGRD, MoLPPS, MoJ, DNPW, UNIMA, MZUNI and NGOs

Objective 11.2 Promote regional cooperation

Strategy 11.2.1 Promote effective cooperation and support for the conservation and sustainable use of biological conservation between governments of the SADC region and beyond.

Actions

- (a) Operationalise the Biodiversity and Biosafety Clearing House Mechanism (CHM) for information exchange and scientific collaboration with other countries.
- (b) Promote regional protocols related

to the CBD by integrating the protocol into national policies and implementing related activities.

- (c) Participate in negotiations of the agreements on conservation and sustainable use.
- (d) Provide experts to secretariats that promote the CBD provisions.
- (e) Negotiate the transboundary agreements that will promote Conservation and sustainable use of biodiversity.

Key Players: MoMNRE, DNPW, MoLGRD, EAD, MoJ, FD, DOF, MoLPPS, DNPW,

Objective 11.3 Enhance inter-institutional cooperation

Strategy 11.3.1 Promote collaborative studies between institutions in conservation and sustainable use of biological resources.

Actions

- (a) Strengthen Malawi's role in international and regional collaboration in biodiversity research through collaborative links with institutions of excellence in the area of biodiversity conservation.
- (b) Promote joint management of biodiversity and ecosystems along national boundaries for the management of shared biological resources.
- (c) Provide mechanisms for wise use of international aid.
- (d) Put in place initiatives that promote implementation of the CBD.

Key Players: NHBG, MoMNRE, UNIMA, MZUNI, MoJ, NGOs, NPGRC, FD, DOF, DNPW.

Chapter 5

Strategic Priorities, Targets and Implementation Arrangements

Strategic priorities

Malawi has limited resources and low capacity to adequately implement all actions identified in this strategy and as such these actions cannot all be implemented at once. Thus some should be implemented first, giving priority to those that address existing gaps and inadequacies in Malawi's biodiversity management and those that would contribute more towards achieving national and global biodiversity goals and targets. This means that although Malawi has not prepared a framework for the implementation of the Global 2010 targets, actions that are perceived to contribute to the implementation of the Global 2010 targets were prioritised. These priority actions are not sufficient by themselves and for effective implementation, these will have to be accompanied and integrated into government programmes and initiatives.

A total of 192 (one hundred ninety two) actions were identified for implementation over a period of fifteen years. Of these 23 were prioritized and grouped into the following five areas.

Enhancement of protected areas management

As a measure to protect and conserve the biological diversity hotspots for species, habitats and ecosystems, areas are declared protected areas. The protected areas network consists of national parks, wildlife reserves, forest reserves and botanic gardens. The priority protected areas should include vulnerable freshwater ecosystems, the four lakes in the country and watersheds for major rivers, mountains and the terrestrial ecosystems. Currently, the Lake Malawi National Park forms the only fisheries protected area in Malawi.

Conservation of mountain biodiversity is

crucial in this decade lest most of the mountains are stripped bare due to over-exploitation of resources especially for firewood and agricultural expansion especially in areas close to urban areas. The biodiversity hotspots outside the protected areas network must be identified and prioritised and comprehensive environmental management plans should be developed in partnership with all relevant stakeholders.

Communities and the private sector have vital roles to play in the management of protected areas. Effective partnership between the private sector, government departments and the communities need to be forged and strengthened. In order to ensure that Malawi achieves sustainable management of protected areas the following actions should be given high priority.

Priority Action 1: Formulate a policy framework that would promote conservation of species, habitats and ecosystems that are important but not represented within the existing protected area networks or are vulnerable, fragile or are at risk of irreversible loss or decline of biodiversity.

Targets: Biodiversity hotspots including lakes and wetlands, mountains and terrestrial habitats and ecosystems outside the protected areas network are identified, characterized and protected by 2010.

Priority Action 2: Develop and implement programmes for sustainable conservation of important ecosystems of biodiversity importance including miombo ecosystems, mountain ecosystems, wetlands and biosphere reserves.

Targets: Areas of particular importance to biodiversity such as Miombo ecoregions, Afromontane ecoregions of forest ecosystems and wetlands diversity effectively conserved by 2010.

Priority Action 3: Encourage and support the protection, maintenance and restoration of areas of particular importance for the conservation of selected indigenous species.

Targets: Restore, maintain or reduce the decline of population of species of 50 threatened species by 2010.

Priority Action 4: Promote enforcement and compliance to policy, legislation and international conventions.

Targets: Policy, legislation and other international instruments ratified and promulgated by 2008.

Priority Action 5: Promote the involvement of the local communities, local leaders and NGOs in decision making regarding the management of biological diversity and ecosystems through village natural resources management committees.

Targets: Rates of loss and degradation of natural habitats decreased by 2010.

Promotion of sustainable use of genetic resources

Sustainable use of genetic resources in Malawi is challenged by transboundary issues such as GMOs, Access and Benefit Sharing and the problem of loss or replacement of local indigenous crop varieties and animal breeds. In the pursuit of food security, GMOs are introduced and the indigenous species are crossbred with exotic varieties or breeds with desirable traits. However, most of the indigenous genetic resources are indiscriminately crossbred among communities without proper measures to preserve and conserve the indigenous species. Recognizing this, the strategy proposes strengthening and promoting systematic protection and characterization of genetic resources by the National Gene Bank, seed centers, and

agricultural research stations, the universities, MBERU and other research units.

GMOs, Invasive Alien Species and pests can be propagated by cross border trade through intentional or unintentional introductions. Alien species and pests can spread and threaten indigenous species, habitats and ecosystems. There is need to develop and strengthen and implement policies and regulations for the prevention, control and management of such issues.

Policies and regulations for Access and Benefit Sharing of genetic resources and Bio-prospecting also need to be developed. Access to genetic material and the associated traditional knowledge, innovations and practices is inadequately controlled and individuals and communities do not or inadequately benefit from bioprospecting and biotrade. Issues of sustainable use of genetic resources are complex and as such require cross cutting actions for effective implementation.

Priority Action 6: Develop and enact regulations for access to and equitable sharing of benefit arising from the use of genetic resources.

Targets: Benefits arising from commercial and other utilisation of genetic resources are equally shared with stakeholders by 2010.

Priority Action 7: Collect and maintain genetic resources in gene banks, botanic gardens, national parks, herbaria, museums and zoos, and promote re-introduction, *in-situ* and *ex-situ* conservation of priority, rare, or endangered taxa.

Targets: Databases of genetic resources are created and published by 2009.

Priority Action 8: Collect all agrobiodiversity, including their wild relatives, threatened and/or endangered species, with full participation of communities and preserve them on farm, in field gene banks, seed banks and botanic gardens.

Targets: Agrobiodiversity, genetic diversity of fish and other valuable species conserved.

Priority Action 9: Develop or strengthen existing regulations and institutional framework on conservation and sustainable use of rare and endangered taxa including international trade on endangered species.

Targets: Illegal trade on endangered species reduced by 2010.

Priority Action 10: Develop methodologies to monitor, prevent and arrest the spread of invasive species in shared ecosystems, including early detection and coordinated management efforts at the community, national and regional levels.

Targets: Pathways for major potential alien invasive species controlled by 2010, management plans in place for major alien invasive species that threaten major ecosystems of Malawi by 2008.

Priority Action 11: Implement the Biosafety Act and develop and implement a broad-based biotechnology policy.

Targets: Sectoral plans for the implementation of the Biosafety Act are developed and implemented by 2010; relevant departments and institutions have identified and trained staff in handling, monitoring and identification of GMOs.

Priority Action 12: Assess and identify available incentive measures important for biodiversity conservation, sustainable use as well as benefit sharing and promote the adoption of best practices.

Targets: Biological resources that support sustainable livelihoods, food security and health care identified and maintained by 2010.

Enhancement and maintenance of partnerships

Different groups of people have a stake in conservation of biodiversity resources. The 90% of the nation living in the rural areas, have a broader appreciation and better understanding of the indigenous species,

habitats and ecosystems associated with the places they live. As such informing, consulting and involvement of the local communities is central in the promotion of conservation and sustainable use of biological resources. To influence people's attitudes and behavior and make it more desirable for them to conserve rather than deplete or degrade biodiversity in the course of their economic activities, economic incentives for biodiversity conservation should be developed.

Forestry, fisheries, national parks and wildlife and the water sectors have incorporated participatory approaches and have established good working relationships and partnerships with local communities in natural resource management programmes. This partnership needs to be extended to private landowners whose participation is of paramount importance yet often lacking.

Government needs to develop and strengthen good working relationships and partnerships with developmental partners, NGOs, private sector and relevant government agencies. Partnerships should also be developed when it comes to management of shared natural resources along national boundaries. Furthermore, government should work in collaboration with international organizations in implementation of its obligations to the CBD and other international conventions or treaties.

The Malawi Government should take into consideration the current decentralization process and promote the involvement of all stakeholders at the local, district and regional levels in the implementation process. In this regard, the devolution of the environmental sector and the current decentralized institutional framework for the environmental sector should be supported and strengthened.

The following priority actions have been identified which when implemented would facilitate implementation of biodiversity management plans in partnership with other stakeholders.

Priority Action 13: Promote the involvement of the local communities, local leaders, the private sector and NGOs in decision-making regarding the management of biological diversity and ecosystems through community based natural resources management communities.

Targets: Guidelines and regulation for establishing and managing village natural resource management areas are developed and implemented; community natural resource management areas identified and managed by 2010.

Priority Action 14: Promote joint management of biodiversity and ecosystems along national boundaries for the management of shared biological resources.

Targets: Cross border management committees are established along shared natural resources; guidelines for cross border management of natural resources developed and implemented by 2008.

Priority Action 15: Promote the participation of different government agencies and collaboration with international organisations to fulfill Malawi's obligations to the CBD and related treaties and protocols.

Targets: Establish and promote multisectoral committees on natural resources management at local, district and national levels by 2010.

Priority Action 16: Promote mechanisms for wise use of development assistance.

Targets: New and additional financial resources are transferred to Malawi; regulations and code of conduct for use of development aid are developed and implemented by 2008.

Priority Action 17: Promote the participation of different government agencies and collaboration with international organisations in programmes and activities to fulfil Malawi's obligations to the CBD and related treaties and protocols.

Targets: Guidelines, procedures and mechanisms for technology transfer are developed and implemented by 2010.

Enhancement of governance in biodiversity conservation

The government should provide strategic direction, funding, national guidance, coordination and monitoring, and encourage the private sector, community and individual participation to ensure the conservation and sustainable use of Malawi's biodiversity. Government should review and establish an effective implementation structure with well-defined roles for implementing and monitoring biodiversity conservation strategies. The commitment displayed by government through incorporation of biodiversity concerns into the constitution should continue if this strategy is to be fully implemented.

Malawi should continue to play a leading role in coordinating and monitoring, and implementation of biodiversity conservation and management programmes by incorporating commitments made in this national strategy into the national and departmental biodiversity management plans. The current environmental management plans should have a sound implementation mechanism. The existing institutions involved in the management of biodiversity should be strengthened and initiatives to set up an Environmental Protection Agency should be given priority, government support and funding. The agency is important since it would be responsible for coordinating programmes and also has potential to become the center of biodiversity management in Malawi.

Malawi is currently experiencing a decline in development assistance especially in the area of environment and natural resources. In addition to this, Malawi has in recent years experienced sudden withdrawal of development assistance (e.g. the Danish Development Aid, DANIDA) that resulted in the premature termination of environmental programmes such as Lake

Chilwa Wetlands project. This underscores the need to develop sustainable financing mechanisms to ensure long term sustainability of natural resource management programmes especially when donor funding ends and to reduce dependence on external assistance. It is against this background that intensive work with the Ministry of Finance and alignments of natural resources activities with the Malawi Development and Growth Strategy is needed. It is envisaged that through this approach, Malawi will progressively support efficient investment in biodiversity via the national budget. Launching of Trust funds and other mechanisms of mobilizing financial support for biodiversity conservation programme should certainly assume a high priority.

The responsibility to reverse the decline in biodiversity is a government priority strategy and as such this strategy recommends that government should strengthen issues of governance through implementation of the following actions.

Priority action 18: Provide strategic direction and guidance to review and harmonize relevant policies and legislation and ensure that policy and legislation are in line with the Convention on Biological Diversity and other international conventions.

Targets: Sectoral policies are revised to incorporate biodiversity issues by 2008.

Priority action 19: Establish alternative financing mechanisms that will minimize resource expenditure and encourage close collaboration between sectors.

Targets: Biodiversity Trust funds are established and fully operational; guidelines for establishing biodiversity working groups are developed and implemented by 2008.

Priority action 20: Promote enforcement and compliance to policy, legislation and international convention through the creation and empowerment of an independent Environmental Protection Agency.

Targets: Environmental Protection Agency is established and operational by 2007.

Strengthen infrastructure and human capacity

Full implementation of actions identified in this strategy will require considerable and substantial improvements in our knowledge base and understanding of biodiversity. This can only be achieved if Malawi invests in training of professionals through research and implementing a biodiversity curriculum at primary, secondary and tertiary levels as well as community education programme in biodiversity management. A comprehensive biodiversity education programme would provide Malawi with human capacity necessary for long-term natural resources management.

Availability and accessibility of information on biodiversity and biodiversity information sources have to be improved. Biodiversity information in form of gray and published literature, databases and biological collections have to be packaged in a form that could be easily accessible through information systems technologies and other media.

Malawi's institutions such as the National Herbarium and Botanic Gardens (currently a national centre for plant diversity), Agricultural Research and Extension Trust, Universities and colleges, the Museums of Malawi, Fisheries Research Unit (with a wide collection of fish of Malawi), Forestry Research Institute of Malawi (with a decent insect collection) have potential to become biodiversity centres because their biological collections are primary sources of taxonomic, ecological and biodiversity information; but they lack human and infrastructure capacity. Such scientific institutions including the Molecular Biology and Ecological Research Unit (MBERU) and the proposed Malawi Invertebrate Centre, should be supported through provision of research equipment and other necessary infrastructure.

Malawi will only effectively implement these strategic priorities with improved human and infrastructure capacity. To achieve this the following actions should be earmarked for implementation within the first five years.

Priority action 21: Develop human, institutional and national capacities to identify, monitor and manage biodiversity through training for target groups in relevant courses including taxonomy, natural resources management, biodiversity assessment and ethnobiology.

Targets: Diplomas, certificates, BSc and MSc degrees in Biodiversity management are established and fully functional in universities and other natural resource management training institutions by 2010; relevant posts (e.g. taxonomists, ecologists, geneticists) and training opportunities are identified and implemented by 2010.

Priority action 22: Instill a biodiversity culture in the youth of Malawi and local communities by developing guidelines on environmental education and curricula for schools and establishment of in-service training programmes for teachers.

Targets: Curricula and guidelines for primary and secondary schools are developed and fully implemented. Training needs and institutions for teachers are identified, prioritized and promoted; guidelines for community participation and education for environmental and natural resources management are developed and fully implemented by 2010.

Priority action 23: Establish and provide capacity for operationalizing the national CHM and strengthen and implement the existing CHM institutional structure, and develop national biodiversity databases.

Targets: Policy guidelines on biodiversity information management are developed and/or reviewed; regulations and guidelines on biodiversity information standards and on access and benefit sharing of biodiversity information developed by 2010.

Implementation arrangements

The National Biodiversity Strategy and Action Plan is a product of a consultative process involving all stakeholders in the management and utilization of biological resources in Malawi. Effective and efficient implementation of the strategy and action plan requires effective institutional arrangement and mechanism to facilitate active participation of the stakeholders. The performance of the current institutional arrangement and mechanism has not been very effective as evident by the continued loss of biodiversity in many sectors. Therefore, it is important that stakeholders continually evaluate the performance and capacity of key institutions as well as the institutional arrangement and mechanism to make necessary improvements to ensure attainment of targets set in the NBSAP.

Current Institutional Arrangements

The implementation of the NBSAP falls within the existing institutional arrangement at central and local government levels in which relevant statutory corporation and non-governmental organizations participate. The key institutions involved in biodiversity conservation activities include government ministries, Departments, statutory corporations, Non-Governmental Organizations and trusts that have different mandates and responsibilities. Some of the institutions are as follows:

- (a) Ministry of Mines, Natural Resources and Environment through Departments of Environmental Affairs, Fisheries and Forestry;
- (b) Ministry of Information and Tourism through the Department of National Parks and Wildlife;
- (c) Ministry of Agriculture through Departments of Crop Production, Research and Technical Services, and Animal Health and Industry;
- (d) National Research Council of Malawi;

- (e) Ministry of Youth, Sports and Culture through Department of Museums;
- (f) Department of Local Government responsible for District Assemblies;
- (g) National Herbarium and Botanic Gardens of Malawi;
- (h) NGOs and Civil Society;
- (i) Mulanje Mountain Conservation Trust;
- (j) Research and Development Institutions e.g. Universities of Malawi and Mzuzu;
- (k) Ministry of Industry, Science and Technology;
- (l) Ministry of Trade and Private Sector Development;

The organizations are linked through committees and focal points at various levels (Figure 18).

Roles and Mechanism for Implementation

At the national level, the ministries and Departments have responsibilities of facilitating participatory formulation, development and implementation of sectoral policies and legislation with coordination by the Ministry of Mines, Natural Resources and Environment through Environmental Affairs Department. The Department of Local Government integrates central government functions for implementation at the District Assembly level.

Role of Government Agencies

The Environmental Affairs Department, which is the national focal point for the CBD, coordinates and facilitates sustainable management of the environment and natural resources in the country. As such it is responsible for harmonisation of national environmental policies and legislation, enforcement of legislation, capacity building, setting of standards, compliance

monitoring and representation at international conventions and treaties. Its coordination mandate enables it to balance concerns of both interested and affected parties under the CBD and the Cartagena

Protocol on Biosafety. Therefore, the Environmental Affairs Department serves as a secretariat for implementation of biodiversity activities hence the NBSAP.

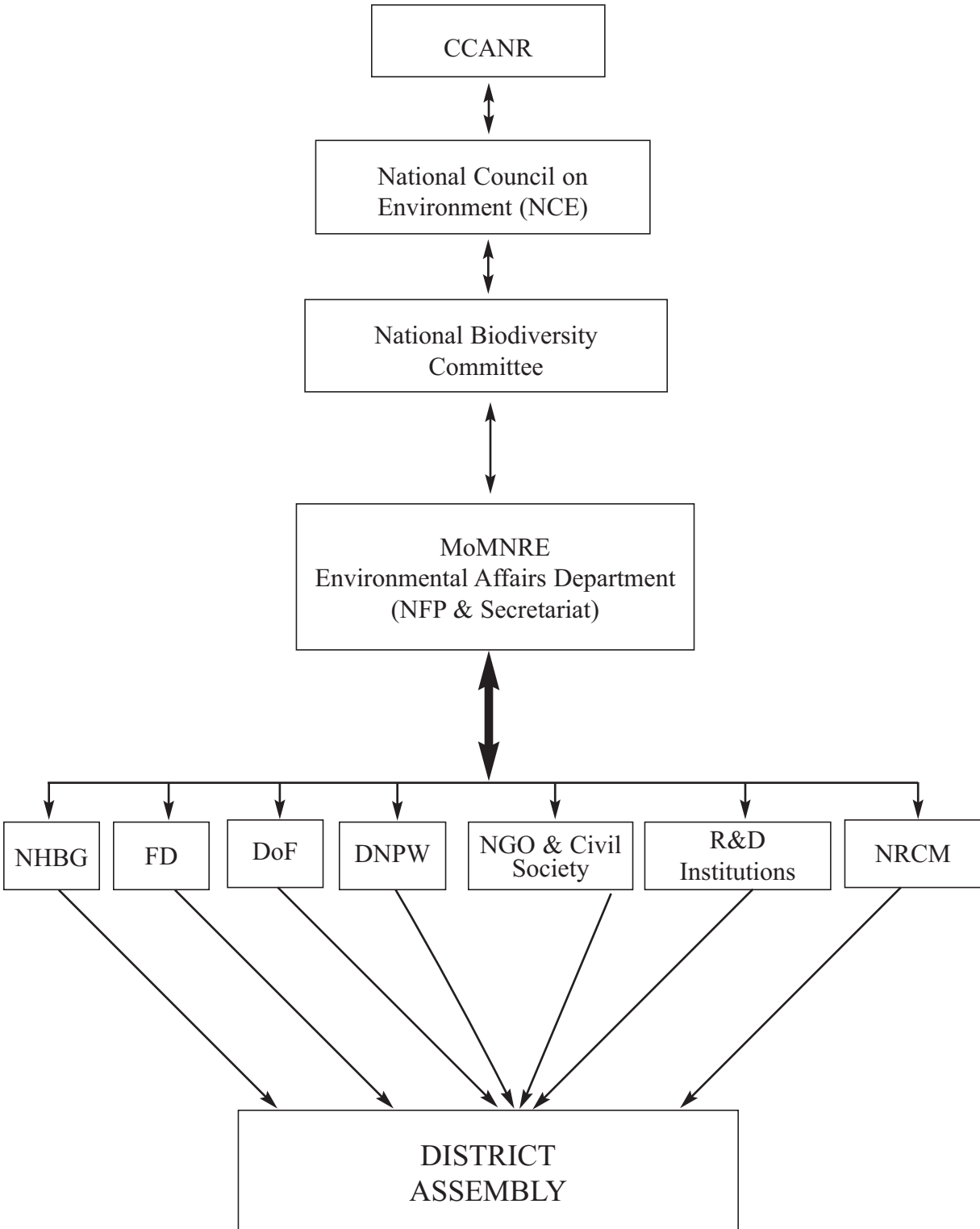


Figure 18: Institutional structures for the implementation of the NBSAP

The Department of Forestry is mandated to conserve the national forestry resources to the upliftment of the quality of life for the benefit of the nation. The sector has empowered communities through community based forest management programmes that focus on the augmentation, management and protection of forests on customary land. The mandate of the Fisheries Department is to protect the existing fish resources through appropriate control mechanisms and to provide framework conditions and excellent services for sustainable utilisation and management of capture fisheries and aquaculture production.

The Department of National Parks and Wildlife in the Ministry of Information and Tourism is mandated to protect and conserve wildlife in such protected areas as National Parks and Wildlife Reserves in collaboration with other stakeholders especially boarder zone communities. The National Research Council of Malawi coordinates all forms of research in Malawi and is the secretariat for Genetic and Biotechnology Resources Committee.

The Ministry of Agriculture promotes conservation and use of agro-biodiversity through the Departments of Crop Production, Animal Health and Industry and Agricultural Research and Technical Services. A gene bank was established and it serves as a repository for various biological resources thereby enhancing *ex-situ* biodiversity conservation.

Museums of Malawi promotes conservation of biodiversity through cultural and natural heritage education. It also promotes preservation and application of indigenous knowledge to conservation of the national heritage.

The Department of Local Government established through the 1998 Local Government Act is a single institutional framework that unifies government and traditional authorities thereby facilitating community participation in the formulation and implementation of developmental and

environmental programmes through District Assemblies. Environmental Programmes at the District Assemblies level are implemented through the Environmental District Office. To ensure public participation in environmental management decisions and plans, the District Assembly manages natural resources through committees responsible for Agriculture and Natural Resources, Health and Environment. The Assembly Secretariat is the operational arm of the District Assembly, which is responsible for planning and implementing the District Development Plan (DDP) and District Environmental Action Plan (DEAP) after approval by the Assembly. The Secretariat established District Environment Subcommittee (DESC) to coordinate and ensure that environmental issues are mainstreamed into all district development plans.

Role of Non-Governmental Organizations and Trusts

The Wildlife and Environmental Society of Malawi is probably the most active and experienced NGO in the field of natural resources management. However, CURE coordinates activities of all NRM NGOs and CBOs. In this regard, CURE in close collaboration with WESM will continue to take an active leading role in coordinating and implementing natural resources programmes and initiatives that promote sustainable use and management of biodiversity in the country.

In the last few years Malawi witnessed the establishment of Mulanje Mountain Conservation Trust that primarily promotes mountain biodiversity conservation. Malawi Environmental Endowment Trust was established during the same period and provides a sustainable financing mechanism for community-driven environmental management projects.

Role of Coordination Committees

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.

The National Biodiversity Committee chaired by the National Herbarium and Botanic Gardens of Malawi meets quarterly to steer the NBSAP implementation of biodiversity programs and activities.

Implementation Strategy

Strengthening existing Coordination and Institutional Linkages

The secretariat needs to coordinate and facilitate the development of a detailed work plan for the implementation of the NBSAP. However, effective coordination and implementation of CBD activities in Malawi is constrained by lack of common vision and strategy amongst implementing agencies. To ensure a coordinated approach the institutional arrangement for the implementation of NBSAP shall continue to rest at Environmental Affairs Department of the Ministry of Mines, Natural Resources and Environment, as the National Focal Point of the Biodiversity Convention and secretariat of the National Biodiversity Committee. The National Herbarium and Botanical Gardens of Malawi will continue to chair the National Biodiversity Committee.

Technically, the National Biodiversity Committee will spearhead the implementation of NBSAP activities in various sectors (Figure 18) by providing guidance to different institutions and organizations involved in biodiversity conservation and management. Furthermore, the National Biodiversity Committee will provide leadership in monitoring and evaluation of activities under the NBSAP.

The National Council on Environment (NCE) has the responsibility and provide policy direction in addition and monitor the implementation of NBSAP while the Cabinet Committee will provide political guidance and support. The Secretariat will build and strengthen technical capacities at all levels of NBSAP implementation structure through established focal points.

Establishing sustainable financing mechanisms

Apart from establishing the various institutions responsible for biodiversity management, Malawi also set up two sustainable funding mechanisms namely

MEET and Environment Management Fund (EMF). However, the level of investment in MEET is still relatively small to ensure significant improvements in the natural resources management to meet the biodiversity targets by 2010 and the Millennium Development Goals as well as NSSD by 2015. In addition, capitalization of the EMF is often too small to sustain meaningful implementation of biodiversity activities.

Furthermore, the current guidelines for the management of the Environmental Management Fund do not have specific provisions for funding biodiversity as a "sector". In this regard, the guidelines for the management of the Environmental Management Fund will have to be revised to ensure that the fund supports implementation of Malawi's NBSAP.

Strengthening existing technical capacities

The current technical capacity is insufficient to facilitate effective and efficient implementation of NBSAP. The inadequacies include human, financial, infrastructural and other material resources. Therefore, there is need to build capacity at all levels and in all sectors. Thus for effective delivery of services, the National Biodiversity Secretariat and key stakeholders will require professional staff, infrastructure and continuous financial and technical support.

Promote enabling policies and approaches

Revise and enforce existing policies to ensure harmonization of principles and strategies for conservation of various components of biodiversity.

Annex one

List of task force members for the NBSAP Project

The Diversity of Plants in Malawi

Lead Agency–NHBG

Task force Leaders: Prof. Seyani, NHBG

Members of the Team:

Mr. A. K. Banda (Deceased)–NHBG
Mr. M. P. Munyenyembe–Chancellor College
Mr. L. Mwabumba–FRIM
Mr. H. M. Banda–Malawi College of Forestry
Mr. M. C. Mwambene–Department of Local Government

Microorganisms

Lead Agency–Bunda College of Agriculture
Task force Leaders: Prof. V. W. Saka–Bunda College of Agriculture

Members of the Team:

Prof. W. A. B. Msuku–Bunda College of Agriculture
Dr. C. T. Kisyombe–Ministry of Agriculture, Chitedze Research Station.
Dr. A. T. Daudi–Ministry of Agriculture, Bvumbwe Research Station
Mrs. E. B. Mwafongo–NHBG
P. Ngwira–Ministry of Agriculture, Chitedze Research Station
N. C. Gondwe–Ministry of Agriculture, Chitedze Research Station
Dr. E. Kaunda–Bunda College of Agriculture

Wild and Indigenous Animals

Lead Agency–DNPW

Task force Leaders: L. D. Sefu–DNPW

Members of the Team:

Ms. C. R. Mhango–Chancellor College
Dr. C. O. Dudley–Chancellor College
Mr. Wilbert N. Chitaukali–Museums of Malawi
Dr. M. E. D. Nhlane–Museums of Malawi
Mr. D. D. Bandula–Metrological Department (Deceased)

Ecosystems of Malawi

Lead Agency–Chancellor College (Biology Department)

Task force Leaders: Mrs. M. P. Kalindekafe

Members of the Team:

Mr. Lusayo Mwabumba–FRIM
Mr. Montfort L. Mwanyambo–NHBG
Prof. Aggrey J. Ambali–Chancellor College
Mavuto Kapyepye–WESM
Mr. Shaibu Mapila–Department of Fisheries (Deceased)
Dr. P. W. Chirwa–FRIM
Mr. S. Makungwa–FRIM

Review of Conservation Legislation in Malawi

Lead Agency–Ministry of Justice

Task force Leaders: Mr. K. Nyirenda –Ministry of Justice

Members of the Team:

Mr. D. A. Kamundi–NHBG
Mr. Makawa–EAD
Mr. F. E. Zhuwao–Ministry of Finance
Mr. M. W. Mikuwa–EAD
N.D. Mhura–Chancellor College

Domesticated and Introduced Species

Lead Agency–Bunda College of Agriculture

Task force Leaders: Dr. A.B.C. Mkandawire, Bunda College.

Members of the Team:

Dr. J. M. Bokosi–Bunda College of Agriculture
Dr. M. B. Kwapata–Bunda College of Agriculture
Prof. R. K. D. Phoya–Bunda College of Agriculture
E. M. H. Khonje–Ministry of Agriculture, Chitedze Research Station
Mr. L. Nsapato–Chitedze Agricultural Research Station

Land Use Management and Biodiversity Conservation

Lead Agency–Land Resources and Conservation Unit (Ministry of Agriculture & Irrigation)

Task force Leaders: V. A. L. Mkandawire–Land Resources and Conservation Unit

Members of the Team:

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An Inventory of Literature on Biodiversity in Malawi

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Annex two

Glossary of Terms¹

Agrobiodiversity or agricultural biological diversity; that component of biodiversity that contributes to food and agriculture production, it encompasses within-species, species and ecosystem diversity.

Access and Benefit Sharing; Access means the acquisition of biological resources, their derivatives, community knowledge, innovations, technologies, or practices as authorized by the National Competent Authority. **Benefit Sharing** means the sharing of whatever accrues from the utilization of biological resources, community knowledge, technologies, innovations or practices.

Access to genetic resources; is the action through which an interested party, having fulfilled all relevant legal requirements in national and international legislation, makes use of genetic resources.

Agrobiodiversity; means that component of biodiversity that contributes to food and agriculture production.

Alien Invasive Species; species that becomes established in a natural or semi-natural ecosystem or habitat, is an agent of change, and threatens native biological diversity.

Alien species; a species that has been introduced outside its normal past and present distribution.

Aquaculture; breeding and rearing fish, shellfish, etc., or growing plants for food in special ponds.

Benefit-sharing; means the sharing of benefits arising from the use, whether commercial or not, of genetic resources, and may include both monetary and non-monetary returns.

Biological control; pest control strategy making use of living natural enemies, antagonists or competitors and other self-replicating biotic entities.

Biological diversity; 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 in within species, between species and of ecosystems. **Biological resources;** includes genetic resources, organisms or parts thereof, populations, or any other biotic component of ecosystems with actual or potential use or value for humanity.

Biopiracy; bioprospecting regarded as the perpetuation of the colonial habit of plundering other countries' biological resources without fair and equitable compensation, resulting in environmental, economic and social detriment.

Bioprospecting; the search for economically valuable genetic and biochemical resource (i.e. useful genetic and biochemical compounds and materials and related information) from nature.

Biosafety; safety aspects related to the application of biotechnologies and to the release into the environment of transgenic plants and other organisms particularly microorganisms that could negatively affect plant genetic resources, plant, animal or human health, or the environment.

Biosphere Reserves; areas of terrestrial and coastal ecosystems promoting solutions to reconcile the conservation of biodiversity with its sustainable use. They are internationally recognized, nominated by national governments and remain under sovereign jurisdiction of the states where they are located.

Biotechnology; any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for a specific use. Biotechnology, in the form of traditional fermentation techniques, has been used for decades to make bread, cheese or beer. It has also been the basis of traditional animal and plant breeding techniques, such as hybridization and the selection of plants and animals with specific characteristics to create, for example, crops which produce higher yields of grain.

¹Source: Belgian Clearing House Mechanism for CBD—on line <http://bcd-cbd.naturalsciences.be/Be;gium/>

Co-management; the sharing of authority, responsibility, and benefits between government and local communities in the management of natural resources. Conservation of biodiversity; the management of human interactions with genes, species, and ecosystems so as to provide the maximum benefit to the present generation while maintaining their potential to meet the needs and aspirations of future generations; encompasses elements of saving, studying, and using biodiversity.

Customary land; all land falling within the jurisdiction of a recognized Traditional Authority, which has been granted to a person or group and used under customary law.

Deforestation; the conversion of forest to another land use or the long-term reduction of the tree canopy cover below the minimum 10 per cent threshold.

DNA (deoxyribonucleic acid); the long chain of molecules in most cells that carries the genetic message and controls all cellular functions in most forms of life.

Domesticated species; species in which the evolutionary process has been influenced by humans to meet their needs.

Ecosystem; a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit.

Ecosystem diversity; the diversity among biological communities and their physical settings, characterised by differences in species composition, physical structure, and function. It is the highest level of biological diversity.

Ecosystem restoration; the return of an ecosystem to its original community structure, natural complement of species, and natural functions.

Ecosystems approach

Endangered species; a group of plant or animal species that is not Critically Endangered but is facing a very high risk of extinction in the wild in the near future.

Endemic species; species is a native species restricted to a particular geographic region owing to factors such as isolation or in response to soil or climatic conditions.

Environmental Impact Assessment; the process by which the consequences of proposed projects or programs are evaluated as an integral part of planning the project, alternatives are analyzed, and the general public has ample opportunity to comment.

Ethnobiology; study of the way plants, animals and micro-organisms are used by humans.

Ex-situ conservation; the conservation of components of biological diversity outside their natural habitats.

Farmers' rights; rights arising from the past, present and future contributions of farmers in conserving, improving and making available plant or animal genetic resources, particularly those in centres of origin.

Forest biological diversity; the variability among forest living organisms and the ecological processes of which they are part; this includes diversity in forests within species, between species and of ecosystems and landscapes.

Gene bank; a storage facility where germplasm is stored in the form of seeds, pollen, embryos, semen, pollen, or in vitro culture, or in cryogenic storage, or, in the case of a field gene bank, as plants growing in the field.

Genetic diversity; the diversity of genes within and among populations of a species.

Genetic erosion; loss of genetic diversity between and within populations of the same species over time; or reduction of the genetic basis of a species due to human intervention, environmental changes, etc.

Genetic material; any material of plant, animal, microbial or other origin containing functional units of heredity.

Genetic resources; genetic material of plants, animals or micro-organisms, including modern cultivars and breeds, primitive varieties and breeds, landraces and wild/weedy relatives of crop plants or domesticated animals, of value as a resource for future generations of humanity.

Genetically Modified Organism (GMO); the modification of the genetic characteristics of a micro-organism, plant or animal by inserting a modified gene or a gene from another variety or species.

Habitat; the place or type of site where an organism or population naturally occurs.

Habitat restoration; the return of a habitat to its original community structure, natural complement of species and natural functions.

Indigenous Knowledge; the accumulated knowledge that is vital for conservation and sustainable use of biological resources and/or which is of socio-economic value, and which has been developed over years in indigenous/local communities.

***In-situ* conservation;** the conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties.

Intellectual property right; a right enabling an inventor to exclude imitators from the market for a limited time.

Invasive alien species; species which becomes established in natural or semi-natural ecosystems or habitats.

Micro-organisms; groups of microscopic organisms, some of which cannot be detected without the aid of a light or electron microscope, including the viruses, the *prokaryotes* (bacteria and archaea), and *eukaryotic* life forms, such as protozoa, filamentous fungi, yeasts and micro-algae.

Modern biotechnology; the application of: (a) *in vitro* nucleic acid techniques, including recombinant deoxyribonucleic acid (DNA) and direct injection of nucleic acid into cells or organelles, or (b) fusion of cells beyond the taxonomic family, that overcome natural physiological reproductive or recombination barriers and that are not techniques used in traditional breeding and selection.

Nematode; roundworms, often internal parasites of animals and plants.

Participatory approach; means the methods that bring about involvement of players and stakeholders in a decision making process.

Patent; a government grant of temporary monopoly rights on innovative processes or products.

Pollinator; a pollinator is an agent, generally an animal (insect, bird, bat, etc.) that carries pollen to the female part of a flower.

Precautionary principle; (= do-no-harm principle) a proactive method of dealing with the environment that places the burden of proof on those whose activities could harm the environment. (Opposite: wait-and-see principle).

Private land; all land that is exclusively owned, held or occupied under freehold tenure and customary land allocated exclusively to a clearly defined community, corporation, institutions, clan, and family.

Vascular plants; includes ferns, flowering plants and trees, but do not include mosses and liverworts.

Protected Area; an area of land and/or sea especially dedicated to the protection of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means.

Public land; land held in trust and managed by the government or Traditional Authority and openly used or accessible to the public at large. It includes land gazetted for use as national parks, recreational areas, and forest reserves.

Quarantine; official confinement of regulated articles for observation and research or for further inspection, testing or treatment.

Red list; a comprehensive inventory of the conservation status of plant and animal species. It uses a set of criteria to evaluate the extinction risk of thousands of species and subspecies. These criteria are relevant to all species and all regions of the world.

Restoration; the return of an ecosystem or habitat to its original community structure, natural complement of species, and natural functions.

Risk assessment; the use of scientific data to identify and characterize the nature and magnitude of hazards, if any, and the likelihood of hazards being realized.

Seed bank; a facility designed for the *ex-situ* conservation of individual plant samples through seed preservation and storage.

Semi evergreen forest

Speciation; separation of one population into two or more reproductively isolated, independent evolutionary units.

Species; a group of organisms capable of interbreeding freely with each other but not with members of other species.

Species diversity; the number and variety of species found in a given area in a region.

Stakeholder; means an individual, organization or group whether formal or informal, affected by, or with an interest in, the activities relating to the acquisition, use or supply of genetic resources.

Sustainable use; the use of components of biological diversity in a way and at a rate that does not lead to the long term decline of biological diversity thereby maintaining its potential to meet the needs and aspirations of present and future generations.

Taxon (pl. taxa); the named classification unit to which individuals, or sets of species, are assigned.

Technology transfer; the transfer of knowledge or equipment to enable the manufacture of a product, the application of a process, or the rendering of a service.

Threatened species; species that are, often genetically impoverished, of low fecundity, dependent on patchy or unpredictable resources, extremely variable in population density, persecuted or otherwise prone to extinction in human-dominated landscapes.

Tissue culture; a technique in which portions of a plant or animal are grown on an artificial culture medium.

Traditional knowledge; refers to the knowledge, innovations and practices of indigenous and local communities around the world. Developed from experience gained over the centuries and adapted to the local culture and environment, traditional knowledge is transmitted orally from generation to generation. It tends to be collectively owned and takes the form of stories, songs, folklore, proverbs, cultural values, beliefs, rituals, community laws, local language, and agricultural practices, including the development of plant species and animal breeds. Traditional knowledge is mainly of a practical nature, particularly

in such fields as agriculture, fisheries, health, horticulture, and forestry.

World Heritage Site; a “cultural heritage” is a monument, group of buildings or site of historical, aesthetic, archaeological, scientific, ethnological or anthropological value.

Bibliography

- Anon. 1993. Forest Resources Mapping and Biomass Assessment for Malawi. Satellitbild, Kiruna, Sweden and Department of Forestry, Lilongwe, Malawi.
- Ansell W. F. H. and Dowsett R.J. 1988. Mammals of Malawi. Trendine Press, Cornwall, UK.
- Ansell W. F. H. 1985. Mammals from Malawi-Part I. Nyala 11 (1): 18-24.
- Banda E. A. K. and Morris B. 1986. Common Weeds of Malawi. University of Malawi, Zomba.
- Banda J. W. and Sichinga K. 2001. Livestock Production in Malawi: Contribution and Implication on Food Security. A report submitted to the European Union, Food Security Project. Lilongwe, Malawi, October 2001.
- Berrie A. 1981. Pteridophyta collected in Malawi, with a preliminary checklist of the Orders Psilotales and Lycopodiales. Luso 2 (1): 33-48.
- Berrie A. 1982. The genus Lycopodium in Malawi. Luso 3 (1):17-29.
- Berrie A. 1984. A checklist of the Pteridophytes of Zomba Mountain, Malawi. Luso 5 (2): 67-86.
- Binns B. 1968. A First Checklist of the Herbaceous Flora of Malawi. Government Printer, Zomba.
- Blackmore S., Dudley CO. and Osborne PL. 1989. An annotated checklist of the macrophytes of the Shire River, Malawi, with reference to potential aquatic weeds. Kirkia 13: 125-142.
- Brass L. J. 1953. Vegetation of Nyasaland. Report on the Vernay Nyasaland Expedition of 1946. Memoirs of the New York Botanical Garden 8 (3): 161-190.
- Brenan J. P. M. 1953. Plants collected by the Vernay Nyasaland Expedition of 1946. Memoirs of the New York Botanical Garden 8 (3): 191-256.
- Brenan J. P. M. 1954. Plants collected by the Vernay Nyasaland Expedition of 1946. Memoirs of the New York Botanical Garden 8 (5): 409-510.
- Brenan J. P. M. 1954. Plants collected by the Vernay Nyasaland Expedition of 1946. Memoirs of the New York Botanical Garden 9 (1): 1-132.
- Britten et al. 1894. The plants of Milanje, Nyasaland, collected by Mr. Alexander Whyte FLS. Transactions of the Linnean Society II, Botany 4: 1-67.
- Brummitt R. K. 1973. Systematic list of Nyika botanical collections. Wye College 1972 Malawi Project Final Report: 47-77
- Burkill I. H. 1897. List of the known plants occurring in British Central Africa, and the British territory north of the Zambezi. In H. H. Johnston, British Central Africa: 233-284.
- Burt Davy J, Hoyle A. C and Topham P. 1958. Checklist of the Forest Trees and Shrubs of the Nyasaland Protectorate. Government Printer. Zomba. 137pp.
- Burt Davy J. and Hoyle A. C. 1936. Check-lists of the Forest Trees and Shrubs of the British Empire No. 2, Nyasaland Protectorate. Imperial Forstry Institute, Oxford.
- CBD Secretariat 2000. Cartagena Protocol on Biosafety to the Convention on Biological Diversity.
- Chabwela D. 1991. Wetlands. A conservation programme for Southern Africa. Vol. II. SADC.
- Chapman J. D. 1962. The vegetation of the Mulanje Mountain, Nyasaland: A preliminary account with particular reference to Widdringtonia forests. Govt. Printer, Zomba.
- Chapman J. D and White F. 1970. The Evergreen Forests of Malawi. Commonwealth Forestry Institute, Oxford.
- Chapman J. D. 1957. The Indigenous Conifers of Nyasaland. The Hetherwick Press, Blantyre Mission, Malawi.
- Chapman J. D. 1962. The Vegetation of the Mlanje Mountains, Nyasaland. Government Printer, Zomba
- Chapman J. D. 1980. Conservation of

- vegetation and its constituent species in Malawi. *Nyala* 6 (2): 125-131.
- Chapman J. D. 1988. Mpita Nkhalango—a lowland forest relic unique in Malawi. *Nyala* 12: 3-26.
- Chapman J. D. 1989. The Cycad, *Encephalartos gratus*: living fossils of Mulanje Mountain, Malawi. *Nyala* 14 (2):113-118.
- Chapman J. D. 1992. Centres of Plant Diversity. A guide and strategy for their conservation—Mt. Mulanje. Aberfeldy. Scotland. Unpubl.
- Chapman J. D. 1995. The Mulanje Cedar, Malawi's National Tree. The Society of Malawi, Blantyre
- Clarke J. 1983. Master Plan for National Parks and Wildlife in Malawi, Lilongwe
- Cumming DHM. 1999. Study on the development of transboundary natural resources areas in the Southern African-environmental context: natural resources, land use and conservation. Biodiversity Support Programme, Washington DC. USA.
- Degnbol P. and Mapila S. 1982. Limnological observations on the pelagic zone of Lake Malawi from 1970 to 1982. Pages 5-47 in Biological studies on the pelagic ecosystem of Lake Malawi. Technical Chapter FI:DP/MLW/75/019. United Nations Food and Agriculture Organization, Rome.
- Dowsett-Lemaire F. 1989. Vegetation and birds of evergreen forests of southern Malawi, with special reference to mid-altitude forests. *Nyala* 14(1): 29-37.
- Dowsett-Lemaire F. 1988. The forest vegetation of Mt. Mulanje (Malawi): a floristic and chorological study along an altitudinal gradient (650-1950 m.). *Bull. Jard. Bot. Nat. Belg.* 58: 77-107.
- Dowsett-Lemaire F. 1988. Vegetation and birds of evergreen forests of Southern Malawi, with special reference to mid-altitude forests. *Nyala* 14(1): 29-37.
- Dowsett-Lemaire F. 1989. The flora and phytogeography of the evergreen forests of Malawi I: Afromontane and mid-altitude forests. *Bull. Jard. Bot. Belg./Bull. Nat. Plantentuin, Belg.* 59(1/2): 3-131.
- Dowsett-Lemaire F. 2001. A synopsis of the vegetation of Malawi. In F. White, F. Dowsett-Lemaire and J. D Chapman (Eds). *Evergreen Forest Flora of Malawi*. Royal Botanic Gardens Kew. UK.
- Dowsett-Lemaire F. and Dowsett, R. J. 1988. Threats to the evergreen forests of Southern Malawi. *Oryx* 22 (3): 158-162.
- EAD 1994, 2002 National Environmental Action Plan.
- EAD 1996. National Environmental Policy.
- EAD 2000. Lake Chilwa Wetland state of Environment.
- EAD 2001. State of the Environment Report for Malawi, 1001, Lilongwe.
- EAD 2001. Lake Chilwa Wetland Management Plan.
- EAD 2001. State of Environment Report. Ministry of Natural Resources and Environmental Affairs.
- EAD 2002. Natural Resources Management Policies, Laws and Institutional Framework in Malawi; Volume 2 Resource Book for Community Level Managers.
- EAD 2002. Natural Resources Management Policies, Laws and Institutional Framework; Volume 1, a Resource Book for District Level Managers.
- Eccles D. H. 1974. An outline of the physical limnology of Lake Malawi (Nyasa). *Limnology and Oceanography* 19:730-742.
- GOM 1995. The Constitution of the Republic of Malawi.
- Government of the Republic of Namibia 2001. Biodiversity and Development in Namibia. Namibia's ten-year strategic plan of action for sustainable development through.
- Hall-Martin A. J. and Drummond RB. 1980. Annotated list of plants collected in Lengwe National Park, Malawi. *Kirkia* 12: 151-181.
- Howard-Williams C. 1977. A checklist of the vascular plants of Lake Chilwa, Malawi, with special reference to the influence of environmental factors on

- the distribution of taxa. *Kirkia* 10: 563-579.
- Hutchison GE. 1957. A treatise on Limnology. Vol. 2. Introduction to lake biology and the International Centre for Living Aquatic Resources Management (ICLAM). 1991. The Context of Small-Scale Integrated Agriculture Systems in Africa: A Case Study of Malawi. Manila, Philippines.
- La Croix IF, La Croix EAS, La Croix TM, Hutson JA and Johnston-Stewart NGB. 1983. Malawi Orchids. Vol.I, Epiphytic Orchids. Montfort Press, Malawi.
- Malawi Agroforestry Task force and ICRAF 1986. A blue print for Agroforestry Research in the Unimodal Upland of Malawi.
- Manda D. R. B., Dzowela B. H., Johnson W. H. 1985. Agricultural Research Resource Assessment in the SADCC countries, Country Chapter. Malawi—volume 11 Devres, Inc., 1985.
- Millington A. and Townshend J. 1989. Biomass Assessment: Woody Biomass in the SADCC Region. Earthscan Publications Ltd. London.
- Ministry of Agriculture 1985. National Rural Development Programme (NRDP). Extension Aids Branch, Lilongwe, Malawi.
- Moriarty A. 1975. Wild Flowers of Malawi. Purnell, Cape Town and London.
- Mugabe J. 1998. Biodiversity and sustainable development in Africa. In J. Mugabe and N. Clark (Eds). Managing Biodiversity. National Systems of conservation and innovation in Africa. Nairobi, Kenya. ACTS Press. Pp5-29.
- Munyenembe P. and Sambo E. Y. 1996. The vegetation of Lake Chilwa. In lake Chilwa RAMSAR Site Project. Biology Department. Chancellor College. University of Malawi.
- Newman K. N., Johnstone-Stewart NGH. and Medland B. 1992. A Supplement to Newman's birds of Southern Africa. Wildlife Society of Malawi, Limbe, Malawi.
- Ngulube M. R., Mwabumba L and Chirwa P. 1999 (eds). Community-based management of miombo woodlands in Malawi. Proceedings of a National Workshop, Sun and Sand Holiday Resort, Mangochi, Malawi.
- Owen R. B. and Crossley R. 1992. Spatial and temporal distribution of diatoms in sediments of Lake Malawi, Central Africa, and ecological implications. *J. Paleolimnol.* 7: 55-71.
- Pauw C. A. and Linder H. P. 1997. Tropical African cedars (*Widdringtonia*, Cupressaceae): systematics, ecology and conservation status. *Botanical Journal of the Linnean Society* 123: 297-319.
- Pitcher T. J. 1995. Species changes and fisheries in African lakes: outline of the issues. In: Pitcher, T. J and Hart, P. J. B. (eds.). *The Impact of Species Changes in African Lakes*. Fish and Fisheries Series 18. Chapman & Hall. Glasgow.
- Pullinger J. S. and Kitchin A. M. 1982. *Trees of Malawi*. Blantyre Print and Publishing, Blantyre.
- SADC 1993. Declaration and Treaty of the Southern African Development Community. SADC Secretariat, Gaborone, Botswana.
- Scoones I. 1996. Hazards and opportunities-farming livelihoods in dryland Africa; Lessons from Zimbabwe, Zed Books Ltd. in association with the International Institute for Environment and Development, London and New York.
- Secretariat for the Convention of Biological Diversity 2000. Handbook of the Convention on Biological Diversity.
- Shorter C. 1989. Introduction to the Common Trees of Malawi. Wildlife Society of Malawi.
- Stuart S. N., and Adams R. J. (eds.) 1990. Biodiversity in Sub-saharan Africa and its Islands -Conservation, Management and Sustainable Use. Occasional Papers of the IUCN Species Survival Commission No. 6:132-134.
- Tawenezvi HPR, Wark HK, Trail JCM Light D. 1988. Evaluation of beef breeds for weaner production in Zimbabwe. *Animal Production* 47: 351.

- Topham H. 1958. Check List of the Forest Trees and Shrubs of the Nyasaland Protectorate. Government Printer, Zomba.
- Tweddle D. and Willoughby N. G. 1979. An annotated check list of fish fauna of the River Shire south of Kapachira falls. Nyala 5: 74-91.
- UN. 2002. A Framework for Action on Biodiversity and Ecosystem Management. WEHAB Working Group, United Nations.
- Van Strien N. J. 1989. Notable vertebrates of Mulanje Mountain. Nyala 14 (2) : 75-79.
- White F. 1983. The Vegetation of Africa. UNESCO, Paris.
- Willan R. G. M. and McQueen D. R. 1957. Exotic Trees of the British Commonwealth: Nyasaland.
- Williamson J. 1975. Useful Plants of Malawi. Univ. of Malawi.
- Wittenberg R. and Cook M. J. W. 2001. Invasive alien species: a toolkit of best prevention and management practices. CAB International, Wallingford, Oxon, UK.
- World Bank. 1993. Ecologically Sensitive Sites in Africa. Volume VI: Southern Africa. Compiled by the World Conservation Monitoring Centre for the World Bank, Washington, DC, USA.

PREFACE

After long and comprehensive consultations and much work by both local and international biodiversity experts I am pleased to present our Biodiversity Strategy and Action Plan, NBSAP. The process started in 1998 with comprehensive analyses of biodiversity components and assessment of current biodiversity management regimes. The process identified a number of critical biodiversity issues and threats that must be addressed if Malawi is to achieve its environmental protection obligation as called for in the Constitution. As such the overriding goal of the strategy is to protect, conserve and maintain protected areas, mountains and species within them, promote restoration of degraded and vulnerable ecosystems and habitats and recovery of rare and threatened species for the benefit of the people.

The ultimate objective is to promote conservation, sustainable use and equitable sharing of benefits with full participation of all stakeholders including rural communities. As such implementation of this strategy and action plan is critical if Malawi is to fully benefit from biodiversity. In implementing this strategy Malawi will be fulfilling its obligations to the Convention of Biological Diversity.

The NBSAP follows a thematic approach rather than the traditional sectoral approach. It is thus comprehensive and I perceive this strategy as a spring board for the implementation of the five focal areas (water, energy, health, agriculture and biodiversity popularly referred to WEHAB) that the 2002 Johannesburg World Summit on Sustainable Development identified. It is also my hope that priority actions identified in this strategy will be the basis for International donor commitments for supporting the conservation of biological diversity in Malawi.

The NBSAP presents a number of strategies and action plans that I believe will lead to:

- improved awareness of the importance of biodiversity and community participation in biodiversity conservation;
- harmonized sectoral policies, legislation, strategies and programmes;
- improved infrastructure and human capacity for biodiversity conservation; and
- improved biodiversity knowledge base.

This strategy is not a stand-alone initiative. It forms part of a broad range of activities and programmes which are being implemented by various stakeholders. Its implementation will therefore require coordinated approach and it is my hope therefore that this shall be achieved through the participation of all the stakeholders that are involved in the implementation of all matters on the Conservation on Biological Diversity in Malawi.

I trust that this NBSAP will be a valuable tool and guide that will contribute substantially to the enhancement of conservation, sustainable use and benefit sharing of biodiversity in Malawi.



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MALAWI GOVERNMENT

Ministry of Energy, Mines, and Natural Resources

National Biodiversity Strategy and Action Plan

Environmental Affairs Department
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