



## **SECTION ONE**

### **1.0 EXECUTIVE SUMMARY**

As an agency of the United States of America (USA), USAID has to comply with the relevant statutes of the United States of America in the administration of its aid activities and projects. Incorporation of environmental factors and values as integral aspects of USAID's operations is strictly governed by US environmental laws, regulations and procedures as detailed and codified in the FAA and the 22 CFR 216 with a view of ensuring that development activities USAID undertakes are not only environmentally sound but also economically sustainable and protective of Zambia's environment.

Taking cognisance of the Poverty Reduction Strategy Paper (PSRP) as a national guiding strategy the USAID has elected to align its programmes in Zambia with the PRSP and these will be enshrined in the Country Strategic Plan 2004 – 2010. In fact the alignment of USAID programmes in Zambia to the PRSP is further amplified in the multi-dimensional and cyclical nature assumed by poverty inasmuch as it is regarded as both a consequence of environmental degradation and a cause of it. The basic construct is that environmental degradation exacerbates the poverty situation. Through the depletion of the natural resources base environmental degradation contributes to food insecurity, water borne diseases thereby limiting the survival strategies of communities. This results in disempowerment of most people particularly in the rural areas. Furthermore, this poses a double-wedged challenge, which connotes that tackling poverty should also assure that adequate environmental protection and natural resources management systems are developed and implemented.

The main purpose of this investigation is to obtain information on the status of Zambia's natural resources with a view to promoting sustainable resources management and targeting appropriate development interventions and other efforts. Furthermore, the information generated by this study will be key in ensuring that development strategies are realistic as these are closely related to the available natural resources.

Zambia is immensely endowed with a rich diversity of ecosystems including vast areas of wetlands albeit amidst numerous and intense threats for their sustenance. The ecosystems are home to a wide variety of fauna species. They are also an important source of protein for the majority of the people in Zambia. Some of the species are known to be endemic to Zambia alone, for instance the Black Lechwe, which thrives in swampy areas, is known to exist only in Zambia.

The country has diverse landscape formations ranging from valleys, rivers, lakes, swamps and plateaus to escarpments and mountains. The scenic and aesthetic values these areas present offer an attraction and appreciation to masses especially visitors. The formations have given rise to habitat diversity for living things.

Compared to many African countries, Zambia has formulated numerous environmental policies, laws, management plans, guidelines and planning documents. Most of the policies and laws are sector based and therefore fragmented. There is need for integrated legal and policy framework so that concerted efforts are fully realized. In addition, Zambia is a party to many conventions of international importance, among them the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), the Ramsar Convention, African Convention, and the Convention on Biological Diversity (CBD).

The deterioration in the Zambian economy has been accompanied by environmental degradation. It has reduced food production levels among some of the poorest in the rural areas of Zambia. Government policies have contributed to environmental degradation by permitting cultivation of marginal lands. Rapid population growth and rural urban migration amidst limited job opportunities leading to over exploitation of forest reserves. Worse still, a greater percentage of Zambia depends on either fuel wood or charcoal for domestic energy supply. This indicates the extent to which forest reserves are threatened.

Zambia has abundant wildlife, which includes their ecosystems and biodiversity in 19 National Parks, 34 Game Management Areas (GMA) and Bird Sanctuaries. The National Parks, Game Management Areas and Bird Sanctuaries carry most of the wildlife resources and basically fall in the ecological zones namely wetlands,

woodlands and open savannah grasslands. The National Parks contribute substantially to the conservation of the ecosystems and biodiversity. The 19 National Parks cover approximately 63,585 km<sup>2</sup>, which is equivalent to 8% of the country. Game Management Areas are protected areas established by law to control the hunting of wild animals through a licensing system. GMAs are communally owned areas where human habitation is permissible, along with economic activities that are not inimical to in-situ wildlife management. Zambia's 34 GMAs cover approximately 164,421 km<sup>2</sup>, which is equivalent to 22% of the country. While the total area classified under GMAs is about 72% of the wildlife estate, the entire wildlife protected area system makes up to one third of the total land surface area of Zambia.

### **Threats to biodiversity in Zambia**

Biodiversity in Zambia is increasingly threatened by both human and natural factors. The major human threats are:

**Land use conflicts** threatening biodiversity through activities such as shifting cultivation, which is widely practised in the Northern province, uncontrolled early burning practised especially in the pastoral areas and the use of insecticides and herbicides in commercial farming areas.

**Human settlements** are threatening biodiversity in Zambia, as the population increases there is a demand to clear more areas for people to settle and the demand for livelihood especially for rural populations for plants and animals as a source of food increases.

**Pollution** as a result of increased industrialization especially along the line of rail increases in effluent discharges that pollute the rivers. The Kafue River is the most polluted, receiving effluent discharges from various activities including mining, manufacturing, agricultural and sewage treatment plants threatening the flora and fauna in the river system. In addition, pollution of water systems has reduced invertebrate diversity. There is also an increase in aerial discharges of Sulphur dioxide in the copper mining areas resulting in acid rain.

**Over exploitation** of resources such as over fishing in the major fisheries and timber harvesting in the Western province.

**Deforestation** in general due to increase in demand for wood fuel. This takes cognisance of the fact that only 18% of the total Zambian population have access to electric energy.

**Introduction of new and exotic species** such as the Water Hyacinth and Carpfish.

**Conversion of forestlands to agriculture** has also contributed to the depletion of some species and without an appreciable gene pool extinction is threatening.

Habitat loss and fragmentation of land close to protected areas may therefore lead to extinction of faunal species. Rapid loss and fragmentation of wildlife corridors will result in loss of biodiversity. There is need for a study that seeks to identify, zone and map the wild life corridors, forecast future impacts and indicate alternative land uses not in conflict and intense competition for land on corridors; suggest ways to harmonize rural communities and conservation authorities and other stakeholders for intensive management and conservation of biodiversity in the area.

On average, based on anecdotal data reviewed in the last decade, the poaching scourge in Zambia's Protected Areas appears to have subsided considerably in areas with external support such as South Luangwa, North Luangwa and Kasanka National Parks. Other areas are under severe threat from poaching. Between 1970 and 1990 there were generally more reported incidences of poaching compared to the last decade. Although not statistically significant, field reports and aerial observations indicate a reduction in poaching trends in elephant since early 1990 while on the other hand at least 4000 Kafue Lechwe are illegally harvested from the Kafue Flats. The trend might be the same in various other species for bush meat trade. Additional monitoring data should be generated to ascertain the impact of illegal utilization on biodiversity complexes in Zambia. For example Zambia boasted of one of the largest elephant population in Africa south of the Sahara in the late 1960's - it is estimated that the elephant population at that time was over 200,000. Combinations of census results backed by anecdotal observation have documented a decline

between 1976 and 1986 because of excessive poaching. The losses in elephant numbers in recent years have levelled off due to intensification of anti poaching activities and community based wildlife management projects in these areas. The national elephant surveys conducted between 1992 and 1996 estimate a national population of between 22,000 and 25,000 animals.

#### *Management of Natural Resources in Zambia*

The government policy to hive off potentially self-sustaining governmental entities is enshrined in the Public Sector Reform Programme - PSRP. The enactment of new legislation has enhanced Zambia's conservation programmes through the creation of efficient autonomous bodies such as the Zambia Wildlife Authority (ZAWA). As autonomous institutions, these bodies are expected to generate their own funds and develop financial sustainability without compromising their core function of biodiversity conservation.

The ecosystem approach to wildlife, forest, soil and biodiversity conservation in Zambia protects lesser species as well, while conservation measures emphasize on protection of keystone species, endangered species, rare species and endemic species with special emphasis on large mammals and their habitats. Natural resources estate in Zambia is highly diverse with a wider coverage throughout the country.

#### **Constraints in Natural Resources Management**

The efforts at managing natural resources have been constrained by a number of factors that include:

*Resource Allocation:* The most important factor is inadequate resource allocation, for general management and operations, such as monitoring. Resource allocation is in this case financial and human.

*Illegal hunting and over-exploitation:* Illegal hunting, especially for commercial purposes, is one of the main causes of wildlife decline in Zambia. The decline in African elephant and rhinoceros populations are cases in point.

For the same reason, the population of black rhino fell from an estimated 15,000 during the 1980s to possibly a few animals by the end of the 1990s. Over-exploitation through the legal licensing system has been mainly due to a lack of sound monitoring information.

*Land-use pressure:* With only 13.5 people per km<sup>2</sup>, Zambia has a low population density compared with other countries in the region. However, Zambia has a population growth rate of 2.9% per year. This high growth rate, coupled with a harsh economic environment, has resulted in human encroachment in areas around national parks, and increased settlement in GMAs. In Zambia, encroachment is associated with clearing of vegetation for agriculture, bush fires, and illegal subsistence hunting.

*Inadequate monitoring information:* Management of natural resources requires accurate and/or precise information on abundance and distribution of economically important wildlife species, and the status of their habitats. Due to inadequate resource allocation, this information is non-existent for most protected areas.

*Inadequate planning:* Due to the inability to generate data for adaptive management, preparation of general management plans has not been done for most areas of high concentration, hence natural resources management in these areas has continued on an ad-hoc basis.

Other critical threats include unmanaged fires, incompatible agriculture practices, invasive plants and dam operations.

## SECTION TWO



*Photo Credit, MTENR*

### 2.0 INTRODUCTION

This report is intended to produce sufficient outputs for an Environmental Threats and Opportunities Assessment (ETOA) that will constitute the Environmental Annex required in the United States Agency for International Development (USAID) Mission's Country Strategic Plan (CSP). In this regard the United States government through the United States Agency for International Development (USAID) tasked Pathfinder Limited and its Collaborating Partners to conduct an ETOA to detail the state of natural resources and allied management efforts by the government, communities, cooperating partners and other stakeholders for the sustainability and possible growth of the natural resources.

The assessment utilised a multidisciplinary team of biologists, chemists, agricultural and forestry scientists and natural resources management scientists to undertake the diagnostic scanning of existing documentation and undertook snap surveys to sparingly assess the state of natural resources on the ground. In addition interviews were held with representatives of a number of stakeholders, Non-Governmental Organisations and Donor institutions on their roles and support to various environmental activities, projects and initiatives.

## 2.1 Study Objectives / Purpose

The prime objective of the assignment was to undertake a study to obtain the current quantitative and qualitative status of the key natural resources detailing trends in their management, biophysical condition, productivity, abundance and distribution and identify threats confronting these natural resources. In addition, the study was intended to evaluate and analyse the past and current initiatives and activities undertaken by the various stakeholders in the development of Zambia and how these initiatives have moulded the development direction of Zambia and ascertain how this is influencing or affecting environmental sustainability.

Finally, the study also purported to earmark and/or benchmark opportunities and entry points for USAID/Zambia efforts and envisaged interventions under the new Country Strategic Plan (CSP) that will positively influence the conservation of natural resources. It was intended that the results of the study should assist in fine-tuning interventions and implementation strategies and serve as starting point indicator when assessing environmental policy implementation achievements during monitoring and evaluation.

## 2.2 Scope of Work - Specific Tasks

The study was conducted for the entire Zambia and related to such key natural resources as wildlife, forests and woodlands, wetlands and soils. Specifically and as delineated in the Terms of Reference, the locus of the study was threefold as follows:

- i) Assess and document the current state of identified natural resources quantifying trends in their management, biophysical condition, productivity, abundance and distribution and identify threats to which they are subjected;
- ii) Conduct an evaluation and analysis of how past events and current initiatives (both Zambian and donor) have shaped the country's development trajectory, highlighting the performance/ indicator levels. The concern is how Zambia's response to development setting, its geo-political position in the Southern African region and its internal development agenda are currently affecting environmental sustainability (as codified in the Foreign Assistance Act, Part I, section 117).
- iii) Identify opportunities and entry points of USAID/Zambia efforts under the new CSP that will positively influence the conservation and natural resources (wildlife, forests and soils) and improve environmental management.

It was intended that Accomplishment of the above broad objectives would ensure that the USAID/Zambia's CSP was adequately informed by providing and ensuring:

- An overall understanding of development threats to environment and forests;
- An assessment of the environmental threats and opportunities within the Mission's geographic and programmatic scope of responsibility; and
- Basic compliance with the environmental provisions of the FAA.

### 2.3 Background to the Assessment

Since 1991 Zambia's economic scenario has undergone drastic transformation. The adoption of economic liberalization has witnessed the implementation of economic policies under the Structural Adjustment Programme (SAP). Some of these policies include:

- i) De-regulation
- ii) Commercialisation, and
- iii) Privatisation.

A key initiative has been the privatisation of the state owned enterprises, which was designed to attract the capital and management expertise to transform inefficient state owned enterprises, while easing the burden of this transformation on the public budget. However even as these seemingly grandiose policy thrusts were and are implemented Zambia's economy continued to degenerate unabated and thus its qualification to the Highly Indebted Poor Countries (HIPC) Initiative (this was premised on successful compliance with benchmarks set by the multilateral institutions). In order to redefine the country's strategic direction for its development efforts the Poverty Reduction Strategy Paper (PRSP) was mooted. This has become the Government of Zambia 's (GoZ) guiding strategy for development efforts although the Transitional National Development Plan (TNDP) has extended its horizon by a year.

Taking cognisance of the PRSP as a national guiding strategy the USAID has also elected to align its programmes in Zambia with the PRSP and these will be enshrined in the CSP 2003 – 2009. In fact the alignment of USAID programmes in Zambia to the PRSP is further amplified in the multi-dimensional and cyclical nature assumed by poverty inasmuch as it is regarded as both a consequence of environmental degradation and a cause of it. The basic construct is that environmental degradation exacerbates the poverty situation through the depletion of natural resources base contributing to food insecurity, water borne diseases and limiting the survival strategies resulting in the disempowerment of most people particularly in the rural areas. This poses a double wedged challenge which connotes that tackling poverty should also assure that adequate environmental protection and natural resources management systems are developed and implemented.

As an agency of the United States of America (USA) USAID has to comply with the applicable laws, regulations and procedures in the administration of its aid activities and projects. Incorporation of environmental factors and values as integral aspects of USAID's operations is strictly governed by US environmental Laws, regulations and procedures as detailed and codified in the FAA and the 22 CFR 216 with a view of ensuring that development activities USAID undertakes are not only environmentally sound but also economically sustainable and protective of Zambia's environment.

Specifically, the core environmental requirements of USAID operating unit strategic plans are spelled out in ADS 201.5.10g and are derived from the provisions of the FAA. In accentuating environmental sustainability as an integral part of a successful development

program Section 117.\71\Environment and Natural resources of the FAA states that “if current trends in the degradation of natural resources continue in developing countries they will severely undermine the best efforts to meet basic human needs, to achieve sustained economic growth and prevent international tension and conflict.”

In further introducing specificity to the importance of incorporating environmental factors in strategic planning Section 118.\73\ Tropical Forests – is very explicit in its concern about “continuing and accelerating alteration, destruction and loss of tropical forests in developing countries, which pose a serious threat to development and the environment. Tropical forests destruction and loss –

- (1) result in shortages of wood, especially wood for fuel; loss of biological productive wetlands; siltation of lakes, reservoirs and irrigation systems; floods; destruction of indigenous people; extinction of plant and animal species; reduced capacity for food production; and loss of genetic resources; and
- (2) can result in desertification and destabilisation of the earth’s climate. Properly managed tropical forests provide sustained flow of resources essential to the economic growth of the developing countries, as well as genetic resources of value to developed and developing countries alike”

The foregoing underscores the avowed commitment of the USA and its agencies like the USAID to integrate environmental factors and values into aid decision-making process and therefore constitute the basis for the formulation of the Country Strategic Plan.

## SECTION THREE

### 3.0 ZAMBIA

#### 3.1 A BRIEF BACKGROUND

Over the past two decades the Zambian nation has witnessed considerable economic strains. Beginning from the mid 1970's with the short fall in the price of copper, Zambia began experiencing deficits on government budget. In spite of several attempts to reverse the decline of Zambia economy through IMF/World Bank sponsored reforms in the 1990's these efforts failed to arrest the economic slide.

By the beginning of the 1990's, the economy began to face serious external debt servicing difficulties, chronic shortages of foreign exchange, and a treble digit rate of inflation and deterioration of infrastructure and social services. Economic decline was accompanied by a high rate of population growth estimate at 3.2% during the late 1970's and 1980's. Rapid rural-urban migration during the same period was another feature with adverse effects on the economy.

Various commentators on Zambia's economy acknowledge that the impact of economic crisis on the social fabric of Zambia society has been devastating. The rate of unemployment in the 1980's began to sour, and by the 1990's, the formal sector could only account for less than 10% of the total labour force. Incomes declined sharply and GDP per capital in 1975 prices fell from K386.79 between 1970 and 1974 to K188.48 between 1987 and 1990. Households adopted coping strategies in attempt to survive the crisis. This usually meant raising household labour participation by women with children increasingly taking up activities in the informal sector. The rate of malnutrition rose and accounted for nearly 40% of the infant mortality rate towards the end of 1980s.

The crisis thus produced strains on the cohesiveness of Zambia family system and led to an upswing in cases of divorce. Female-headed households assumed greater statistical importance in social analysis towards the end of 1980s.

The deterioration in the economy has been accompanied by environmental degradation. It has reduced food production levels among some of the poorest in the rural areas of Zambia. Government policies have contributed to environmental degradation by permitting cultivation of marginal lands. Rapid population growth and rural urban migration amidst limited job opportunities has contributed to over exploitation of forest reserves. Worse still a greater percentage of Zambia depends on either fuel wood or charcoal for cooking. This indicates the extent to which forest reserves are threatened.

The National Environment Action Plan (NEAP) of 1994 estimated an increase in the consumption of charcoal from 510,000 tonnes in 1980 to 588,000 tonnes in 1990. It was further estimated that 2.5 million tonnes of cordwood was used in 1990 to produce

588,000 tonnes of charcoal. The quantity of charcoal consumed has increased substantially to 778,300 tonnes in 1999 and symbolized a commensurate increase in the cordwood utilised to produce it.

Deforestation by charcoal burning occurs in both forest reserves and unreserved forests. For as long as there is lack of information on the status of ecological resources and their value, the trend will continue.

It is therefore; not surprising that in this context there has been a dramatic increase in the exploitation of resources at the expense of future generations and indeed at the expense of nature's carrying capacity. Unless our resources are quantified and understood, it is society that is vulnerable to effects of abusing the status of nature.

### **3.2 Why A National Natural Resources Inventory**

The main purpose of this ecological investigation is to obtain information on the status of Zambia's natural resources in relation to the purpose of sustainable resources management and targeting interventions and other efforts.

The decision for proposing to carry out this study follows the need for information, which will be used for the achievement of the objectives of development purposes, which are closely related to the available natural resources.

Such information would break the ground for the preparation of the Environmental Annex to the Country Strategic Plan (CSP) of the United States Agency for International Development (USAID). This will in effect facilitate the harnessing and nurturing natural resources for socio-economic, environmental management and cultural development. In addition, it will provide information for conservation and protection purposes, for research, tourism such as recreation and amenity purposes and so on.

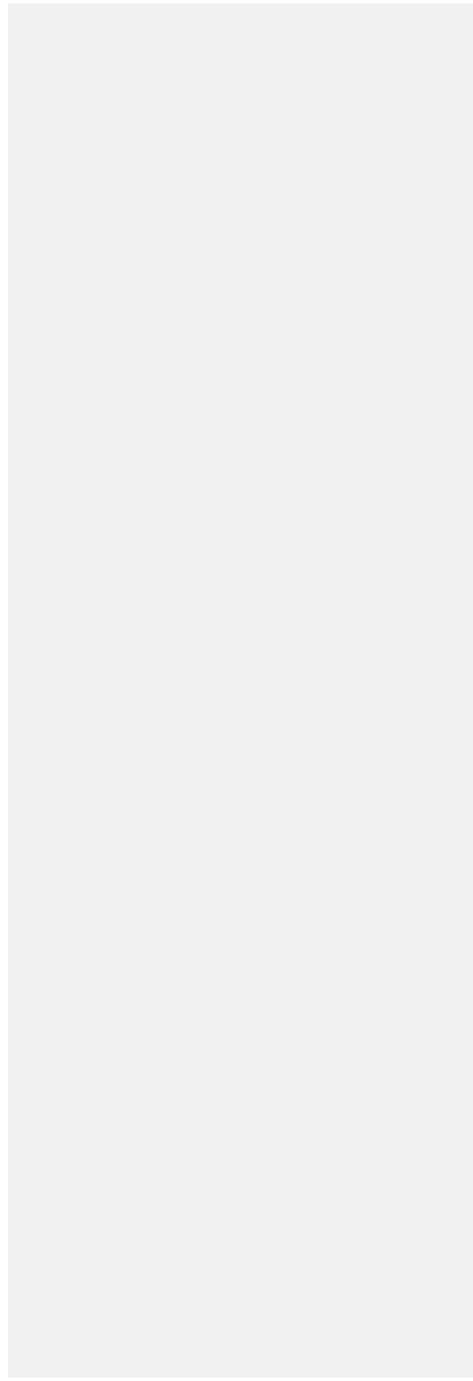
According to the scope of information, the elements and data provided during the execution of this study would be clarified with the appropriate emphasis on their identity. For example, if one part of the study will be on conservation and protection purposes, major emphasis would be put on information for wildlife resources, threatened species, the area, terrain, accessibility, transport facilities, site qualities, management status, historical sites, natural monuments, watershed management, conservation of bird life etc.

### **3.3 Country Setting**

#### **3.3.1 Location**

Zambia is a sub-tropical Country located between latitudes 8° and 18° South of the Equator and between longitude 22° and 34° East. The country is landlocked. It is surrounded by eight countries namely, Angola, Botswana, Democratic Republic of Congo, Malawi, Mozambique, Namibia, Tanzania and Zimbabwe (Figure 1).





### 3.4 Physical Environment

#### 3.4.1 Land Systems

Zambia has a total land surface area of 752,972 km<sup>2</sup> with an average altitude of 1,200m above sea level. The altitude varies with highest parts in the northeast (1,500m - 2,000m above sea level), and the lowest parts in the south (350m – 600m above sea level), which is at the confluence of the Zambezi and Luangwa Rivers in Luangwa District.

The eastern and southern parts of the country are characterised by deep rift valley systems, which form part of the East African Rift Valley. The valley troughs are relatively flat but have hilly escarpments. The rift valley system comprises the Luangwa and the middle Zambezi valley. The predominant escarpment system is the Muchinga.

#### 3.4.2 Agro-ecological Zones

Zambia is divided into three agro-ecological zones of Regions I, II and III (Figure 2). The various characteristics for each of the regions are described in Box 1.

**Box 1: Agro-ecological Zones in Zambia**

**Region I.** This covers the eastern and southern rift valley areas. It also includes the southern parts of Western and Southern Provinces. It is characterised by hottest and driest climatic conditions, with rainfall of less than 800mm per annum and is categorised as semi-arid. It has a short growing period (season) of between 80 and 120 days. The rainfall is highly variable and unreliable within one rainy season, and between the years; putting predicament on agricultural development. The rainfall intensities in this region are very high. These can induce the process of soil erosion if the land is devoid of vegetation through erosivity. The steep slopes along the escarpments have high erosion risk.

**Region II.** This region covers the sandveld plateau zone of Central, Eastern, Lusaka and Southern Provinces. The region is a medium rainfall zone with 800-1200mm per season and has a growing season of 120-150 days. This is the most productive zone in the country. However, use of machinery, prolonged crop production over a period of time on the same portions of land and continuous application of chemical fertilisers have generally affected the natural soil qualities and the soils are degraded.

**Region III.** This is part of the central African plateau covering Northern, Luapula, Copper-belt and North Western Provinces, as well as parts of Serenje and Mkushi Districts. The region is a high rainfall area of 1,200mm and above and has a growing season of up to 190 days. The high rainfall has resulted in considerable leaching and the soils are highly acidic, limiting the range of crops that can be grown in this region, especially if special farming practices are not employed.



### 3.4.3 Soils

In general, the soils that have developed on the plateau region of northern and north-western parts of the country in *agro-ecological Region III* are the *strongly weathered, highly leached and very strongly acid clayey to loamy soils*. The eastern and south central plateau has *moderately leached clayey to loamy soils with medium to strong acidity*. These soils are found in *agro-ecological Region IIa*. In the western part of the country the soils are *very strongly to strongly acid, coarse to fine sandy soils* with more than 90% quartz developed over Kalahari sands. This constitutes *agro-ecological region IIb*. The soils of the escarpment zone are *shallow, coarse to fine loamy*. The valley trough has *loamy to clayey soils*. The last two geomorphic units constitute *agro-ecological Region I*. The *sandy to heavy clay water logged soils* are found in the floodplains and dambos.

### 3.4.4 Climate

The climate of Zambia is influenced by the three main factors: the Inter-tropical Convergence Zone (ITCZ), Altitude and El Nino. ITCZ is an area where two air masses from the northern and southern hemisphere meet, producing an active convective area, that in turn causes rainfall. It's movement north to south and back to the north in each rain season causes moist Congo air to prevail for a longer period to the northern parts of the Country than to the southern parts half of the country where dry south-easterly air flow is predominant at the start and end of the seasons. Hence the northern receives more rains than the southern. Altitude causes low temperatures in the broad belt plateau country, from what would otherwise be harsh tropical climate. El Nino is the warming of sea surface temperature in the Pacific Ocean in certain years causing wet and dry conditions in some parts of the Globe. In Zambia, most El Nino events have been associated with drought.

Zambia is characterised by three distinct seasons: the warm rainy season (November to April), the cool dry season (May to July) and the hot dry season (August to October). The Country experiences temperatures ranging from 16°C to 27°C in the cool-dry season and from 27°C to 38°C in the hot dry and warm rainy seasons. The high altitude areas experience cooler temperatures than the low-lying regions.

Zambia receives an annual average rainfall of about 1,000mm countrywide. Rainfall varies on average from 1,400mm in the north to 600mm in the south.

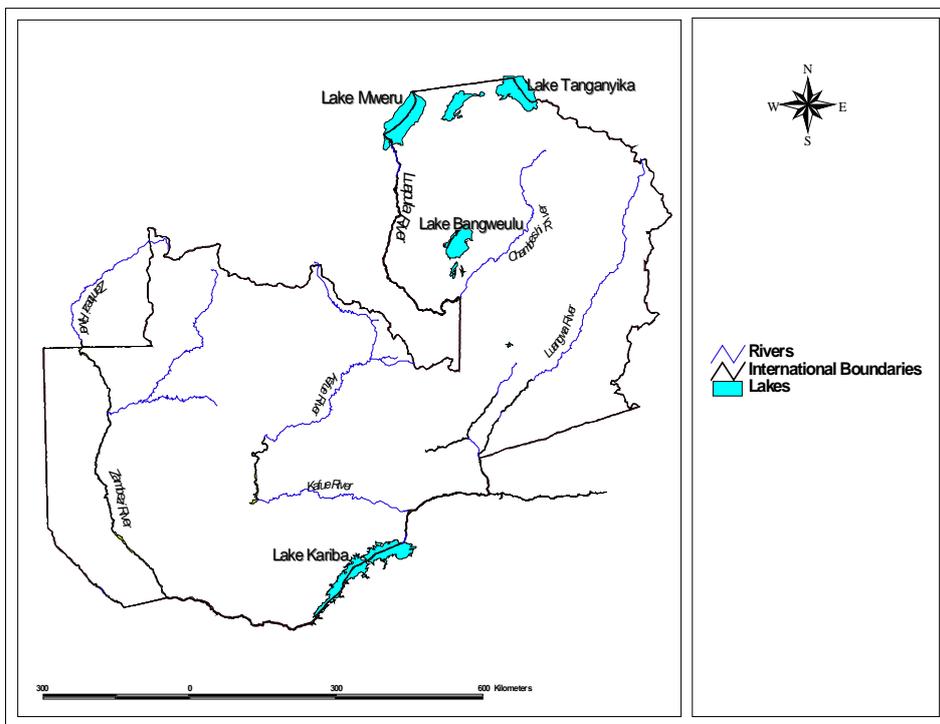
### 3.4.5 Water Resources

Zambia is well endowed with surface and ground water resources. The major perennial rivers constituting surface water include the Zambezi, Luangwa, Kafue, Kabompo, Luapula and Chambeshi. The major lakes of Zambia are Bangweulu, Kariba, Tanganyika and Mweru.

Surface water from these rivers cover about 6% of the Country (ZFAP, 1998). If all the wetlands are included, surface water covers 20% of Zambia’s surface (Chabwela, *et al*, 1994). See Figure 3 below.

The water bodies also constitute wetland areas of Zambia such as Kafue Flats, Bangweulu Flats, Zambezi Flood Plain and Luangwa Valley Flood Plain. Some of these wetland areas are listed as wetlands of international importance under the Ramsar Convention.

**Figure 3. Major Rivers of Zambia**



### 3.4.6 Wildlife Resources

Zambia has abundant wildlife, which includes their ecosystems and biodiversity in 19 National Parks, 34 Game Management Areas (GMA) and Bird Sanctuaries. The National Parks, Game Management Areas and Bird Sanctuaries carry most of the wildlife resources and basically fall in the ecological zones namely wetlands, woodlands and open savanna grasslands. The National Parks contribute substantially to the conservation of the ecosystems and biodiversity.

### 3.4.7 Forest Resources

The total area of indigenous forests in the country is about 44.6 million hectares and cover about 60 percent of the total land areas out of which about 9.6 percent are gazetted forest. There are variations in the vegetation types found in the country but the most extensive is the Miombo Woodlands. The natural vegetation formation has been influenced by a combination of geographical and geological factors. The Teak forests found in the south-western parts of the country are rich in commercial timber species namely *Baituidla plurijuga* and *Pterocarpus angloleuis*. The conversion of forests into agricultural land is a threat to Zambian forests in open areas and protected reserves while settlements in wetland areas have negative effects on surrounding forests to the wetlands. The loss of forests is leading to loss of bio diversity.

The major threats to biodiversity conservation in Zambia are mainly caused by human activities. These include:

- Deforestation
- Wildlife depletion
- Population expansion and
- Water pollution

The result of deforestation and wild fires has been habitat destruction. Water pollution has reduced invertebrate diversity. The poor state of museums, herbaria and gene banks as repositories of biodiversity resources also poses a threat to plant and animal collections. Many protected areas are being encroached by human settlements being unsustainably deforested, cultivated and subjected to habitat and species destruction (*for further discussion refer to section 7.0*).

## 3.5 Biological Resources

### 3.5.1 Ecosystems

Zambia's sub-tropical setting places her within the Zambebian Regional Centre of Endemism that extends from Katanga in the Democratic Republic of the Congo to Transvaal in South Africa, representing characteristic features of both semi-arid and tropical environments.

### 3.5.2 Vegetation

As earlier alluded to, forests cover 60% of the country. The country's vegetation is classified into four major categories (Storrs, 1995). These are *Closed Forests*, *Open Forests*, *Terminaria* and *Grass Lands* as further discussed in section 7.0.

### 3.5.3 Fauna

Zambia is blessed with a wide and rich diversity of ecosystems including vast areas of wetlands. These form a home to a wide variety of fauna species. Among these species, fish and mammals are the most valuable, making Zambia an important destination for tourism in Africa. They are also an important source of protein for the majority of the people in Zambia. The Black Lechwe, which thrives in swampy areas, is known to exist only in Zambia.

The fauna diversity is estimated at 3,631 and distributed as follows: 2032 invertebrates (27+ endemic), 409 fish (204 endemic), 67 amphibians (1 endemic), 150 reptiles, 733 birds (76 rare or endangered), 224 mammals (28 rare or endangered) and 16 domesticated animals (MENR, 1999). Under the wildlife statutes, 28 mammals, 36 birds and 4 reptiles are under protection. The list of protected species has not been reviewed for some time now.

Protected areas have been established because of the diversity of habitats and the associated flora and fauna that has regional and international importance. Zambia has a very good network of protected area systems comprising 19 national parks, which cover 8% of the country and 34 game management areas covering 22% of the country. An additional 10% of the land is protected forest area, making a combined 40% of the land in Zambia under protection. The protected areas network also includes bird sanctuaries, game ranches, botanical reserves and national heritage sites.

Through sustainable management practices, wildlife (including fish) resources contribute significantly to local and national economies through revenue generation and sustainable supply of protein food for a variety of species that are abundant.

### 3.5.4 Micro-organisms

There are about 598 species of micro-organisms that have been identified to exist in Zambia. These consist of 12 species of bacteria, 446 of fungi, 4 of protozoa and 35 of viruses (MENR, 1999). The distribution of microorganisms is generally affected by rainfall and soil moisture content. Habitats with high rainfall have a higher variability of species and greater numbers of individuals per species.

Detailed information on distribution and abundance of microorganisms in different ecosystems is not readily available. There is need, therefore, to do bio-prospecting research on microorganisms, as recent scientific work has revealed the importance of the use of some of these organisms in modern medicine.

Microorganisms are also very important in the maintenance of the ecosystems through nutrient cycling. More effort is, therefore, needed to manage the habitats and moisture in the soils effectively for purposes of conserving microorganisms to meet the above uses. This is more crucial in the dry-land areas where rainfall is limited, vegetation is sparse and therefore biological activity is inhibited to

promote the breakdown of organic matter and thereby releasing nutrients in the soil.

### **3.6 Social Economic Environment**

#### **3.6.1 Zambia's Economy**

Zambia's economy is still dependent on copper mining, which accounts for a shade over 70% of the country's export earnings, contributing 45% to government revenue and is a major source of formal employment and Gross Domestic Product.

From independence to 1974, the economic performance was very impressive and experienced a boom in terms of foreign exchange reserves due to good copper prices on the international market.

The Zambian economic environment started deteriorating when the copper prices began to fall as from the mid 1970s, while the prices for oil rose. This entailed high oil import bills. During this period Zambia's exports also declined. This resulted in the depletion of the country's foreign reserves.

From independence to the 1990's, Zambia adopted socialist economic policies that were characterised by public sector domination in which government had overall control.

The economy was built on an extensive administrative control system following commandist socialist policies, which were characterised by nationalisation of most economic activities, import substitution in the industrialisation process and the use of price controls and subsidies. To meet its social obligations, Zambia has had to borrow heavily and is today one of the highly indebted countries in the world.

#### **3.6.2 Economic Reforms**

In recognition of these problems, Government since the 1980s began to implement a series of structural economic reforms, supported by the International Monetary Fund (IMF), the World Bank and other bilateral and multilateral agencies to try to reverse the trend in economic performance.

Currently, the Government is implementing the ambitious New Economic Reform Programme (NERP) under the Structural Adjustment Programme. The programme aims at stabilising the economy in order to lay a foundation for sustainable growth and development. This programme focuses on the liberalisation of the economy and the privatisation of commercial undertakings. It also entails reformation of economic institutions and the implementation of the public sector reform programme with a view to improving efficiency and management. Dependence on the state has been reduced through promotion of private initiatives among the people. The programme has removed subsidies and promoted competition and market led activities. The Government has promoted cash budget measures to scale down on expenditure.

### 3.6.3 Social Environment

#### 3.6.3.1 Poverty

It should be mentioned that the economic pressures facing Zambia puts her as one of the poorest states in the world. Poverty is widespread and intense in Zambia, as illustrated by the CSO's Living Conditions Monitoring Survey Report of 1996 and 1998. Measured in terms of real household incomes, expenditures, asset ownership, nutritional status, disease incidence and access to quality social support service and amenities, the reports show high incidence of poverty. 68% of the households were living below the poverty datum line in 1991 and this rose to 78% in 1996. It slightly declined to 73% in 1998 and was approximated at over 80% in 2001.

The incidence of poverty according to the 1998 survey is higher in Zambia's rural and peri-urban areas (83%) like Western Province, than urban areas 56% (CSO, 1998). In terms of various strata, poverty is more serious among the most disadvantaged groups of society, namely the subsistence farmers, unemployed, women, children and the disabled.

There is a high correlation between poverty and environmental degradation as a result of poor people's dependence on exploitation of the environment for survival (UNDP's Zambia Human Development Report, 1998). The poverty situation in Zambia intensifies resource overuse and its degradation.

Increased unemployment has forced a lot of people to be engaged in informal sector activities as a coping strategy, mainly involving natural resource products in rural urban trade and unregulated or unsustainable forms of exploitation (Mupimpila, *et al*, 1998).

These informal sector activities include agriculture (semi-shifting cultivation), harvesting of trees for firewood and for charcoal, logging of timber, gathering of plant materials for various uses, illegal commercial hunting and unregulated fishing. These activities if unchecked result into the degradation of the natural resources base.

In dryland areas, which are generally marginal and sensitive, heavy exploitation of natural resources to meet food needs, as a result of food shortages, would induce and enhance land degradation and impairing of the ecosystems.

#### 3.6.3.2 Human Population

##### a) Composition of the Population:

Zambia's population has grown rapidly over the years. Zambia's population enumerated at 4.1 million in 1969 grew to 5.7 million in 1980 and 7.4 million in 1990. In 2001, it was estimated to have grown to 10.3 million. The estimated population growth rate was 3.1%, which was one of the highest in the world, implying approximately a 23 year doubling time of the population (UNDP, 1998). This growth rate has currently plummeted to 2.9%. The structure of the population

is characterised by a high proportion of youths 51%, under 16 years old. This indicates high dependency ratio. There are clear indications of considerable momentum for future population growth. This growth of the population is due to mainly high fertility rates, calculated at 6.7 children per woman and reduced mortality rates. These fertility rates are considered as one of the highest in Africa. Fertility rates are even higher in rural areas (7.0 children per woman) as compared to urban areas (6.3 children per woman). This is due to lower levels of literacy and contraceptive use in the former. High fertility rates complimented by lowered mortality rates between the 1960s and 1980s, led to the rapid increase in the Zambian population.

The mortality rate has begun to rise in the recent years due to the deterioration in living standards of many Zambians and the prevalence of the Human Immuno-Deficiency Virus/ Acquired Immune Deficiency Syndrome (HIV/AIDS).

Most of the population is dependent on natural resources for survival. This has serious implications on the country's physical environment. The government capacity to provide adequate services to its people and effectively manage natural resources is hindered by its constrained treasury.

According to 2000 census, the Zambian population of 10.3 million is characterized by a high proportion of females 51% compared to males at 49%.

Females have special cultural problems as a result of their gender, for example, limited access to productive resources, poverty and heavily constrained with household chores. This distribution of population entails serious social economic problems with the Zambian female-headed households.

The increasing human population pressure on the resources, coupled with the competitive open access harvesting for day to day subsistence, have resulted into the cumulative demand pressures on the resources arising from commercial activities including those of the poor.

## b) Population Density

Zambia's population density was estimated at 13.5 persons per km<sup>2</sup> in 1998. The density varies considerably between areas and some locations have over 100 persons per km<sup>2</sup>.

There are a number of factors that have influenced population distribution and settlement patterns. These include availability of agricultural land. Kay (1971) points out that there is a close relationship between population distribution and soil types. This means that those parts of the country which have good agricultural soils, like Southern, Eastern and Central Provinces have high population concentrations, as people particularly in rural areas depend on agriculture.

Other factors include displacements, for example, construction of the Kariba Dam, which resulted in the displacement of the Gwembe Tonga from the valley to Lusitu area. This resulted in the concentration of people in areas like Lusitu (Siavonga) which are now heavily populated and severely degraded due to high population pressure and overgrazing beyond the area's carrying capacity.

Availability of water is another factor, which affect population distribution. People settle along perennial streams or major rivers, around swamps, lakes or big dambos for water supply, agriculture (including livestock) and fishing.

The other factor is tsetsefly distribution. Areas infested with tsetseflies are sparsely inhabited due to the prevalence of trypanosomosis, which affect both livestock and humans.

Migration and urbanisation influences population density or distribution. In Zambia, most rural areas have inadequate employment opportunities and social amenities. These aspects are closely associated with urban areas. Other benefits associated with urban areas are that they serve as service centres, with all factors combined trigger rural-urban migration in Zambia. This makes Zambia one of the most urbanised countries in Southern Africa. The outstanding problem resulting from the rural-urban influx has been the uncontrolled growth of squatter compounds in urban areas. The governments, both past and present, have had difficulties in providing housing and social services in these areas, especially given the economic decline Zambia is experiencing.

These social economic factors, coupled with increasing human population growth that exert demand on the declining government revenue base, reinforce the many disadvantages that exist in the Zambian Society. These have implications on land degradation.

Its worth noting that overcrowding in some areas of Zambia poses a threat to the environment. The increasing population growth rate and the existence of localised pockets and islands of densely populated areas entails over- exploitation of natural resources. This is evident from the standpoint of over- exploitation and the rates of deforestation, which correlate very closely with population densities. The threat is posed by wood-fuel demand (charcoal) and poor agricultural

practices which contribute to deforestation and the problem of solid waste disposal and pollution, which when combined can result into land degradation and biodiversity loss.

## SECTION FOUR

### 4.0 BIODIVERSITY CHALLENGES AND CONSERVATION EFFORTS IN WILDLIFE PROTECTED AREAS OF ZAMBIA

Zambia is immensely endowed with biological diversity albeit amidst numerous and intense threats for its sustenance. The country has diverse landscape formations ranging from valleys, rivers, lakes, swamps and plateaus to escarpments and mountains. The scenic and aesthetic values these areas present offer an attraction and appreciation to masses especially visitors. The formations have given rise to habitat diversity for living things. Although definition of the Biological Diversity from the Convention on Biological Diversity (CBD) was adopted as variations in landscapes, ecosystems, species, genetic resources or any combination of these, with consideration of process and the function they have (GRZ, 1999), much of the focus has been limited to species and ecoregions to some extent.

Zambia has fourteen ecosystems based largely on vegetation types, with exceptions of aquatic ecosystems and agro-athropic ecosystems. The distribution of the ecosystems in Zambia is varied and portrays inclinations to latitude, climate and human land use practices (GRZ, 1999). Change detection on the entire ecosystem distribution is little known because of scanty surveys undertaken. Although species diversity status is unknown for most of the ecosystems for lack of data (Ferra, 1998), ecosystem with highest species diversity is Munga, Miombo woodlands and Grasslands while Montane forest, though limited in extent, has the highest number of endemic woody diversity (GRZ, 1999). More studies are required to ascertain the diversity ranks in each ecosystem because the conservation efforts have been based on the diversity levels in the protected areas.

Wildlife Protected Areas are under the state management regimes and occur in two categories. The first one are the 19 Zambian National Parks and the second are the 34 Game Management Areas, all spatially spread over one third of the entire country. The level of resource protection and utilization varies from one National Park to another. Few national parks are well protected whereas the rest greatly lack logistical support and experience massive shortage of human resources. Protection of the wildlife in Game Management Areas is far from being sufficient and it is intricate based on the non-availability of land use plans for majority of them. Resource utilization especially on consumptive basis in the Game Management Areas is not well planned and coordinated, where it has ever been attempted. Poverty has been attributed as a threat to sustainable utilization of the wildlife resources (Chabwela, 1992).

Outside the protected areas, Open Areas, biodiversity is not comprehensively documented on the species level (Ferrar, 1998). As a result, management is not optimized. Wildlife resources are at high risk of illicit offtakes and the populations have either been driven to absolute decimation or extreme brink of extinction, with exceptions for the ranches and special areas such as traditionally protected areas.

In parts, the Government of Zambia and cooperating partners have concentrated logistical and financial resources for protection but more efforts are required.

Poverty levels have steadily escalated in the country and have affected the rural human communities much more as the national economy deteriorated in the face of limited alternatives for the rural households. Inevitably, the natural resources have been utilized unsustainably.

The major threats to loss of biodiversity are the habitat alterations, invasive alien species and illegal species harvest (poaching). Key causal factors to these have been inadequate capacity on law enforcement and monitoring by the agencies and lack of implementable land use and development plans. Means to conservation such as Community Based Natural Resources Management require to be strengthened.

Comparable to many African countries, Zambia has formulated numerous environmental policies, laws, management plans, guidelines and planning documents. Most of the policies and laws are sector based and therefore fragmented. There is need for integrated legal and policy framework so that concerted efforts are fully realized. In addition, Zambia is a party to a great many conventions of international importance, among them the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), the Ramsar Convention, African Convention, and the Convention on Biological Diversity (CBD) – check Appendix 6 for a list of conventions.

In case of CITES, Zambia acceded to the Convention in November 1980 and ratified the Convention on 22 February 1981. The Zambia Wildlife Authority is currently both the Management and Scientific Authority for the management of the Convention in Zambia. The Convention is administered and domesticated under the Zambia Wildlife Act No. 12 of 1998. The National CITES Coordinating Committee was recently established comprising representatives of various institutions necessary for the enforcement of various CITES provisions. As a signatory to CITES, Zambia abides by the conditions applicable to Appendix I listing of the species. Additionally, Zambia has achieved necessary wildlife law reforms, which prohibits any commercial use of the elephant and its products. The Lusaka Agreement and SADC wildlife protocol have been incorporated into the domestic legislation to facilitate collaborative enforcement

The initiatives mentioned above are hardly implemented due to ineffective and inadequate human resource inputs, inadequate financial and logistical resources. There is need to forge on conservation efforts on the basis of resource protection performance basis and implementing feedback systems in the resource and projects monitoring. Zambia Wildlife Authority, which is a government agency for management and conservation of wildlife in Zambia, has undergone institutional transformation from the year 2000 with the view to efficiently and effectively conserve and manage wildlife resources in Zambia. The new institution is required to strengthen its operations in the wildlife estate by achieving financial sustainability and creating strong partnerships in the protected areas.

#### 4.1 Biodiversity Management Perspective

General objectives in wildlife management include, *inter alia*, informing of policy decisions by land use managers and regulators on the sustainable use of wildlife

resources for developing the livelihoods of local people around and in protected areas as well as the rural-urban interface in African savannas. The specific scientific and technological objectives for wildlife management include determination of the key ecological factors that control flagship systems, wildlife population dynamics and potential utilization, ecological sustainability of current practices and revenue flows among and across the rural-urban interface.

In today's diverse management regimes, it is essential to identify options for community participation in the management of the wildlife resource, sustainable use and resolution of human-wildlife conflicts. Therefore, the integration of ecological and socio-economic functions of protected areas for land use and resource managers and regulators based on monitoring and proper management practices is essential.

In a bid to rise to the challenges facing wildlife biodiversity, Zambia Wildlife Authority has developed a five-year Strategic Plan (2003 – 2007) to which it is committed to implement. The plan attempts to address the challenges through a number of means, which would include a combination of adaptive management using the best industrial practices with appropriate deployment of staff for effectiveness and efficiency, decentralized budgetary and cost-control systems, strengthening of business management experiences and systems, building partnerships and developing a culture of customer-oriented service delivery. Stemming from the Government initiatives in the Poverty Reduction Strategy Paper (MFNP, 2002), wildlife management would have to be done along side the poverty reduction strategies that will factor in sustainability of resource protection and utilization.

#### **4.2 Biodiversity In Zambia**

Zambia takes centre stage in endemism in the Zambezi Region with relief between 1000 and 1500m. Zambia is not mountainous but has extensive miombo woodland plateau interrupted by dambos, swamps, rivers and large wetlands (Bingham, 1998). The wildlife-protected areas in Zambia were not established for biodiversity conservation as the primary reason. This explains why there is no relationship with areas of high biodiversity. Since the principle of biodiversity conservation might be high priority there would be need to re-examine the existing wildlife protected areas and areas outside for inclusion. This would involve inventories for classification. The level of an ecosystem on the other hand comprises the abiotic and biotic components with interlinkages that provide for flow of materials and energy in the system. An effective ecosystem management of biodiversity requires classification and mapping of the habitats for a wildlife protected area system plan. Vegetation maps have been used in developing system plans. Zambia's vegetation map (Edmonds, 1976) and reviews of vegetation maps (Fanshawe, 1971), LANDSAT maps and aerial photographs would be used to classify ecological vegetation zones while groups of animals and microbes may also be used in identifying areas of high biodiversity (Bingham, 1998) but these have not been sufficiently documented in Zambia.

### 4.3 Optional Approaches to Biodiversity Conservation

Proportions of spatial dimensions of the different ecosystems have been analysed by MENR (1998) and the extract is delineated in section 7.0.

ZAWA (2002) provides four regional options to conservation, in the main; ecoregional approach, hotspot approach and transfrontier initiative approach. All the three are landscape /ecosystems based. In addition, Red Data List approach that is species based offers another possibility.

#### 4.3.1 Ecosystems Approach to Biodiversity

Biological diversity is the variability among living organisms to include diversity within species, between species and ecosystems. Biodiversity can therefore be considered at ecosystem, species and gene levels. Much of the work on biodiversity in Zambia is at species level and to a limited extent on ecosystems. Consequently the country study when formulating Zambia's Biodiversity Strategy and Action Plan (BSAP) focused more at species and ecosystems levels.

Savanna is the only terrestrial biome in Zambia. The biome is characterized by annual mean temperature of 20 - 30°C and rainfall range of 500 – 1500 mm from south to north. The biome lies between the rain forest conditions in the north-west and semi-desert conditions in the south-west. The savanna biome consists of woodland and grassland type of vegetation. Floristically, Zambia lies within the Zambebian regional Centre of endemism bordering the Guinea-Congolian region to the north and the Karoo-Namib region to the south and south-west.

Zambia has fourteen (14) ecosystems based on vegetation types. It also has fresh water aquatic ecosystems and anthropic land cover types for different forms of agricultural land uses. The aquatic ecosystems consist of natural and man made lakes and the major perennial rivers.

##### 4.3.1.1 Agricultural Biodiversity

Zambia has also identified agricultural biodiversity as an important aspect upon which almost 1,000,000 households depend directly for their livelihood.

Agro-biodiversity is therefore used to refer to the variation between and within crop and livestock species. This diversity is affected by historical factors and differences in farming systems, agro-ecological and socio-economic conditions. The main categories of ecosystems in Zambia are forests, thickets, woodland and grassland.

There about 100 cultivated plant species. There are also wild plant species related to cultivated crops and include wild relatives of rice (about five species), cowpea, sorghum, sesame and various cucurbits species. Crops with most significant genetic diversity include cowpea, bambara groundnuts and beans. Crop genetic diversity is high under traditional farming systems than commercial farming. The total diversity of domesticated animals is estimated at sixteen (16) species.

#### 4.3.1.2 Species Diversity

There are 8017 species of organisms that occur in Zambia. There 316 endemic species, 174 rare species and 31 endangered species of plants and animals. These figures are seemingly underestimated inasmuch as knowledge about most species is incomplete.

Miombo woodlands and grasslands are ecosystems with the highest biodiversity while montane forests have the highest number of endemic woody plants. The diversity of ferns and orchids is correlated to ecosystem diversity of some invertebrates (arachnids and butterflies) and ferns show a south-north increase in relation to rainfall /moisture gradient. There are approximately 598 species of micro-organisms, 2032 species of invertebrates, 3774 species of both lower and higher plants, 409 species of fish, 733 species of birds and 224 mammal species.

#### 4.3.2 Ecoregions Approach

Ecoregions are generally extensive areas with similar species composition and underlying ecology. Miombo ecoregion also properly called the Southern Caesalpinoid Woodland Ecoregion is one with 3.6 million sq. km in extent and covers 11 countries, Zambia inclusive. The other two examples are East African Montane Ecoregion (Nyika / Mafinga Hills area) and the Great Lake Ecoregion (Lake Tanganyika). The Ecoregion approach to a large extent does fit the designated ecosystem zones given in Table 1. These ecoregions present an opportunity for cooperation in partnerships for the conservation. The large-scale biodiversity conservation is sensitive to local biodiversity issues and the socio economic environment. It provides for a more comprehensive approach to conservation of large biodiversity complexes. Motivated by the approach, WorldWide Fund for Nature (WWF) embarked on a number of Ecoregion initiatives that include the following complexes;

- i) the Great Lakes Ecoregion initiative covering Lake Tanganyika, with focus on the lucustrine biodiversity;
- ii) East African Montane Ecoregion initiative, encompassing Nyika plateau and associated uplands;
- iii) Miombo Ecoregions focusing on wildebeest migration in Liuwa plains and eastern Angola in the upper Zambezi plains complex;
- iv) Miombo Ecoregion covering Kasungu National Park in Malawi and the adjacent parts of the Luangwa Valley, where South Luangwa lies, and;
- v) Miombo Ecoregion collaboration with the DRC in Luapula Valley / Lake Mweru area

#### 4.3.3 “Hotspot” Approach

The premise on which the “hotspot” approach is based is on the existence of the heavily exploited and often highly fragmented ecosystems that are greatly reduced in original extent. Where such areas exist, management efforts are required to be concentrated. Partnerships would have to be requested to channel the resources to salvage the situation. The challenge for Zambia is to identify these hotspots using

appropriate criteria such as endemism, rare, richness or rate of extinction. The degree of threat for ecosystem or species should be assessed. It is hypothesized that against the current threats to biodiversity hotspots do exist in Zambia.

#### **4.3.4 Transfrontier Initiative Approach**

Ecoregion (ecosystems / landscapes) approach is closely related to the Transfrontier Initiative approach. In the recent times, the transfrontier initiatives have gained grounds. Among the other reasons, for example, the implementation of transfrontier conservation area management covering the Caprivi Strip, northern Botswana (including the Okavango), north – western Zimbabwe and south – western Zambia (as indicated on the map below), would attempt to manage 170,000 heads of elephants (keystone species). The area of coverage is circumscribed in the map below. Included in this transfrontier area is Mosi-oa-Tunya National Park. The elephant population is about 25 % of the entire world's population of the African elephants. The initiative is spearheaded by African Wildlife Foundation sponsored by USAID regional funding.

In similar initiatives, African Wildlife Foundation is also spearheading the initiative for transboundary resource management covering lower Zambezi of Zambia, mid Zambezi valley of northern Zimbabwe and western end of Lake Cabora Bassa and the Tchumo Tchato area of Mozambique. The area encompasses the Lower Zambezi National Park and the surrounding Game Management Areas ( Chiawa and Rufunsa).



#### 4.3.5 Red Data List

The Red Data List is a tool in conservation based on species. Taxa of species are assessed based on the threat to extinction. The threat could be from the stochastic events in the population, loss of habitat, fragmentation of the population et cetera. A long list of species exists showing species that are critically endangered, rare or vulnerable in Zambia (Taylor, 2000). Appendix 1 reproduces the Red Data List for Zambia. One of the two species designated as critically endangered is Black Rhinoceros which is believed to be extinct, though only a few will be re-introduced to North Luangwa National Park under an intensive management program with the support of the Frankfurt Zoological Society. Poaching has been attributed to the loss of the Black Rhinoceros in Zambia. Besides, majority of the species on the red data list are locally rare or vulnerable. The parameters contributing to the later are not well studied but could be due to habitat selection and endemism. Endemic subspecies of black lechwe (*Kobus leche smithemani*) and Kafue lechwe (*Kobus leche kafuensis*) exist in large but isolated floodplains of Bangweulu and Kafue respectively. Thornicroft giraffe and Cookson's wildebeest are ecologically restricted to Luangwa valley.

There is need for detailed studies in various species taxa. The information from the status of various species is imperative in conservation. For instance, indicator

species such as certain butterfly species and dragonfly may be used to gauge the integrity of the terrestrial and aquatic habitats respectively. Keystone species, for example elephants, will modify the habitat in accordance with their biomass and numbers.

#### 4.4 Abundance Of Species By Ecosystem Type

Data on species listed under each ecosystem type is summarized in Table 4.1 Data on invertebrates, amphibians, reptiles and birds is rather scanty and not well documented

**Table 4.1** Relative abundance of species by ecosystem type

Ecosystem	Ferns	Seed plants	Invertebrates	Amphibians	Reptiles	Birds	Mammals
Woodlands							
Chipya	N/a	N/a	N/a	N/a	N/a	N/a	N/a
Miombo	1	4	3	6	5	2	7
Kalahari	7	6	5	5	4	4	6
Mopane	4	8	2	3	3	3	4
Munga	2	6	1	1	2	7	1
Termitaria	N/a	3	N/a	2	8	5	5
Grassland	7	1	N/a	4	1	6	2
Aquatic	3	N/a	4	7	7	9	10
Other	N/a	N/a	N/a	N/a	N/a	N/a	N/a

##### a) Diversity Of Microorganisms

The occurrence of microorganisms is varied by rainfall and soil moisture content with high rainfall areas having greater numbers of individual species and higher variability. Approximately 497 species of microorganisms have been listed in Zambia. These consist of 12 species of bacteria, 446 of fungi, 4 of protozoa and 35 of viruses

##### b) Diversity Of Plants

The diversity of flora in Zambia has been estimated at 3788 species of which 211 species are endemic to Zambia. 418 are lower plants consisting of non-seed bearing plants namely Thallophyta (algae, fungi, lichens) and Bryophyta (ferns, horsetails, clubmosses). 3370 are higher plants consisting of seed bearing plants namely Gymnosperme (coniferales, genetales and cycadales) and Angiosperme (monocotyledons, dicotyledons and crops including vegetable species)

##### c) Diversity Of Fauna

The diversity of Fauna has been estimated at 3631 species of which 204 species of fish and 200 species of birds are endemic in Zambia. 76 species of birds are considered rare or endangered

The diversity of invertebrates is estimated at 2032 species, of these, the insect group is the most diverse followed by snails and roundworms. Grasshoppers are estimated at 172 species of which 27 are endemic to Zambia.

The diversity of fish has been estimated at 409, information on the endemism of species is poorly documented while data on rare and endangered species of fish is scanty and difficult to find. Fish species known to be seriously endangered include the lungfish (*Protopterus annectens*), *Barbus marequensis* and *Labeo altvelis*. The main reason for depletion are change in environment and over exploitation.

The diversity of amphibians has been estimated at 67 species, only *Hyperrolius kachalolae* is known to be endemic.

The diversity of reptiles is estimated at 150 species whilst that of birds is estimated at 733. 100 species of birds are endemic in Zambia; 76 species are rare or occur infrequently.

The diversity of mammals is estimated at 224 species. Twenty-eight of the species are considered as either endangered or vulnerable [4]. The number of endemic species is not known.

In Zambia biodiversity is valued for livelihood, economic uses, health aspects, ecological balance, aesthetic and recreational uses as well as scientific uses.

#### 4.5 Biodiversity Management Efforts Being Undertaken In Zambia

Current management of the country's biodiversity is incorporated in a network of protected areas consisting 19 National Parks, 35 Game Management Areas, 2 bird sanctuaries, 28 forest reserves, botanical reserves, National heritage sites and protected fishing areas. In addition to the in-situ protection in the above-mentioned areas, ex-situ conservation is practiced to allow for more cost effective preservation of biodiversity through:

- Botanical gardens such as Munda Wanga in Chilanga
- Herbaria by Department of Forests in Kitwe, the Department of agriculture at Mt. Makulu, and by the University of Zambia in Lusaka.
- A national gene bank by the Department of Agriculture at Mt. Makulu.
- Fish breeding stations at Chilanga and Mwekera
- A wildlife orphanage at Chimfunshi near Chingola
- Veterinary research facilities at Magoye and Balmoral
- Game ranches in different parts of the country

Management of these areas is predominantly a responsibility of the state. There is an increase in private sector and NGO involvement in biodiversity conservation in recent times.

The GRZ has prepared a national biodiversity strategy and action plan, which is a five-year plan whose objectives are:

- To ensure the conservation of the full range of Zambia's natural ecosystems through a network of protected areas
- To conserve the genetic diversity of Zambia's crops and livestock

- To improve the legal and institutional frame work and human resources to implement the strategies for conservation, sustainable use and equitable sharing of benefits from biodiversity management
- Sustainably manage and use Zambia's biological resources
- Develop an appropriate legal frame work and the human resources to minimize the risks of the use of Genetically Modified Organisms (GMOs)

In addition a National Biosafety Strategy and Action Plan has been developed to counter the threat of GMOs to the ecosystem.

It is hoped all key stakeholder groups, individuals and interested parties will participate.

Zambia is a signatory to the Convention on Biological Diversity (check Appendix 6 for other conventions to which Zambia is a signatory).

#### 4.6 Threats to biodiversity in Zambia

Biodiversity in Zambia is increasingly threatened by both human and natural factors. The major human threats are:

**Land use conflicts** threatening biodiversity through activities such as shifting cultivation, which is widely practiced in the Northern province, uncontrolled early burning practiced especially in the pastoral areas and the use of insecticides and herbicides in commercial farming areas.

**Human settlements** are threatening biodiversity in Zambia, as the population increases there is a demand to clear more areas for people to settle and the demand for livelihood especially for rural populations for plants and animals as a source of food increases.

**Pollution** as a result of increased industrialization especially along the line of rail, there is an increase in effluent discharges that have polluted the rivers. The Kafue River is the most polluted, receiving effluent discharges from various activities including mining, manufacturing, agricultural and sewage treatment plants threatening the flora and fauna in the river system. In addition, pollution of water systems has reduced invertebrate diversity. There is also an increase in aerial discharges of Sulphur dioxide resulting in acid rain. The local authorities lack capacity to manage domestic, industrial and hazardous waste.

**Over exploitation** of resources such as over fishing in the major fisheries and timber harvesting in the Western province.

**Deforestation** in general due to increase in demand for wood fuel. This takes cognisance of the fact that only 18% of the total Zambian population has access to electric energy.

**Introduction of new and exotic species** such as the Water Hyacinth and Carpfish.

The natural factors include **climate change** as a result of global warming which makes conditions unfavourable for some species and encourage the invasion of alien or invasive species displacing indigenous ones. Among such weeds are lantana camara, Kariba weed (salvinia molesta) and water hyacinth (eichlornia crassipes).

**Conversion of forestlands to agriculture** has also contributed to the depletion of some species and without an appreciable gene pool extinction is threatening.

The **human encroachment** to protected forest areas and the subsequent damage to forests results into habitat destruction. The poor state of museums, herbaria and gene banks as repositories of biodiversity resources also poses a threat to plant and animal collections.

#### 4.6 Recommendations for improved Biodiversity conservation

- Enhance a national policy on management of the country's biological diversity
- Improve capacity of biological resources data collection and management of the data
- Establish a focal point institution on biodiversity to regularly monitor vulnerable, rare and endangered species of micro-organisms, flora and fauna
- Documentation of plant and animal species listed under CITES should be done, and they should be protected under the national law.

#### 4.7 SOILS

Zambia is part of the Central African plateau. The plateau can be conveniently divided into an aggraded and a degraded plateau. In addition the Northeastern part of the country has a montane zone and the Eastern and Southeastern parts have relatively deep rift valleys flanked by faulted escarpment zones. Generally, the key characteristics of Zambian soils are as follows:

- The soils vary according to regions, in the uplands of the aggraded plateau Quartzipsamments and Ustorthents (sandy to coarse loamy soils with no or only very little differentiation) predominate.
- The aggraded plateau is traversed by flood plains and alluviated valleys where young and very variable soils are found. Fluvents (stratified alluvial soils), Psamments and Tropepts (slightly developed young soils), Aquaepets, Aquents, Aqualfs (wet soils with a clay burge), Vertisols (cracking clays) and Histosols (peat soils) dominate in low lying parts while Tropepts, Ustalfs and Ustults (dry soils with a clay burge) are common on terraces in the flood plains and alluviated valleys.
- Saline soils that include Natraqualfs and Natrustalfs (wet and salty soils respectively) are found in the South.
- The degraded plateau consists mainly of level to undulating terrain and stretches from the extreme North to the extreme South and East of the country. The degraded plateau is subdivided into the dissected plateau, the hills, ridges, minor escarpment, the swamps, lakes, the flood plains, the terraces and the major dambos.
- The dissected plateau is characterized by steep slopes with young and generally shallow soils which are subject to soil erosion. Common soils found in these areas include Ustorthents and Tropepts, with minor occurrences of Ustalfs and Ustults.
- The hills, ridges, and minor escarpments have thin soil cover. The dominant soil types are Orthents (shallow and often gravelly soils).
- The common soils in the flood plains of the degraded plateau are sandy or coarse loamy soils (Psamments and fluvents) as well as wet clay soils or organic soils.
- The major dambos contain poorly sorted colluvial and alluvial materials with aquents and fluvents as the dominant soil types.
- The soils of the escarpment are usually shallow, rocky or gravelly and are little differentiated.

- The rift troughs have relatively young soils consisting of shallow, gravelly or rocky soils (Orthents) in hilly areas and variable soils in the flat trough floor areas.

Classification of the soil series is currently in preparation at Mt. Makulu Institute. It is probable that several different soil series will emerge due to wide range in parent materials that occur and have weathered to various degrees in different conditions of relief, drainage and biotic activities over various lengths of time. Country data are used for this purpose, though a number of separate detailed soil surveys have been done in several areas in Zambia at very localised levels. Over 20 soil types have been identified for Zambia (Mt. Makulu Soils Research Team, 2002). The most dominant ones are Acrisols and Arenosols.

The past surveys showed that nine soil groups were occurring in Zambia and factors responsible for the formation of the various soil groups attributed to the interaction of climate, vegetation, relief and drainage on parent materials over a period of time (Brammer, 1971). Other soil surveys have been conducted in 1977 and from 1984 a soil survey team has been operational in each of the nine (9) provinces. **Appendix 9** provides details about topsoil texture, subsoil texture, soil colour, the degree of leaching of nutrients, the soil reaction, the parent rock, the soil drainage, the soil depth as well as the common vegetation type on the soil map.

#### 4.7.1 Environmental Threats To Zambian Soils

Zambian soils are threatened by anthropogenic and natural causes. The anthropogenic causes are divided into:

- **Bad agricultural practice** - shifting cultivation practiced especially in the Northern Province which leads to soil erosion.
- **Deforestation** due to the growing demand for forest products especially fuel wood.
- **Waste disposal** -many local authorities lack capacity to adequately dispose of municipal waste, commercial waste, industrial waste and hazardous waste, which end up contaminating large tracts of soil.
- **Agricultural chemicals** -the increased use of fertilizers contributes to soil acidity, pesticides used on agricultural lands lead to contaminating the soils and leach into underground aquifers.
- **Other toxic substances**- emission of Sulphur dioxide from mine smelters and acid plants into the air reduces soil fertility in the surrounding areas.

#### 4.7.2 Recommendations for improving soil management

- Establish legislation to regulate the use of pesticides
- Increase public awareness on pesticides and toxics

- Promotion and enforcement eco-labelling of products through Mandatory Life Cycle Assessment (LCA) to discourage the use of Agricultural Chemicals
- Capacity building for institutions to test the quality of soils and advise farmers accordingly
- Capacity building for enforcement of environmental legislation

#### 4.8 Situation Analysis: Past & Present Condition Of Resource Base

Qualitative information on the condition of resource base does exist for over many decades in contrast of quantitative information. Prior to the colonial era, wildlife resources were relatively plentiful, with a low human population. As the human population density increased and wildlife population dwindled due to intense exploitation; legislation were enacted and implemented, unmatched with people's compliance (Jachmann, 1998). The resource base was greatly affected by the lack of developmental initiatives for socio-economic betterment of the households in the rural Zambia (Chabwela, 1992). It is feared that the field situation on the resource base is still worsening. Component systems approaches to getting the situation under control are still in force but not sufficient.

##### 4.8.1 Wildlife Protected Areas in Zambia

The ecosystem approach to wildlife conservation in Zambia protects lesser species as well, while conservation measures emphasize on protection of keystone species, endangered species, rare species and endemic species with special emphasis on large mammals and their habitats. Wildlife estate in Zambia is highly diverse with a wider coverage throughout the country. It consists of National Parks and Game Management Areas (GMAs) (Policy for National Parks and Wildlife 1998; see Table 4.2 below) which are basis of the ecosystem management approach. The diversity of wildlife and its habitats are given legal protection in 19 National Parks, 34 GMAs and 4 Wildlife Sanctuaries. Although the Wildlife Sanctuaries were designated their spatial sizes have not been estimated. The 19 National Parks cover approximately 63,585 km<sup>2</sup>, which is equivalent to 8% of the country. Game Management Areas are protected areas established by law to control the hunting of wild animals through a licensing system. GMAs are communally owned areas where human habitation is permissible, along with economic activities that are not inimical to in-situ wildlife management. Zambia's 34 GMAs cover approximately 164,421 km<sup>2</sup>, which is equivalent to 22% of the country. While the total area classified under GMAs is about 72% of the wildlife estate, the entire wildlife protected area system makes up to one third of the total land surface area of Zambia.

##### 4.8.2 Management of wildlife in Zambia

The Zambia Wildlife Authority is responsible for management of the wildlife estate in Zambia. The Government of the republic of Zambia transformed the Department of National Parks and wildlife Service into the Zambia Wildlife Authority under the Zambia Wildlife Act 12 of 1998 and commenced operations in November 1999. The government policy to hive off potentially self-sustaining governmental entities is enshrined in the Public Sector Reform Programme - PSRP (MFNP, 2002). The new Wildlife Act has enhanced Zambia's conservation programmes through the creation of an efficient autonomous body, the Zambia Wildlife Authority (ZAWA). As an autonomous institution, ZAWA is expected to generate its own funds and develop financial sustainability without compromising its core function of biodiversity conservation.

The vision of the new Zambia Wildlife Authority is to “*Achieve excellence in wildlife estate management by developing innovative new approaches and partnerships based on best practice with complete transparency and integrity.*” In line with its vision the Zambia Wildlife Authority will contribute to the preservation of the biological and socio economic value of Zambia’s natural heritage, ecosystems and biodiversity for the present and future generations by the careful conservation of Zambia’s present wildlife resources.

#### **4.8.3 Legal and Institutional Arrangement for wildlife resource management**

As provided for under the Wildlife Act No. 12 of 1998, ZAWA is a body corporate with perpetual succession and a common seal, capable of suing and being sued, using its corporate name. The functions of ZAWA include among others:

- a) To control, manage, conserve, protect and administer National Parks, Bird and Wildlife Sanctuaries, and GMAs, and to co-ordinate activities in these areas.
- b) To adopt methods to ensure the sustainability, conservation and preservation in the natural state of habitats and biodiversity in the above protected areas.
- c) To prepare and implement management plans for these protected areas, in consultation with local communities and key supporters of the Authority.
- d) In partnership with local communities, to grant hunting concessions to hunting outfitters in GMAs, and designate areas to photographic tour operators in National Parks and GMAs.

The legal status of all protected areas in Zambia is embodied in the Zambia Wildlife Act No. 12 of 1998. Under this piece of wildlife legislation biodiversity is conserved and managed under two categories of Protected Areas namely; National Parks and Game Management Areas.

National Parks (Category II of IUCN) serve as natural areas of land declared so by law for the purpose of protecting the integrity of one or more ecosystems for the present and future generations to exclude exploitation or occupation inimical to the purpose of designation of the area, and to provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible (IUCN-CNPPA 19). Game Management Areas (Category IV of IUCN) are protected areas comprising mainly communally owned land that is used primarily for sustainable utilization of wildlife, through hunting and/or non consumptive tourism concessions, for the benefit of local communities and the wildlife resources, but which can be used for other land uses such as settlement, agriculture, forestry, mining etc.

The law also protects wild animals inhabiting areas outside the two categories of protected areas and private land. The existing wildlife policy, legislation and regulations are adequate to effectively and efficiently conserve and manage wildlife resources for sustainable development, if supported by adequate funding.

Table 4.2: National Parks and areas

National Park (km <sup>2</sup> )	Size
Kafue	22,400
South Luangwa	9,050
North Luangwa	4,636
Lukusuzi	2,720
Luambe	254
Mweru Wantipa	3,134
Sumbu	2,063
Lusenga Plain	880
Isangano	840
Lavushi Manda	1,500
Kasanka	390
Nyika	80
Lochinvar	410
West Lunga	1,684
Liuwa Plain	3,660
Sioma Ngwezi	5,276
Mosi-oa-tunya	66
Blue Lagoon	450
Lower Zambezi	4,092
Total	63,585

Table 4.3: Game Management Areas and sizes

Game Management Area (km <sup>2</sup> )	Area
Bangweulu	6,470
Chiawa	2,344
Inangu	43
Kalasa Mukoso	675
Nkala	194
Mansa	2,070
Kaputa	3,600
Tondwa	540
Luwingu	1,090
Chambeshi	620
Kafinda	3,860
Munyamadzi	3,300
Machiya-Fungulwe	1,530
Musalangu	17,350
Lumimba	4,500
Lupande	4,480
Sandwe	1,530
Chisomo	3,390
West Petauke	4,140
Luano	8,930
Mumbwa	3,370
Namwala	3,600
Kafue Flats	5,175
Bilili Springs	3,080
Mulobezi	3,420
Sichifulo	3,600
Lunga Luswishi	13,340
Chibwika-Ntambo	1,550
Lukwakwa	2,540
Musele-Matebo	3,700
Chizera	2,280
Kasonso-Busanga	7,780
West Zambezi	38,070
Mukungule	1,900
<b>Total</b>	<b>164,421</b>

For the purpose of this paper the analysis and review will be restricted to Mosi-oa-Tunya (66 km<sup>2</sup>), Lower Zambezi (4,140 km<sup>2</sup>), South Luangwa (9,050 km<sup>2</sup>) and Kafue (22,400 km<sup>2</sup>) National Parks (NPs), with few examples from elsewhere for elaboration of the magnitude of challenges. The status of the Lower Zambezi National Park as a transboundary area, its potential as a biosphere reserve and eco tourism development motivated us to include it in this assessment. For brief outlines on the secondary parks and their attributes, refer to Appendix 5.

## 4.9 WILDLIFE TRENDS AND STATUS

### 4.9.1 Endemic species

The present distribution of large mammals is related to refuges that are fragmented by human settlements. The endemic subspecies of lechwe occur at low densities on wetlands of international importance in Zambia. The black lechwe (*Kobus leche smithemani*) found on the Bangweulu swamps and the Kafue lechwe (*Kobus leche kafuensis*) confined to the Kafue Flats are the only world's populations (trends in population sizes are shown in Appendix 5). The Thornicroft giraffe (*Giraffe camelopardalis*) confined to Luangwa valley seems to exist as a local race (Bingham, 1998).

### 4.9.2 Endangered species

Zambia's black rhino might be biologically extinct. However, up to about 1999, there were frequent reports on sightings of the species in the Luangwa valley. Research studies indicate that the extinction of the rhino was followed by a parasitic fly larva associated with the stomach lining of rhino. The painted African hunting dog (*Lycan pictus*) can be classified as endangered in Zambia with known populations confined to Lower Zambezi, Kafue and South Luangwa National Parks. The elephant population for Zambia is not endangered but it is on the CITES Appendix I List as threatened.

### 4.9.3 African elephant

The African Elephant (*Loxodonta africana*) is considered as one that may become threatened in the country. The estimates of aerial surveys of elephant populations conducted since 1992 on non-annual basis are mostly comparable and depict some variations among species and over the protected areas. The survey design, survey season and method of analysis over years could be roughly comparable. There is good correlation between the resource allocation (efforts delivered) and the population comeback or declining. In project areas such as South Luangwa NP and North Luangwa NP, elephant populations show some recovery (See Appendix 2).

## 4.10 Biodiversity in Prime National Parks

### a) South Luangwa National Park

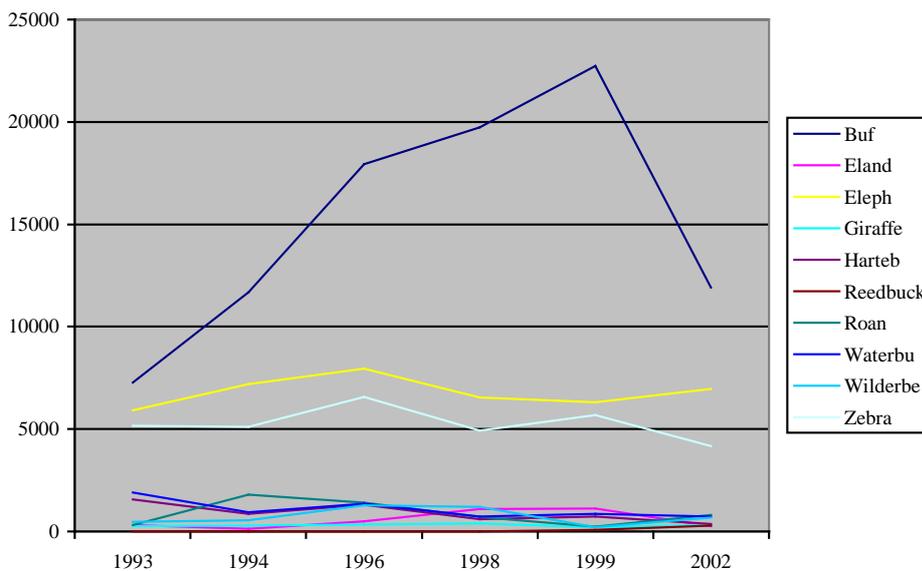
Records indicate that the population of the elephants in the Luangwa valley (North Luangwa and South Luangwa inclusive) was approximately 100,000 in the early 1970s (Leader – Williams et al, 1990) and in 1996 elephant population estimates staggered at about 17,050 (Jachmann, 1996). Further drastic decline of the elephant population has been prevented due to a combination of factors; effective resource allocation for law enforcement and integrated management programmes (Jachmann, 1998).

In the South Luangwa National Park, 1094 species of flowering plants and ferns have been identified and annotated (Astle et al, 1997). Similar work was also

executed in the same ecosystem of North Luangwa National Park, focusing on the vascular plants (Smith, 1997). A total of 924 plant species were recorded, from 464 genera and 123 families. The most biologically diverse vegetation type was Riparian forest, woodland and thicket (412 plant species), while the least diverse was Mopane woodland (73 plant species). However, both works do not indicate the extent of threat to the plant species studied.

Refer to Appendix 3a. (and Chart below) for animal trends in South Luangwa National Park. A great deal of species occur in the Luangwa valley. The most important of reptiles found in the valley include snakes, crocodiles and monitor lizards. The valley has over 700 species of birds (Carr, 1997). Inventories of fish and invertebrates are inadequate and unsystematic (PAPU, 1998) but the species diversity seems to be great.

Trends in Animal Population in South Luangwa National Park



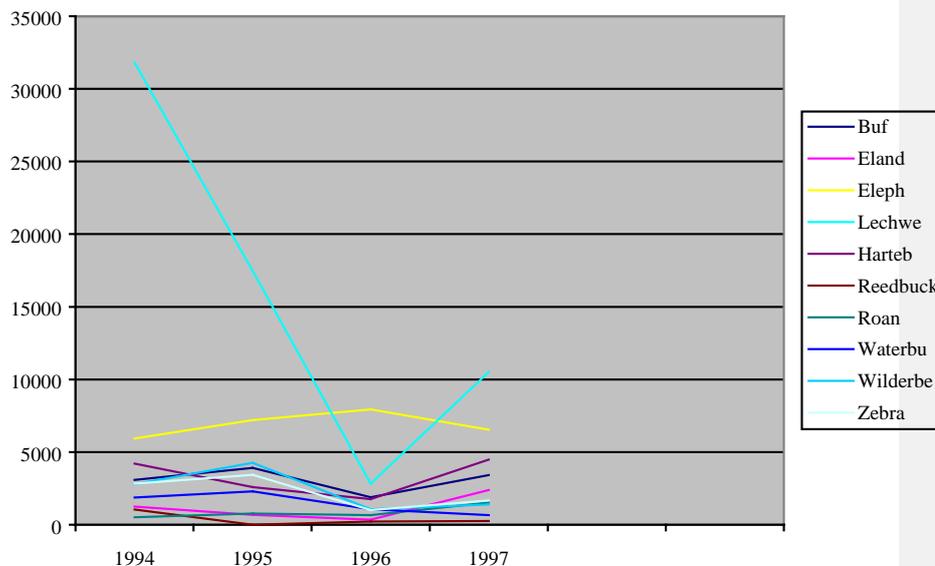
**b) Kafue National Park**

In Kafue NP, animal abundance and population trends have been documented (NPWS & JICA, 1999). The Park was known to have supported very high animal populations in 1970s albeit poaching took a heavy toll to decimate the populations over the years. The park has probably the greatest animal species diversity in Zambia. 158 species of mammals, 481 species of birds, 69 species of reptiles, 35 species of amphibians and 58 species of fish are known to occur in the park. In the last decade, there has been a downward trend mostly in large mammals. Black Rhinoceros (*Diceros bicornis*) seem to have disappeared. Known endangered mammals in the park are African elephant (*Loxodonta africana*), wild dog (*Lycan pictus*) and Cheatah (*Acinonyx jubatus*). Lion (*Panthera leo*) and Spring hare (*pedetes capensis*) are considered vulnerable. Birds that are endangered are Black cheeked Lovebird (*Agapornis nigrigenis*). Slaty Egret (*Egretta vinaceigula*), lesser kestrel (*Falco naumanni*), wattled crane (*Grus carunculatus*) and corncrake (*Crex*

*crex*) are all vulnerable. Much of the efforts have been devoted on the elephants and other critical species have received remote attention and quantitative information is by far limited. The status and trend of many species (fauna, flora, birds, amphibians and reptiles) require to be investigated in detail to generate the needed information for conservation.

The differences in the animal counts and estimates done between 1994 and 1997 of most of the large mammals are not very significant (NPWS & JICA, 1999). Appendix 3b. shows the numbers of animals counted and estimated as the result of aerial surveys in Kafue National Park. In addition the chart below shows the variability of some species in specific counts and estimates for the Luangwa national Park. As indicated by the line graph buffalo, elephant, giraffe and zebra into stable abundance level, while all the other types of wildlife are declining (adapted from Moinuddin et al) as shown in the chart below.

Trends in Animal Population in Kafue National Park



The most noticeable decline in the numbers of wildlife was registered by the Lechwe represented by a precipitous drop from an estimated 31,800 in 1994 to 2,838 in 1996 before increasing to about 10,515 in 1997. These changes in numbers calls in question the accuracy of the methods used in recording these figures inasmuch as they do not much up with the gestation, lactation and weaning period for speedy recovery of the numbers for re-stocking purposes.

**c) Mosi-oa-tunya National Park**

In Mosi-oa-Tunya National Park, size and multiple uses constrain the park’s performance (PAPU, 1998). Status of specific plant species in Mosi-oa-Tunya National Park is basically descriptive and unquantified. Main threats to the plant species occurrence and distribution are edaphic conditions, level of utilisation and invansive alien species such as *Lantana camara*, Kariba weed (*Salvinia molesta*)

and prickly pear. Generally, the densities of wild animals are low, except in the 11 km<sup>2</sup> Zoological Park (part of the Mosi-oa-Tunya National Park). Reliable information on the numbers of the various species is scanty. The table 4 below gives an indication of the animal estimates in recent years.

Little is known of the actual status and trends on the birds, reptiles and amphibians as well as fish in Mosi-oa-Tunya NP. Inventories done indicate that there are 415 species of birds and these are concentrated on the islands and gorges. Gorges in particular have 36 raptor species, among which 13 breed there and 16 are specially protected (PAPU, 1998). Taita falcon *Falco fasciinucha* is one of the species of concern as it is locally rare (Taylor, 2000) but has the breeding sites along the gorge, requiring protection. About 23 amphibians and 30 fish species reside in the Mosi-oa-Tunya area.

**Table 4.4: Wildlife population estimates for Mosi-oa-tunya Zoological Park**

Species	NCC, 1987 <sup>1</sup>	IUCN, 1996 <sup>2</sup>	EDF / NPWS, 1997 <sup>3</sup>	Warden, 1997 <sup>4</sup>
Elephant		30-84	9	
Buffalo	19	50-80	66	150
Giraffe	21	50	10	70
Zebra	124	40	41	200
Wildebeest	213	22	14	50
Impala	982		67	800
Kudu	14			5
Warthog	82		9	50
Eland	8			
Bushpig	8			
Sable	7		1	2
Waterbuck	7			20
White Rhino	1		4	5

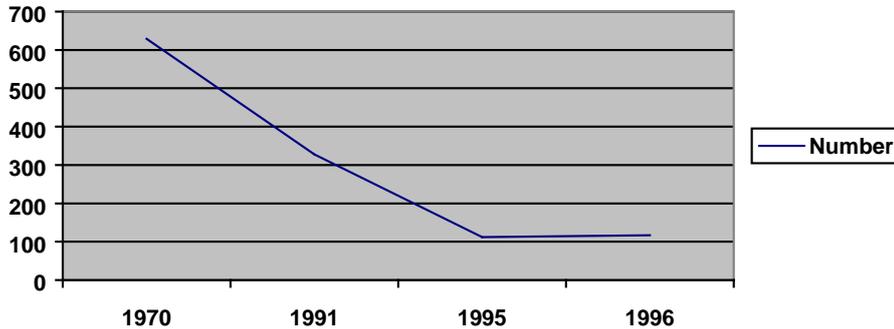
<sup>1</sup> Quoting Chabwela, 1975-1977 <sup>2</sup> SEA Report <sup>3</sup> Microlight aerial census – October <sup>4</sup> Personal Observation

**d) Lower Zambezi National Park**

Chiawa GMA forms the buffer zone on the west and Rufunsa GMA is east of the National Park. Conservation Lower Zambezi (CLZ) is a non-government organisation that works with the Zambia Wildlife Authority under public/NGO partnership and private sectors in developing effective conservation of wildlife and habitat in the Lower Zambezi National Park. The objectives of conservation regime are through inputs into the Zambia Wildlife Authority's efforts in the development, protection and maintenance of biodiversity in the Lower Zambezi National Park, Chiawa and Rufunsa Game Management Areas and increasing community awareness and knowledge of natural resource management opportunities and benefits.

There are the moist dystrophic and arid eutrophic zones. Moist dystrophic ecosystems have poor nutrient soils, which are acidic with high moisture availability. The zone has high plant biomass of low quality and low animal biomass dominated by browsers such as elephant. The dry eutrophic zone has high nutrient soils with low moisture availability. The zone has high quality plant biomass characterized by grazers such as zebra, buffalo and waterbuck. Previous

surveys have estimated the elephant population at 629 elephant in 1970, 328 in 1991, in 1995, 112 in 1995 and 117 in 1996 (Phiri, 1996).



The trend is a resounding decline in the elephant numbers and need for pragmatic interventions need not be overemphasized.

The Lower Zambezi National Park is endowed with numerous wildlife resources, which include mammals, birds, reptiles, amphibians, fish, insects and mammals (Anon, 1992; 1997). Several game species exist and include:

Table 4.5 Game Species

<b>GAME SPECIES</b>	
<b>Common Name</b>	<b>Scientific Name</b>
Elephant	<i>Loxodonta africana</i>
Hippopotamus	<i>Hippopotamus amphibious</i>
Buffalo	<i>Syncerus caffer</i>
Zebra	<i>Equus burchelli</i>
Impala	<i>Aepyceros melampus melampus</i>
Waterbuck	<i>Kobus ellipsiprymnus</i>
Eland	<i>Taurotragus oryxlivingstonii</i>
Kudu	<i>Tragelaphus strepsiceros</i>
Roan antelope	<i>Hippotragus equinus</i>
Warthog	<i>Phacochoerus aethiopicus</i>
<b>CARNIVORES</b>	
Lion	<i>Panthera leo</i>
Leopard	<i>Panthera pardus</i>
African hunting dog	<i>Lycaon pictus</i>
Hyena	<i>Crocuta crocuta</i>
<b>SMALL ANIMALS</b>	
Jackal	<i>Canis adustus</i>
Dwarf and Banded Mongoose	<i>Helogale parvula</i>
Large Spotted Genet	<i>Genetta pardina</i>
African Civet	<i>Civettictics civeta</i>
Bushbaby	<i>(Galago crassicaudatus)</i>

Inconsistent censuses of large mammals by NPWS have shown drastic decline in densities of elephant and buffalo. Rhino (*Diceros bicornis*), once found in large numbers in the valley, have not been sighted during the past ten years. Reduction in buffalo and elephant population numbers is attributed to illegal hunting both in terms of mortality and pressured migration away from Lower Zambezi National Park into the bordering wildlife areas of Zimbabwe. Small mammals and invertebrates are not accounted for because of lack of data exacerbated by absence of financial resources.

In 1996 the then Department of National Parks Wildlife Service placed emphasis on the reduction of illegal wildlife use in the Lower Zambezi National Park and in partnership with CLZ enhanced law enforcement operations. It is estimated that approximately forty to fifty elephants were killed illegally during the years before 1996 (ZAWA, 2002). Buffalo, zebra and kudu were also severely impacted. Illegal hunting pressures forced large mammals to migrate across the Zambezi to Mana Pools National Park area in Zimbabwe. Anecdotal data indicate that reduction in buffalo herds impacted negatively on lion population in the park.

Up to early 2002 illegally killed elephants were estimated at approximately four to five animals per year. Descriptive assessments of the situation by operators in Lower Zambezi National Park indicate that law enforcement efforts by ZAWA combining with local community led to a significant reduction in illegal wildlife use during the period before the year 2002. Wildlife numbers were observed to increase rapidly as illegal hunting pressures were reduced. Anecdotal data and

conservative estimates indicated a doubling in the number of the elephant since 1996 and increases in buffalo and lion populations have been observed. The majority of the population increases among the buffalo and elephant may be attributed to migrations of these large mammals from across the Zambezi river. It seems legal hunting operations in Zimbabwe force large mammals to move into the protected areas in Zambia. Considering that under sufficient resource protection and effective management, legal harvesting under a maximum sustainable yield quota has no impact on animal populations, the resultant downward pull factor on large mammals in the Lower Zambezi System can be attributed to illegal off take.

Animal habitat assessments based on the field work survey conducted in the arid eutrophic and dystrophic ecological zones of Lower Zambezi National Park, the habitat is viable and can support increased densities of herbivores, browsers, mixed feeders and grazers.

## SECTION FIVE

### 5.0 WETLANDS

#### 5.1 Kafue Flats

The Kafue Flats are located at about 15.5<sup>0</sup> S latitude and 27-28<sup>0</sup> E. longitude. The Kafue Flats are an expansive wetlands area of about 6500 km<sup>2</sup>, stretches in an east-west direction to about 225 km long and varying in width between 16 and 50 km (Kampamba, 1998). The Kafue Flats comprise Kafue Flats GMA, Lochinvar and Blue Lagoon National Parks and Open area.

##### 5.1.1 Hydroelectricity generation

Two hydroelectric dams namely the Kafue Gorge dam constructed in 1972 and the Itezhi-tezhi dam built in 1978 are for generating power. The Kafue Gorge dam altered natural annual changes in water levels. The variations in peak floods and dry season period have been reduced (Nefdt, 1992). Research has shown that interference with the flooding regime through increased amount of land under permanent inundation reduced the quantity and quality grass biomass available to the endemic Kafue lechwe (Kampamba, 1998; Kapungwe, 1993; Nefdt, 1992). Certain areas which would ordinarily be available to the lechwe and other grazers in the dry season are now covered by water. Drought years are worse as even the little water that there might be is held back by the Itezhi-tezhi dam for discharge at times that are convenient to power generation.

##### 5.1.2 Animal communities and status

Records show about 20 species of large mammals were found on the Kafue Flats (Sheppe and Osborne, 1971). About 40% of these species are now extinct. Large predators such as lion and leopard were exterminated by pastoralists on the Kafue Flats. The Kafue Flats is endowed with wildlife diversity that exists under limited densities. They include mammals, birds, reptiles, amphibians, fish, insects and mammals. Several game species have been recorded which include, hippopotamus (*Hippopotamus amphibious*), buffalo (*Syncerus caffer*), zebra (*Equus burchelli*), Kafue lechwe (*Kobus leche kafuensis*), sitatunga (*Tragelaphus spekei*), waterbuck (*Kobus defassa*), and hyena (*Crocuta crocuta*). The small animals include Jackal (*Canis adustus*), dwarf and banded mongoose (*Helogale parvula*), large spotted genet (*Genetta pardina*) and African Civet (*Civettictics civeta*). Review of research evidence estimates the Kafue lechwe population at about 250,000 in 1934 and 41,574+-5857 in 2000 (Pitman, 1934; Kampamba, *et al*, 2000).

The carrying capacity of the Kafue flats was estimated at 80,000 animals after dam impoundments (Kapungwe, 1993). The population of Kafue lechwe is currently around 40,000 animals. The size of population of Kafue lechwe has continued to exist at about and below carrying capacity since the 1980s. Research has shown that the proportion of legal hunting on licences is estimated at 2% or less of total population. Like in other species stochasticity in environmental conditions and dependent factors do not limit population growth. The sharp drop in animal numbers from 1974/75 to date is due to illegal hunting.

## 5.2 Bangweulu swamps

The Bangweulu Basin is a Ramsar Site located at latitude 10° - 13° South and between longitude 29° - 31° 30' East. The Bangweulu basin measure about a total of 30,000km<sup>2</sup> and 2/3 of the area comprises the core basin. It comprises the Bangweulu and Kalasa Mukoso Game Management Areas (GMAs) and Open area.

Comment [EM1]:



Figure 5.1: Luapula Wetlands, near Kashiba – The water table appears lower as can be seen from what used to be a covered area with water

In April 2002, Thomro Investment Limited a private organisation worked with the Zambia Wildlife Authority to investigate the ecology of the shoebill stock for developing effective conservation strategies of the species and its habitat in the Bangweulu Swamps (In press). The Zambia Wildlife Authority will apply the research results in the development, protection and maintenance of the shoebill population and its critical habitat in the Bangweulu Game Management Area. Other objectives are to increase community awareness and knowledge on the shoebill for resource management opportunities and benefits, assist the local communities develop a focused value on the shoebill for economic benefits through tourism development as means to achieve sustainable management of the shoebill and development in local communities.

As part of conservation of the shoebill and biodiversity Thomro Investments Limited expressed interest in the ecological study of the Bangweulu Swamps for effective in-situ management and feasibility for re-introductions. This ecological study will serve to provide the baseline data for the shoebill population rehabilitation.

### 5.2.1 Ecological zones

There is one ecological zone namely the moist dystrophic. The ecosystem is characterised by rich organic top soils which are acidic with high moisture availability. Except on flood plains grassland, this zone has high plant biomass of low quality and low animal biomass historically dominated by browsers such as elephant. The arid eutrophic systems in zones elsewhere such as the East Africa one are characterised by high nutrient soils with low moisture availability and low mean annual rainfall of less than 800 mm per annum. It has low but high quality plant biomass dominated by grazers such as reedbuck, oribi and zebra.

### 5.3 Synopsis of Major Wetlands in Zambia

Table 5.1 gives a summary of the major wetlands in Zambia in terms of their type, system, location and approximate coverage where available. It can be seen from the table that Zambia has extensive and diverse wetlands of considerable local and international importance which cover approximately 14% of the country's surface area and include areas of montane bog, wet forests, dambo, swamp, marshes and flood plain types. Dambos are the most extensive covering 10% while swamps, marshes and flood plains cover the other 4% [1]. Zambia is considered the wettest country in the SADC region in terms of fresh water

**Table 5.1 - Extent of Major Wetlands in Zambia[1]**

Natural	Wetland	System	Type	Location	Coverage Km <sup>2</sup>
	Bangweulu	Lake	Marsh and swamp	Northern	11,000
	Zambezi flood plain	Riverine	Flood plain	Western	9,000
	Kafue flats	Riverine	Flood plain	Central, Southern and Lusaka	6,500
	Mweru	Lake	Swamp and Marsh	Luapula	4,500
	Chambeshi plains	Riverine	Flood plain	Northern	3,500
	Lukanga swamps	Riverine	Swamp and Marsh	Central	2,500
	Busanga plains	Riverine	Flood plain	North western	2,000
	Mweru wa Ntupa	Riverine	Swamp and marsh	Northern	1,300
	Dambos	Palustrine	Plain	Country wide	75,260
	Tanganyika	Lake		Northern	
Man made	Kariba	Lake		Southern	
	Itzhi-tezhi	Lake		Southern	

Zambia's wetlands are valuable socio-economic assets from which a variety of resources are obtained. The wetlands are a source of domestic water and hydroelectric power in addition they are a habitat to a variety of fish, birds and large mammals some of them endemic to Zambia. The wetlands also provide an

agricultural system that provides an alternative to the rain fed system with no risk from crop failure due to drought

#### 5.4 Threats To Wetlands In Zambia

Table 5.2 gives a summary of the major threats to the wetlands in Zambia. It can be seen from the listed threats that anthropogenic causes are the major threats although natural causes such as climate change do pose a threat.

**Table 5. 2.** Major threats to wetlands in Zambia[1,2]

<b>Threat</b>	<b>Examples of areas of risk</b>
Agriculture	Nearly all wetlands of southern parts
Construction of roads	Along major road networks
Dams	All dams especially lower Zambezi
Drainage for agriculture and settlements	Zambezi flood plain, Lukanga and Bangweulu
Dredging/canalization	Zambezi flood plain, Lukanga and Bangweulu swamps
Discharge of agro-chemicals	All parts of Zambia
Eutrophication	Urban areas
Land fills and waste dumps	Urban areas
Fires	All parts of Zambia
Human settlements	Luapula, Bangweulu, Kafue flats, and Lukanga swamps
Irrigation	Kafue flats and Luapula
Land tenure	All parts of Zambia
Mining	Kafue flats
Over fishing	All rivers, lakes and flood plains
Over grazing	Most parts of Eastern, Southern, Central and western
Poaching	All parts of Zambia
Industrial and domestic waste	Urban areas
Deforestation	All parts of Zambia
Siltation	Luangwa river
Water abstraction	Kafue flats, Zambezi River and Kafue River



Figure 5.2: Luena Flats, Chief Mushota's Area, Luapula Province. Much of what used to be a spectacular wetland has dried up due to anthropogenic factors

Even though Zambia has extensive wetland resources, planned management of these resources does not exist. The greatest threats to wetlands in Zambia are a result of unsustainable competing uses. The sustainability of wetland resources is threatened essentially by the lack of appreciation of the values of wetlands, the lack of coordination of their utilisation and their fragmented management. Developing, implementing and monitoring a comprehensive wetland conservation framework has been identified as a challenge for Zambia.

## 5.5 Animal communities and status

The Bangweulu GMA is endowed with wildlife resources although they exist at low densities. These include mammals, birds, reptiles, amphibians, fish, insects and mammals. Several game species have been recorded which include elephant (*Loxodonta africana*), hippopotamus (*Hippopotamus amphibious*), buffalo (*Syncerus caffer*), zebra (*Equus burchelli*), black lechwe (*Kobus leche smithemani*), tsessebi (*Damaliscus lunatus*), sitatunga (*Tragelaphus spekei*), waterbuck (*Kobus defassa*), sable antelope (*Hippotragus niger*), roan antelope (*Hippotragus equinus*), and warthog (*Phacochoerus aethiopicus*). Carnivores include lion (*Panthera leo*), which are presently locally extinct. Those present are leopard (*Panthera pardus*) and hyena (*Crocuta crocuta*). The small animals include Jackal (*Canis adustus*), dwarf and banded mongoose (*Helogale parvula*), large spotted genet (*Genetta pardina*), African Civet (*Civettictis civeta*) and bushbaby (*Galago crassicaudatus*) in the woodlands.

The endemic black lechwe population on the Bangweulu swamps is the only world's population of the subspecies. The population has been limited to less than the carrying capacity since the 1970s. Research by Howard, *et al.* (1984) estimated

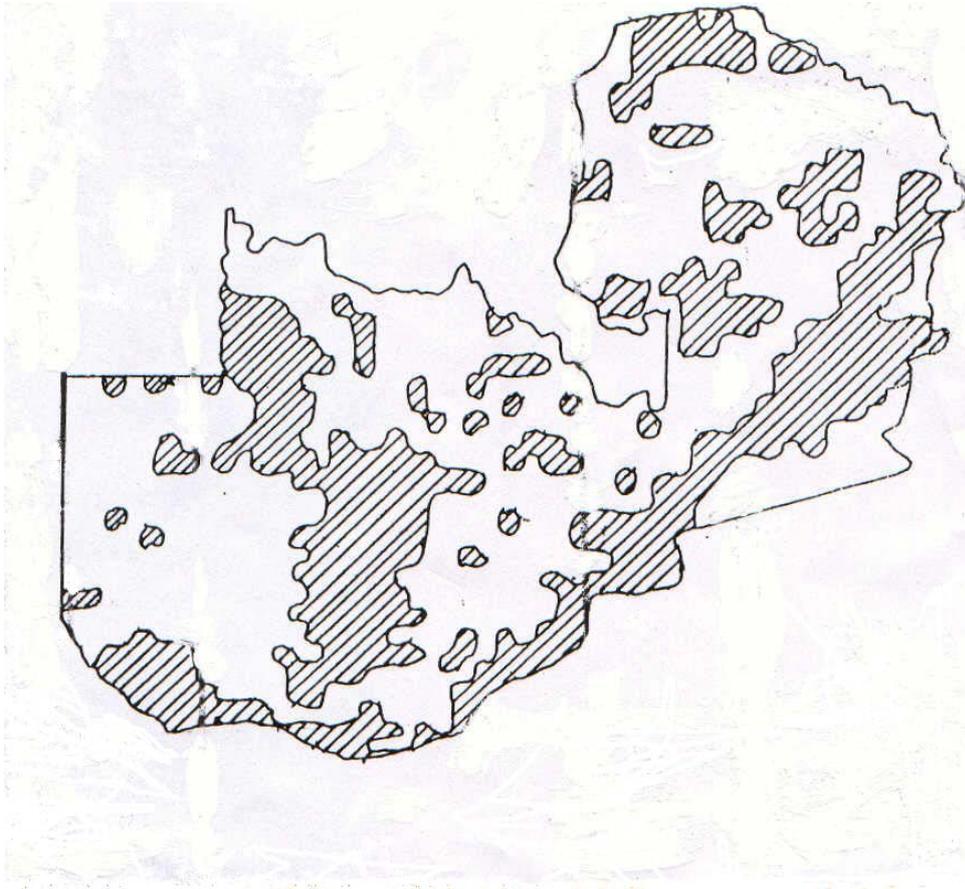
the potential increase in black lechwe at 20% while the actual annual rate of population increase on the Bangweulu swamps was estimated at 5%. Considering that harvest quotas for legal off take are set at about 2% or less of the total population 15% of the potential population growth is unaccounted for each year and can be attributed to illegal harvesting.

## 5.6 Elephant Management In Zambia For Biodiversity Conservation

Records show that elephants were once spread over the entire continent of Africa. The elephant freely ranged the whole of the sub-Saharan Africa in the tropical montane forests, open grasslands, semi arid bush and desert. In Zambia elephants were widely distributed until the early 1970s (see figure 1). The increase in human population and agricultural activities and excessive hunting for ivory during the precolonial and colonial era reduced elephants' populations such that today they are mainly confined to protected areas. By 1989 for example, the numbers had fallen to about 18,000 animals from an estimated 200,000 in the 1970s. The species was later upgraded to Appendix I of CITES in 1989 to save it from extermination from commercial poaching. Zambia has a low population density compared with other countries in the region at 12.1 people per km<sup>2</sup>. On the other hand, Zambia has a population growth rate of 3.2% per year. This high growth rate, coupled with a harsh economic environment, has resulted in human encroachment in areas around National Parks and increased settlement in GMAs. In Zambia, encroachment is associated with clearing of vegetation for agriculture, bush fires, and illegal subsistence hunting.

The current distribution patterns and population estimates of elephants are derived from aerial surveys. The Zambia Wildlife Authority is responsible for population monitoring. The surveys are supposed to be conducted biannually but due to resource constraints, infrequent aerial counts are restricted to few National Parks with external support. The last national survey was done in 1996 and up to this time it has not been possible to cover the whole country. In the past aerial counts focused on the core elephant ranges of Luangwa, Kafue and Lower Zambezi areas with donor support.

Fig 5.3: Previous range and elephant distribution in Zambia (Ansell, 1978)



### 5.6.1 Elephant Range

The elephant range is difficult to define accurately since the animal traverses very large areas for amounts of food to meet their metabolic requirements. Elephants also tend to wander in search of water and food at different times of the year. However, law enforcement reports and anecdotal reports from ZAWA staff, and the local communities through CRBs indicate an increase in elephant / human conflicts in a number of new areas as an indication of expanding elephant range. National Parks in the Luangwa valley, Mid Zambezi valley, Sioma Ngwezi and Kafue system are the core areas of elephant and are present throughout the year. Other remaining areas are for seasonal utilisation and elephants are present seasonally. Furthermore there are erratic range areas where elephants may occur periodically but not necessarily every year and there is also unknown range where elephants are known to occur but there is no further information available. Cross border movements have been recorded between Zambia and Zimbabwe; Zambia and Namibia around the Caprivi Strip /Botswana/Southern Angola and Zambia/Malawi to and from the Luangwa valley. A proportion of the elephant's seasonal, erratic and unknown range in Zambia occurs outside the protected areas' network.

National Parks are functionally becoming more and more of ecological islands due to human settlements around their borders and land conversion for agriculture. This is against the principle that key ecological systems extend beyond protected area boundaries and in many cases also overlap international borders. As a migratory and keystone species, the African Elephant can be used to identify ecological corridors and so as to promote the corridor approach that will connect protected areas of the sub-region or neighboring countries.

Conservation of wildlife habitat and movement corridors is therefore perceived vital in order to ensure connectivity of biodiversity areas. This approach is critical because firstly, elephants in protected areas do go out of established reserves to areas where they get killed legally as problem animals and illegally through poaching. Secondly, protected wildlife areas with viable populations today may not do so in future due to critical constriction, fragmentation and loss of habitat on corridors. Human population increase and increased demand for more land for agricultural development threatens the future of corridors linking protected wild life areas.

A number of explanations for migrations in faunal species include reduced available feed, avoidance of predation and seasonal changes in rainfall. Other factors influencing the direction and the magnitude of elephant movements include political changes affecting the management regime of the population in the country, increased number of the population requiring an extended range, legal hunting and illegal offtakes in the area. Human density dependent activities such as fire and habitat modification do influence the feeding ecology of the elephant. Established and well-managed wild life corridors reduce chances of species extinction by increased feeding and breeding habitat.

Habitat loss and fragmentation of land close to protected areas may therefore lead

to extinction of faunal species. Rapid loss and fragmentation of wildlife corridors will result in loss of biodiversity. There is need for a study that seeks to identify, zone and map the wild life corridors, forecast future impacts and indicate alternative land uses not in conflict and intense competition for land on corridors; suggest ways to harmonize rural communities and conservation authorities and other stakeholders for intensive management and conservation of biodiversity in the area.

### 5.6.2 Elephant habitat

Most of the elephants in Zambia are found in the following areas: Luangwa valley (in National Parks and Game Management Areas) dominated by mopane woodlands on the valley floor and Miombo woodlands on the plateau; Mid Zambezi Valley (National Park and GMAs), dominated by Acacia woodlands, mopane and miombo woodlands; Kafue area (National Park and GMAs) dominated by miombo woodlands and some *Baieka plurijuga* woodlands on kalahari sands in the southern parts; Sioma Ngwezi and West Zambezi GMA and other areas put together, mainly miombo and some *Baieka plurijuga* woodland and flood plains; Bangweulu and Nsumbu are mainly covered by miombo and thickets. Minor elephant areas include; the West Lunga National Park, and Mweru wa Ntipa areas.

The areas with viable populations of elephants in Zambia are the Luangwa Valley, the Lower Zambezi Valley, Sioma Ngwezi, the Nsumbu/Mweru Wa Ntipa, the Kafue National Park and adjacent areas, Sesheke/Senanga districts, Kasanka/Lavushi Manda areas and Chizera/West Lunga areas in North Western province. However there are no data from most of these areas on the population estimates of the elephant.

The habitat currently available to elephants in Zambia is considerably large. Over 230,000 km<sup>2</sup> or about 30% of the total land mass is set aside as Protected Areas in form of National Parks and Game Management Areas and although some traditional movement routes and patterns may have been disrupted by recent changes in land use and human settlement patterns, there is still adequate habitat to accommodate the increasing elephant population. The availability of water throughout the year in most Protected Areas and most communal/traditional land makes Zambia an ideal elephant country.

### 5.6.3 Elephant Population status and trends

Zambia boasted of one of the largest elephant population in Africa south of the Sahara in the late 1960's. It is estimated that the elephant population at that time was over 200,000. Combinations of census results backed by anecdotal observation have documented a decline between 1976 and 1986 because of excessive poaching. The losses in elephant numbers in recent years have leveled off due to intensification of anti poaching activities and community based wildlife management projects in these areas. The national elephant surveys conducted between 1992 and 1996 estimate a national population of between 22,000 and 25,000 animals (see Appendix 3).

On average based on anecdotal data reviewed in the last decade, the poaching scourge in Zambia's Protected Areas appears to have subsided considerably in areas with external support such as South Luangwa, North Luangwa and Kasanka National Parks. Other areas are under severe threat from poaching. Between 1970 and 1990 there were generally more reported incidences of poaching compared to the last decade. Although not statistically significant, field reports and aerial observations indicate a reduction in poaching trends in elephant since early 1990 while on the other hand at least 4000 Kafue lechwe are illegally harvested from the Kafue Flats. The trend might be the same in various other species for bush meat trade. More monitoring data should be generated to ascertain the impact of illegal utilization on biodiversity complexes in Zambia.

#### 5.6.4 Role of the species in the ecosystem

Elephant is a keystone species, which plays an important role in the ecology of the habitats. Their feeding habits of breaking woody vegetation and opening up forest canopy and thickets, modifies the habitat. Pathways are created which other animals and humans alike can use. Opening forest canopy and thickets makes the habitat unsuitable for thicket loving species such as Black rhino.

Elephants also facilitate seed dispersal. Seeds of species such as *Faidhebia albida* are known to germinate from elephant dung. Several other woody plants benefit in the same way. Elephants are also known to dig for water in dry riverbeds making water available to other species. Loss of this keystone species would have a significant impact on the ecology of its habitat and other species.

The need to monitor the elephant population like any other wildlife species can not be overemphasized. Two programmes are under implementation in the elephant monitoring.

#### 5.6.5 The Monitoring of the illegal killing of elephants (MIKE)

The monitoring of the illegal killing of elephants became operational in Zambia in 2002 as a pilot project. The programme will be established in South Luangwa National Park and would include surrounding GMAs if sufficient resources are available. The programme would also target border areas, entry and exit ports, and other key elephant areas, in order to get countrywide data on the illegal killing of elephants, for monitoring purposes. The MIKE as a programme is not an anti poaching operation to stop the illegal killing of elephants, it only provides information and skills needed for effective monitoring of the illegal killing of elephants important for management decisions.

## 5.7 International Trade Monitoring

Although not sufficient, the Zambian Government has put in place some measures to control international trade in wildlife products. The Zambia Revenue Authority (ZRA) facilitates the export of wildlife and wildlife products on the strength of the CITES Export Permits and Veterinary Health Certificates. The Department of Animal Production and Health (DAPH) issues Veterinary Health Certificates on the strength of a valid export permit from the ZAWA. Effective monitoring of international trade is weak and hampered by lack of capacity by ZAWA with other law enforcement agencies to police the ports and lack of skills in identification of specimens.

However, to enhance wildlife law enforcement, ZAWA requires strong collaboration with other Institutions in the country such as the Drug Enforcement Commission, Anti-Corruption Commission, Zambia Police, National Airports Corporation, Immigration Department and Zambia Revenue Authority, to form surveillance network, and develop capacity to apply forensic techniques.

## 5.8 RECOMMENDATIONS

### A. Monitoring as a strategy for good wildlife management practice

The importance of monitoring is to provide feedback for the adaptive management system, whereby 'adaptive' relates to adjustment of management actions based on information collected through monitoring. Wildlife monitoring can be defined as a periodic inventory of key elements of the resource in predetermined areas or, an investigation into the status of economically important species, at predetermined intervals in selected areas. Zambia Wildlife Authority's (ZAWA) definition includes the monitoring of land-use, law-enforcement effort and efficiency, and illegal use of wildlife. Thus, monitoring not only needs to count particular animal species in selected areas, but also collect information on changes in land-use, and on the size, frequency and movements of anti-poaching patrols in relation to numbers of animals killed illegally. The main objective of wildlife monitoring is to regulate wildlife-based industries and management practices, whereas the main objective of monitoring of law enforcement is to regulate and optimize the effort and efficiency. Monitoring of land use provides additional feedback for adaptive management, mainly to facilitate planning.

#### i) Monitoring for regulation of utilization of wildlife

Zambia's capacity and a system to monitor utilization of wildlife is undeveloped. In the mean time annual setting of hunting quotas for each of the viable Game Management Areas for Resident, and Non-Resident hunting can only be sustainable when annual quotas are based on sound monitoring information. Annual setting of off-take quotas for (community) culling schemes is also important for maintenance of biodiversity.

Monitoring is also important to establish quantitative trends for management biodiversity and assessment of impacts of abuse of wildlife. The conservation of

key-species, such as elephants, is of global concern. The elephant has in the last three decades assumed a very high value profile. As a result global interests in its management profile by Range States are overwhelming. As indicated earlier, elephants declined to low densities between 1970 and 1980 in Zambia. Although counts of elephants will not save them, sharp negative trends will ring alarm bells and will mobilize the conservation establishment, the general public and the authorities. International Conventions, such as the Convention on the International Trade in Endangered Species of Flora and Fauna (CITES) International Ivory Trade, demands periodic but consistent monitoring of national elephant populations.

The viability of conservation areas for safari hunting and photographic tourism is dependant on professional advice based on monitoring. As a semi-government organization, the ZAWA relies heavily on concession fees from safari outfitters in the Game Management Areas (GMAs) and from lodges in the National Parks. Sharp reductions in key-wildlife populations will endanger the industry and therefore the long-term existence of biodiversity and survival of ZAWA.

The viability of community projects is also dependant on good management profile of the resource and resultant tangible benefits to the rural residents as co-managers. In addition to several proposed projects, Zambia has two Community Based Natural Resources Management (CBNRM) programs that have been operating in a number of GMAs for more than 10 years (e.g. the Administrative Management Design for Game Management Areas (ADMAGE) and the South Luangwa Area Management Unit (SLAMU). Success of these programs relies on the abundance of key wildlife species that determine the viability of the safari hunting industry. Thus, the reason for monitoring is closely related to the setting of annual off-take quotas, as described above. The main difference is that periodic monitoring is done in close collaboration with the communities. The communities will be trained to handle most of these monitoring tasks in future.

## **ii) Law Enforcement for Regulation of Management Practices**

In National Parks, law enforcement will always be needed for monitoring abuses of wildlife. Law enforcement is expensive and consumes most of the budget of the agency responsible for managing the resource.

To steer operations, and to improve cost-efficiency, activities need to be monitored, providing management with monthly feedback. For the same reason, animals killed illegally need to be monitored to relate the law-enforcement input (effort) to the output (accomplishments and effects of law enforcement). As an example it is argued that almost 60% of Zambia's national elephant population is concentrated in the SLAMU area (i.e. South Luangwa National Park and the Lupande Game Management Area) (Jachmann, 1998). One of the reasons why elephants are still in abundance in this area is the law-enforcement monitoring system introduced in the early 1990s.

Thus, monitoring of law enforcement and animals killed illegally is done with the following objectives:

- a) Steering of law-enforcement operations. Based on monthly monitoring feedback, the effort may be modified and/or directed towards problem areas.
- b) Optimizing cost-efficiency of law-enforcement. The effort, in terms of conventional patrols and investigations, should be optimized for each area, while scout performance should be closely monitored to maintain efficiency.

### iii) **Monitoring of Land use**

Monitoring of land uses in protected areas is a critical component to wildlife management. It is important for timely detection of changes in land-use patterns in National Parks and Game Management Areas, to keep track of suitable habitat available to wildlife in relation to the viability of the professional hunting industry and CBNRM projects. It can also facilitate land-use planning in GMAs.

Although some expertise in monitoring is available in the ZAWA, resource allocation is insufficient, and current methods of monitoring are unsatisfactory, expensive and inadequate for adaptive management and sustainable utilization of the resource. Innovative and cost effective methods need to be developed over time for land use monitoring.

## **B. Community based Natural Resources Management Programme**

Management of incompatible human settlements requires a participatory land use planning with all stakeholders to develop the appreciation of ecologically and economically land use options. Effective management of wildlife is best achieved by giving it focused value for those who live with it. Community-based wildlife management and benefit sharing should be enhanced so that there is a positive correlation between quality of management and the magnitude of benefit. There should be a motivation for good management. Increased community participation in conservation and the eco- tourism industry is also important for widening the revenue base.

The Poaching scourge needs to be controlled through increased resource protection to curb abuse of wildlife and requires capacity building in rapid response and promotion of programmes that contribute to increased food security and poverty alleviation.

Unmanaged fires may be responsible for loss of biodiversity. Intolerant species do not survive hot fires. Thus, development of fire management plans and strengthened community awareness will sensitise communities against the dangers of unmanaged fires.

## **C. Development of the Wildlife Protected Areas System Plan**

An effective ecosystem management of biodiversity requires classification and mapping of the habitats for a wildlife protected area system plan. Vegetation maps have been used in developing system plans in other countries. Zambia's vegetation map, LANDSAT maps and aerial photographs would be used to classify ecological

vegetation zones while groups of animals and microbes may also be used in identifying areas of high biodiversity. It needs to start with species inventories.

#### **D. General Management Plans for Biodiversity Conservation**

So far, ZAWA has put in place General Management Plans in two wildlife areas namely Kafue and Lower Zambezi National Parks, to guide management to achieve sound management and maintain a balance between preservation and use of the ecosystems. More general management and Zone plans are required for effective and sustainable utilization of the wildlife resources. A number of species and subject specific policies need to be developed and ratified by government for execution. Among them is the fire policy, which is designed to maintain the integrity and ecological functioning of the habitat. However, the vastness of the protected area network (30% of the total landmass) would make the implementation of the fire policy tenuous in the face of limited resources. It is however believed that with the increasing levels of community participation through the CRBs wild fires are likely to be reduced.

All being equal the Zambia Wildlife Authority also desires to formulate the elephant, rhino, wild dog and other specific policies. The policy statement expresses government's intention to regulate use of wildlife by such means and measures that will ensure its long-term survival, by providing for human benefit particularly to local communities, and enjoyment of the biodiversity by the public in such manner and by such means as will not degrade the status.

## 5.8 ECO-TOURISM



Fig 5.4 Ntumbachushi falls, Kawanbwa. The water is not as forceful as earlier due to reduced flow.

Zambia's Tourism is mainly wildlife based. The scenic beauty and elephants, along with other big game, make up the main attraction. However the industry is not yet developed to sustainable levels. Rehabilitation of road infrastructure and recapitalization of the Zambia Wildlife Authority is recommended for Zambia to compete in the tourism sector. The Government has recognized tourism as one of country's economic backbone. There are relatively few statistics on tourism in protected areas in Zambia (Table 5.3).

Table 5.3: Numbers of tourists, visiting selected protected areas

Year	Kafue Flats	Kafue NP	Mosi-oa-Tunya NP	Vic Falls	South Luangwa NP
1994	-	1,303	-	-	-
1995	-	-	-	-	-
1996	-	1,850	-	-	-
1997	3,440	2,133	-	-	-
1998	4,401	2,085	-	-	12,699
1999	967	-	23,608	70,075	12,893
2000	444	-	14,998	31,248	16,837
2001	-	3,390	12,433	-	18,241

Source: Moinuddin et al, 2002

Under the Securing of Environment for Economic Development (SEED)-Biodiversity Project, the aim is to improve the conditions of the target areas to provide for revamped investment opportunities and economic growth. Biodiversity Project is a component of SEED-Tourism Project. Its target areas are Mosi-oa-Tunya and Kafue National Park and their communal surrounding areas.

In November 2001, the Government of Zambia through the Ministry of Finance and National Planning made agreements with the World Bank for financial support. Within the provision of the funding, Global Environment Facility (GEF) and International Development Association (IDA) have committed to provide US \$ 14 Million indicatively, to be utilized on the Biodiversity Project. The initial financing will be utilized in the project preparatory phase that will last for six months from the date of effectiveness of the funding. The stage will be followed by the implementation of full project, lasting for a period of five (5) years.

## 5.9 Constraints In Wildlife Management

The efforts by ZAWA to manage wildlife have been constrained by a number of factors that include:

- a) *Resource Allocation:* The most important factor is inadequate resource allocation, for general management and operations, such as monitoring. Resource allocation is in this case financial and human.
- b) *Illegal hunting and over-exploitation:* Illegal hunting, especially for commercial purposes, is one of the main causes of wildlife decline in Zambia. For example, the African elephant has declined from an estimated 300,000 in the 1960s to about 15,000 to 25,000 during the late 1990s.

For the same reason, the population of black rhino fell from an estimated 15,000 during the 1980s to possibly a few animals by the end of the 1990s. Over-exploitation through the legal licensing system has been mainly due to a lack of sound monitoring information.

- c) *Land-use pressure:* With only 12.1 people per km<sup>2</sup>, Zambia has a low population density compared with other countries in the region. However, Zambia has a population growth rate of 3.2% per year. This high growth rate, coupled with a harsh economic environment, has resulted in human encroachment in areas around national parks, and increased settlement in GMAs. In Zambia, encroachment is associated with clearing of vegetation for agriculture, bush fires, and illegal subsistence hunting.
- d) *Inadequate monitoring information:* Management of wildlife requires accurate and/or precise information on abundance and distribution of economically important wildlife species, and the status of their habitats. Due to inadequate resource allocation, this information is non-existent for most protected areas.
- e) *Inadequate planning:* Due to the inability to generate data for adaptive management, preparation of general management plans has not been done for most protected areas, hence wildlife management in these areas has continued on an ad-hoc basis.

Other critical threats include unmanaged fires, incompatible agriculture, invasive plants and dam operations.

## SECTION SIX

### 6.0 PARTNERSHIPS AND COOPERATION

#### 6.1 Government Support

The Zambian Government through the Ministry of Finance and National Planning has committed to ZAWA an average of US\$500,000 per month to cover staff salaries, salary arrears, field costs, finance and administrative expenses from July 2002 up to May 2003 due partly to the delayed hunting concession allocations.

In September 2002, the Ministry of Finance and National Planning executed the agreed financing agreement. The outstanding hunting income shares for Community Resource Boards from hunting for the 2000 are being paid. This will help communities to implement community projects and hopefully renew the confidence of the local communities in Zambia Wildlife Authority as a genuine partner in conservation. The plan to pay all outstanding statutory obligations is being implemented too.

#### 6.2 Support from cooperating partners

Following the appointment of the new Board of Directors, the Director General and senior management team, the cooperating partners have expressed their willingness to support ZAWA. The cooperating partners continue playing cardinal role in building the gap where the ZAWA and the government lack. Refer to Appendix 4 for detailed nature of assistance, location and activities undertaken.

#### 6.3 Threats To Wildlife Biodiversity

The major threats to the animal populations in Zambia are the increasing constriction of the range by settlements & agriculture, heavy poaching scourge since the early 1970s to date, over-fishing, uncontrolled bush fires, inappropriate agricultural practices and invasive alien species. As the human population is increasing countrywide at 3%, more range is reclaimed and most of the wildlife traditional movement routes are taken over by human settlements. This has also resulted into rising human / elephant conflicts. Anecdotal data on damage to various agricultural crops caused by feeding and trampling as well as loss of human life are indicative of the magnitude of the problems that cannot be ignored particularly in areas with high elephant densities.

##### 6.3.1 Critical Threats

###### a) Incompatible human settlements

Human settlements in the wildlife estate contribute to the conversion of the wildlife habitats. Human settlements are a form of encroachment where they are illegally established in the protected areas. Both Corridors and habitats are destroyed. Species become vulnerable and the encroachment may result into negative impacts.

**b) Poaching and Over-fishing**

Poaching is referred to as direct but illegal offtake of the wildlife resources. It is human driven population regulatory factor, which is unsustainable and may result in extinction of species. From the management point of view, poaching is wasteful and irrational. The major threat to wildlife game is probably poaching. Some species such as black rhinoceros, Robert's lechwe and some insect species are feared to have disappeared. Protected areas are largely located in the watersheds and fishing is one of the major land uses. However, the fish stocks are over-exploited and as a result biodiversity (fish) is under threat to extinction.

**c) Unmanaged fires**

Generally, controlled fires can be useful in the manipulation of the ecosystem. Late fires, however, are known to burn the accumulated dry vegetation biomass. Consequently, the vegetation composition and structure are altered. Fires may as well cause loss in some species and encourage the dominance of the fire tolerant species. Ultimately, the species diversity constricts. Uncontrolled fires are prevalent in protected areas. Some protected areas have implemented fire management plans albeit the majority still are faced with the challenges of containing uncontrolled fires.

**d) Incompatible agriculture practices**

Anthropic activities for agricultural land use are varying. These include opening up new land (habitat conversion) and application of agrochemicals. The former may destroy the habitat completely or obstruct the animal corridors. The latter affects the aquatic systems, inevitably negatively impacting on the biodiversity. Incompatible agricultural practices are practiced widely throughout the country, especially in the protected areas system.

**e) Invasive Alien species**

Invasives constitute one of the leading threats to natural ecosystems and biodiversity as well as costs in agriculture, forestry, wildlife and other human enterprises (Wittenburg, R., and Cock, M, J.M., 2001). Generally, alien species often consume or prey on the native ones, overgrow them, infect or vector diseases to them, compete with them, attack them, or hybridise with them. They can also alter hydrology, fire regimes, nutrient cycling and other ecosystem processes. In Zambia, invasives have not been comprehensively studied and documented. Refer to the table 6.1 below depicting some invasive alien species , their anchorage and locations in protected areas in Zambia.

**Table 6.1:** Some alien species; locations, their anchorage and vegetative characteristics

Invasive species	Anchorage	Vegetative characteristics	Locations
<i>Lantana camara</i>	Terrestrial (rooted)	Spatial expanse coverage	Mosi-oa-Tunya, Kafue flats
Kafue weed ( <i>Salvinia molesta</i> )	Aquatic (floating)	Mat forming	Mosi-oa-Tunya
Water hyacinth ( <i>Eichhornia crassipes</i> )	Aquatic (floating)	Mat forming	Kafue water system
Hippo grass ( <i>Vossia cuspidata</i> )	Aquatic (floating)	Mat forming	Luapula water system
<i>Mimosa pigra</i>	Aquatic (rooted)	Non-mat forming	Lochnvar

Source: GMPs & ZAWA reports

#### f) Dam operations in the Kafue Flats

Changes in flooding pattern have not only affected the Kafue lechwe but many fauna and flora species as well (Kapungwe, 2001). The palatable aquatic species for lechwe such as *Echinochloa* spp., *Vossia cuspidata* and *Aecyrum macrom* have been lost due to limited water supply. Instead woody species such as *Dichrostachys cinera* and *mimosa pigra* have invaded the floodplains. Besides, changes in water levels and flooding regime patterns are some of the major factors affecting productive behavior, hatching, growth, and natural mortality and eventually determine the structure of, and density of the fish population.

### 6.3.2 Strategies to Mitigate Threats

- a) Incompatible human settlements
  - ❖ Participatory land use planning
  - ❖ Community-based wildlife management and benefit sharing
  - ❖ Increased community participation in conservation and tourism industry
- b) Poaching
  - ❖ Increased resource protection
  - ❖ Capacity building in rapid response
  - ❖ Increase food security
- c) Unmanaged fires
  - ❖ Development of fire management plans
  - ❖ Strengthen community awareness
  - ❖ Strengthen resource protection
- d) Incompatible agriculture practices
  - ❖ Public Awareness and broadening sphere of community livelihood ( Initiatives)
  - ❖ Capacity building and Strengthening of Community Agricultural Extension
  - ❖ Benefit sharing from Tourism & other Land Uses
- e) Invasive Alien species
  - ❖ Collaborative approaches to eradication of invasives
  - ❖ Awareness creation to park staff, tour operators and visitors
  - ❖ Law enforcement for invasive alien species
  - ❖ Capacity building in invasive species management

- f) Dam Operations
  - ❖ Planning and coordination of water releases from the Dam
  - ❖ Intensified research and monitoring

### 6.3.3 Opportunities Arising From Various Interventions

There are a number of opportunities that arise as a result of various interventions (current, past and future). Listed below are some of them;

- ❖ Partnerships: There are already a number of partnerships that exist between the cooperating partners and ZAWA (see Appendix 4 ). These partnerships could be expanded and the efforts complimented. The local communities align themselves with ZAWA very well through the establishment of Community Resource Boards (CRBs). Other partnerships are through cooperation between government on the transfrontier resources management initiatives.
- ❖ ZAWA has articulated a 5-year strategic plan, which embodies focussed and implementable objectives for the wildlife sector. The implementation of the objectives, especially at the start, may require assistance from the cooperating partners on capital items in order to keep up with the critical path of the plan.
- ❖ Integrated approach to the operations of the cooperating partners would also present a perfect opportunity to all stakeholders to maximize the logistic and technical resources. There is need to design and implement the mother umbrella organ that could coordinate the various efforts. Currently, the role is within the ZAWA's framework but it needs to be strengthened.
- ❖ Lessons learnt from the current reviews and studies in the Kafue and Mosi-oa-Tunya National Parks under SEED Biodiversity Project and various studies elsewhere in the protected areas of Zambia, could be communicated and made use of. The recommendations require to be implemented effectively if proven feasible and plausible.
- ❖ Wildlife Monitoring and Planning form the centre of wildlife management. Although some basic information do exist, there is need for continuous and systematic monitoring. Various tools could be used such as Community Based Natural Resources Management and Conventional systems. Some structures are already available but require to be strengthened.

## SECTION SEVEN

### 7.0 FORESTS AND THEIR HABITATS: STATUS, STRATEGIES AND INTERVENTIONS

#### 7.1 Vegetation

Forests cover 60% of the country. The country's vegetation is classified into four major categories (Storrs, 1995). These are *Closed Forests*, *Open Forests*, *Termitaria* and *Grass Lands*. Table 1 below gives the extent of these vegetation types.

**Table 7.1:** Extent of Ecosystems in Zambia

Biome	Ecosystems	Approximate Extent	
		Square Kilometers	Percentages
Forest	Dry evergreen	15,835	2.10
	Deciduous	6,735	0.90
	Thicket	1,900	0.25
	Montane	40	0.01
	Swamp	1,530	0.20
	Riparian	810	0.11
Woodland	Chipya	15,560	2.07
	Miombo	294,480	39.13
	Kalahari sand	84,260	11.20
	Mopane	27,010	4.92
	Munga	30,595	4.06
	Termitaria	24,260	3.22
Grassland	Dambo	75,760	10.07
	Foodplain / swamp	129,075	17.15
Aquatic	Lakes and rivers (15)	10,500	1.40
Anthropic	Cropland and fallow, Forest plantations and built up areas	24,210	3.21
	<b>Total</b>	<b>752,578</b>	<b>100</b>

Source; MENR, 1998

The closed forests are limited in extent, covering only about 6% of the country. The *Cryptosepalum* evergreen forests are the most extensive and occur in the western part of the country while the *Baikiaea* forests found in the south west parts of the country are the second most extensive forests characterised by the commercially valuable indigenous tree species known as *baikiaea Plurijuga*.

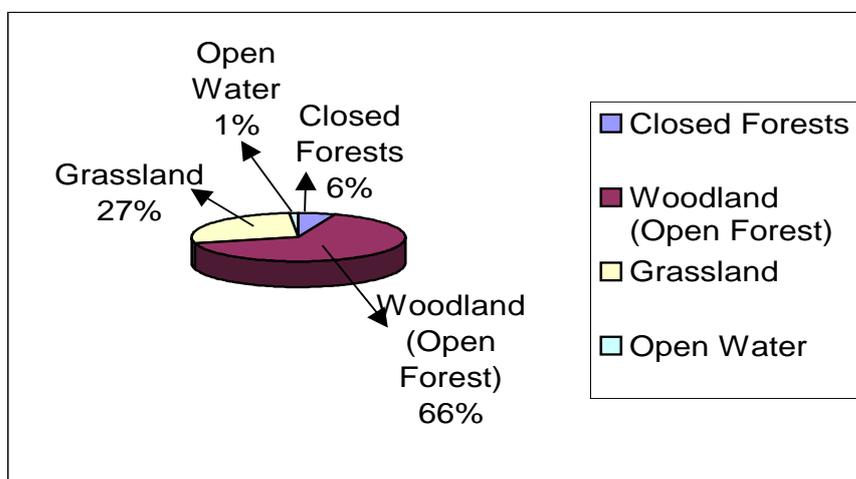
The open forests or woodlands known as Savannah woodlands are the dominant vegetation type in Zambia covering 66 % of the land. There are four types of these woodlands of which the most extensive being the Miombo woodlands that covers about 42% of the country characterised by the *Brachystegia*, *Julbernadia* and *Isobertinia* species. This is followed by the Kalahari woodlands, Mopane, Munga and *Termitaria*.

*Termitaria* or anthill vegetation covers about 3.23 % and is present in all regions of the country except in areas of pure sand. This vegetation type is classified according to its association with other vegetation types; hence the classification:

Miombo *Termitaria*, Kalahari *Termitaria*, Mopane *Termitaria*, Munga *Termitaria*, Riparian *Termitaria* and Glassland *Termitaria*.

Grasslands cover 27% of the land area in Zambia and ranges from pure grasslands to grasslands with scattered trees. They occur in poorly drained dambos, flood plains or swamps.

Figure 4: Vegetation Types of Zambia



Zambia has an estimated floristic diversity of over 3,774 species, 40% comprising shrubs and woody plants. 211 of these species are endemic to Zambia (MENR,1999).

**Values and Uses of Forests**

Forest resources have an immense value to the Zambian society and provide valuable environmental services that ensure the continuation of ecological processes that maintain biodiversity. Forests maintain the ecological balance through maintenance of water and nutrient cycles, control of soil erosion and land degradation and regulating climatic parameters such as temperature, rainfall, just to mention but a few. Forests support livelihood systems through provision of plant food fruits, stems, tubers, leaves as well as, flowers and animal proteins for invertebrates, fish, birds and mammals. Plants are also directly used as medicine for treatment of diseases. They are also exploited for commercial gain at household, community and national levels.

## 7.2 BACKGROUND TO THE PROTECTION OF FORESTS

### 7.2.1 The United Nations Convention to Combat Desertification

The United Nations Convention to Combat Desertification (UNCCD) was conceived out of concern by the international community which recognised that desertification was a major economic, social and environmental problem to many countries in all regions of the world. This resulted in convening of the United Nations Conference on Desertification (PACD) in 1977, which adopted a plan of action for desertification control. Despite PACD and other efforts made by the United Nations Environment Programme (UNEP), which concluded in 1991, the problem of land degradation in arid, semi-arid and dry sub-humid areas intensified. However, there were local examples of success (UNCCD, 1994).

Today, there are about 250 million people from over 100 countries that are directly affected by desertification with another one billion at risk. The projected increase in the world's population to 10 billion by the year 2050 will further stretch the carrying capacity of the earth. In addition, the increasing pressure from humans, animals and climatic events, in particular, recurrent droughts have exacerbated land degradation processes.

As a result, the question of how to tackle desertification was still a major concern for the 1992 United Nations Conference on Environment and Development (UNCED) which was held in Rio de Janeiro in Brazil. This conference recognised that environmental concerns were inextricably linked to development and that the survival of present and future generations will depend on the promotion of sustainable development.

In respect to desertification, the conference supported a new integrated approach to combating the problem through emphasising action to promote sustainable development at community level. The conference called upon the United Nations General Assembly to establish an inter governmental committee to prepare by June, 1994 a Convention to Combat Desertification in those countries experiencing serious drought and /or desertification, particularly in Africa.

The Convention aims at combating desertification and mitigating the effects of drought in countries experiencing serious drought and/or desertification, particularly in Africa, through effective action at all levels, supported by international co-operation and partnership arrangements, in the framework of an integrated approach which is consistent with Agenda 21, with a view to contributing to the achievement of sustainable development in affected areas.

Achieving this objective will involve preparation and adoption of long-term integrated strategies that focus simultaneously, in affected areas, on improved productivity of land and the rehabilitation, conservation of land and water resources, leading to improved living conditions, especially at community level.

## 7.2.2 Definitions of Terms

According to the Convention to Combat Desertification (CCD) the following terms are defined as follows:

1. '*Desertification*' means land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities.
2. '*Combating Desertification*' includes activities which are part of the integrated development of land in arid, semi-arid and dry sub-humid areas for sustainable development which are aimed at:-
  - i) prevention and /or reduction of land degradation,
  - ii) rehabilitation of partly degraded land, and
  - iii) reclamation of desertification land
3. '*Drought*' means the naturally occurring phenomenon that exists when precipitation has been significantly below normal recorded levels, causing serious hydrological imbalances that adversely affect the land resource production systems.
4. '*Mitigating the Effects of Drought*' means activities related to the prediction of drought and intended to reduce the vulnerability of society and natural systems to drought as it relates to combating desertification.
5. '*Land*' means the terrestrial biophysical system that comprises soil, vegetation, other biota and the ecological and hydrological processes that operate within the system.
6. '*Land Degradation*' means reduction or loss, in arid, semi-arid and dry sub-humid areas, of the biological or economic productivity and complexity of rain fed crop land, irrigated cropland, or range, pasture, forest and woodlands resulting from land-uses or from a process or combination of processes, including processes arising from human activities and habitation patterns, such as:
  - i) Soil erosion caused by wind and/or water,
  - ii) Deterioration of the physical, chemical and biological or economic properties of soil, and
  - iii) Long term loss of natural vegetation.
7. '*Arid, Semi-Arid and Dry Sub-humid Areas*' means areas, other than polar and sub-polar regions, in which the ratio of annual precipitation to potential evapo-transpiration falls within the range from 0.05 to 0.65mm.
8. '*Affected Areas*' means arid, semi-arid and/or dry sub-humid areas affected or threatened by desertification.

9. '*Affected Countries*' means countries whose lands include, in whole or in part, affected areas.

### 7.2.3 Ratification of the UNCCD

The UNCCD was adopted on 17<sup>th</sup> June 1994 and it came into force on 26<sup>th</sup> December 1996. Zambia signed and ratified the Convention in 1994 and 1996 respectively.

Zambia is also a party to some other environmental conventions that have a bearing on matters of land degradation. These are reflected in Appendix I.

### 7.2.4 The National Action Programme and the Process

To address land degradation problems affecting the Country, Zambia has decided to come up with a National Action Programme (NAP). This is in line with Article 5 of the Convention that states each affected Country party should establish strategies and priorities, within the framework of sustainable development plans and/or policies, to combat desertification and mitigate the effects of drought. Articles 9 and 10 that state that the formulation and implementation of the National Action Programmes form the core to the implementation of the treaty support this. All affected parties are obliged to prepare, publicise and implement them as 'the central element' in their strategies. They are to be closely inter-linked to development policies and are to be updated through a continuing participatory process on the basis of lessons learnt from the field and from the results of research.

According to the NAP process, it should provide a framework to incorporate long-term strategies to combat desertification and mitigate the effects of drought with national policies for sustainable development. Taking into account the causal factors and specific requirements of a particular affected country, the NAPs shall include, as a requirement, and as appropriate, some or all of the following long term measures to combat desertification and mitigate the effects of drought. These measures have been outlined in Box 7.1.

**Box 7.1: Long Term Measures to be included in NAPs (Source, MTENR)**

- Promote alternative livelihoods and improvement of economic environments with a view to strengthening programmes aimed at the eradication of poverty and at ensuring food security;
- Promote development of sustainable water harvesting programmes for irrigation of crops and livestock;
- Management or control of population dynamics;
- Promotion of sustainable management of natural resources and agricultural practices;
- Development and efficient use of various energy sources;
- Strengthen institutional and legal framework;
- Promote and develop co-operation and co-ordination, in the spirit of partnership, between the donor community, government at all levels, NGOs, local populations and community groups, and facilitate access by local populations to appropriate information and technology;
- Strengthening of capabilities for assessment and systematic observation including climatological, hydrological and meteorological services;
- Strengthening of drought preparedness and management, including drought contingency plans; and
- Strengthening of capacities, education and public awareness.

**7.2.5 Guiding Principles**

To prepare and implement an effective and sustainable management programme of the constituents of the environment, according to the Convention, the following guiding principles have been agreed. The NAP shall:

- Ensure and facilitate the participation of concerned stakeholders and enhance partnership building and promote community participation;
- Build on past experiences;
- Contribute to furthering current sustainable development efforts and plans;
- Strengthen national and local capacities; and
- Establish mechanisms for follow-up and co-ordination, systematic monitoring and evaluation.

The process should contribute to the following along with the above:

- Formulating and promoting the implementation of programmes based on priorities identified through a consultative process;
- Identifying all possible financing windows to ensure funding and consolidating the relevant on-going programmes;

- Providing better synergy and coherence between the various programmes at local and national levels and thus providing a framework for harmonisation of policies and improvement at local and national levels. It enhances international co-operation and co-ordination;
- Facilitating exchange of information, experiences and know-how amongst stake-holders;
- Rationalising and strengthening activities of national organisations dealing with desertification and drought to ensure more coherence and avoid duplication; and
- Ensuring economies of scale in the implementation.

The approach for the preparation and implementation shall take into consideration community participation and gender.

### 7.3 Environmental Problems

The main environmental problems that affect Zambia today include air pollution in mining areas, deforestation, water pollution and inadequate sanitation, wildlife depletion and land degradation which when combined have led to biodiversity loss.

#### **Biodiversity loss**

The existence of every life form is dependent on the survival of the other forms of life including human life. The activities of over-exploitation appear to alter this balance and an increasing number of species are lost each day on earth, posing a serious threat to the existence of life. In Zambia, depletion of wildlife, fish resources and plant species resulting from illegal hunting, over exploitation and habitat destruction is a serious problem.

#### **Agriculture, Land-use Pressures, Deforestation and the resultant Desertification**

The majority of the people depend on agriculture, forests and other natural resources for their survival. However, the practices employed to enhance production or extraction are detrimental to the natural resource base, resulting into land degradation. Unless sustainable land management systems are practiced, land degradation will continue, posing a threat to biodiversity by causing imbalances in ecological processes and shortage of fresh water. Land degradation also has far-reaching implications like widespread poverty, significant disruptions in social economic systems, migrations and loss in land productivity.

#### **Other issues – The Mining Problem**

Other issues include growing amount of wastes and air pollution. In Zambia, there is increasing use of biomass energy, which increase carbon emissions and eventually contribute to global warming. This in turn has effects on life. Air pollution is as a result of dust pollution from huge mine tailing dumps and sulphur dioxide emissions from smelting operations in urban areas.

Mining can disturb land, air and water systems as evidenced by the extensive land wastage in Chingola as a result of open cast mining. In other words mining of raw and industrial processes required to turn these ores into usable materials and

products are the underlying basis of modern industrialized civilization. However this has never been the case in the Zambian mines and law enforcement should be reinforced to ensure compliance by all mining companies – be it small or large. Kitwe and Mufulira on the Copperbelt have had their measure of problems resulting from copper smelting thus creating a highly acidic environment signaled by completely barren land (in Mufulira's Kankoyo township and Wusakili/Chamboli in Kitwe). It is important that new investment in mining emphasises clean technologies that also account for land reclamation.

As earlier mentioned, in the past little attention was given to the protection of the environment during such activities as exploration, planning, operation and restoration.

### **Exploration Stage**

During the first stage of mining activities, the exploration stage, activities such as prospecting, drilling and trenching are undertaken in order to locate mineral deposits of economic interest. This activity if not properly planned severely scars the environment and causes disturbance to land, water, vegetation and wildlife habitat. There is no indication that the current exploration activities in North western province are mindful of the current and future impact on the environment in terms of wildlife and vegetation (ecosystems), water (ground water, streams, rivers), air quality and climate and soils. Experiences in Eastern province and other areas in Zambia have indicated no deliberate effort on the part of explorers to be mindful of the environment and have left a defaced environment wherever there have been.

### **The Planning Stage**

It is a requirement under current Laws that an environment impact statement should be provided before any mining activities can commence. Depending on the results of these studies, further work can proceed only after all the required permits, which determine the terms under which an environmentally-responsible mine may be developed, have been obtained. The conditions current reflect the international awareness of the need to protect the environment and rehabilitate old mine sites. In reality however, recognition of the conditions is one and compliance by the mining corporation and enforcement by the relevant authorities (in this case the Environmental Council of Zambia) is quite another. In Zambia environment laws are stringent but authorities lack the necessary clout and capacity to institute punitive actions on offending corporations.

### **Mine Operations**

In order to accomplish corporate goals, activities such as environmental education, waste reduction, recycling, monitoring and reporting should be actively promoted by the mining company. The only time at which the will and intent to provide environmental education and reduce waste was when the privatized copper mines (under new ownership) namely Konkola Copper Mines (KCM) and Mopani Copper Mines (MCM) presented their Environment Management Plans for public scrutiny and commentary. This marked a

reorientation of the copper mining activities toward more socially responsible operations and more upright corporate citizenship.

The Kafue river today stands out as the most polluted river in Zambia as it traverses the main mining towns of Chililabombwe, Chingola and Kitwe. Efforts should be enhanced to ensure that the adverse effects of mining activities are not felt by the people they (mining activities) are intended to benefit. If all mining corporate bodies could emulate KCM and MCM and implement Environmental Management Plans it is most likely that the environment in the mining towns could improve qualitatively, for example KCM has a detailed draft biodiversity strategy and corporate guidelines which is likely to have a lot of spin of effects if effectively implemented.

### **Mine Restoration**

Mining is an intensive type of land use with potential for environmental impact over a limited area. When closure occurs, it should address both environmental and safety aspects. Mine reclamation is an ongoing programme designed to restore to an acceptable state the physical, chemical and biological quality or potential of air, land and water regimes disturbed by mining. This is seemingly anathema to the Zambian mining companies who do not have any such plans. Evidence abounds as to the state of closed mines. Kabwe, Nkandabwe and Bwana Mukubwa Mines were simply abandoned without regard to the importance of restoration. Nkandabwe mine has remained flooded for a long time while Bwana Mukubwa was salvaged by foreign investors although Roan Copper Mines (RAMCOZ) also seems consigned to the same level of dereliction as Kabwe and Nkandabwe Mines as there are no plans for a systematic restoration.

Zambia faces another pervasive problem which requires immediate attention – illegal quarrying. Almost all unoccupied spaces in Lusaka are points of illegal economic activities. The problem has extended to beyond Kafue Town towards Chirundu to the south and Mazabuka to the southwest where deep gullies have been sunk. The problem bespeaks the poverty – ecosystem integrity dilemma. Most of the people engaged in this activity are all “economically challenged” and living in abject poverty such that the government can only remove them at the expense of increasing other vices (e.g larceny, prostitution and so on).

#### 7.4 Status Of Desertification

The problem of desertification and drought occurs throughout the country but it is more severe in the southern half of the Country comprising Regions I and II that cover the Central, Eastern, Lusaka, Southern and Western Provinces (Figure 5 of Section Three).



Abandoned farming area in Chikwanda's area in Northern Province (impoverished soils)

A summary of problems associated with desertification and drought in the five mentioned provinces as cited in the consultative workshops held in 1998 on the UNCCD-NAP are as follows:

##### **Lusaka Province**

In Lusaka Province, desertification has caused the following problems: food insecurity, scarce energy resources, inadequate water supplies and adverse climatic conditions. The causes of food insecurity were identified among others as low yields, poor marketing and storage facilities. Scarce energy sources were as a result of deforestation and non-availability of energy alternatives. Droughts, lowered water tables and poor water management caused inadequate water supplies. Adverse climatic conditions were identified as being a result of deforestation and frequent droughts.

### **Central Province**

In Central Province, major desertification problems included the following: reduced agricultural yields, reduced rainfall due to prolonged dry spells during the rainy season, reduced plant and animal productivity, low ground water supply, silting of water courses, salinisation of the soils and reduced quality of rangelands. The causes of these problems were listed as follows: poor land management practices, inadequate extension and technical support by relevant extension authorities, deforestation, global weather changes, increase in population, poverty, accelerated soil erosion, drought, overgrazing and uncontrolled bush fires.

### **Eastern Province**

In Eastern Province, the following list represents the problems of desertification: poverty, low ground water levels, reduced soil fertility, soil erosion and poor crop and animal productivity. The cause of which included: cultivation along streams and riverbanks, over-grazing, poor farming methods, population growth and rural-urban drift, for example, cultivation on hill slopes in Chipata.

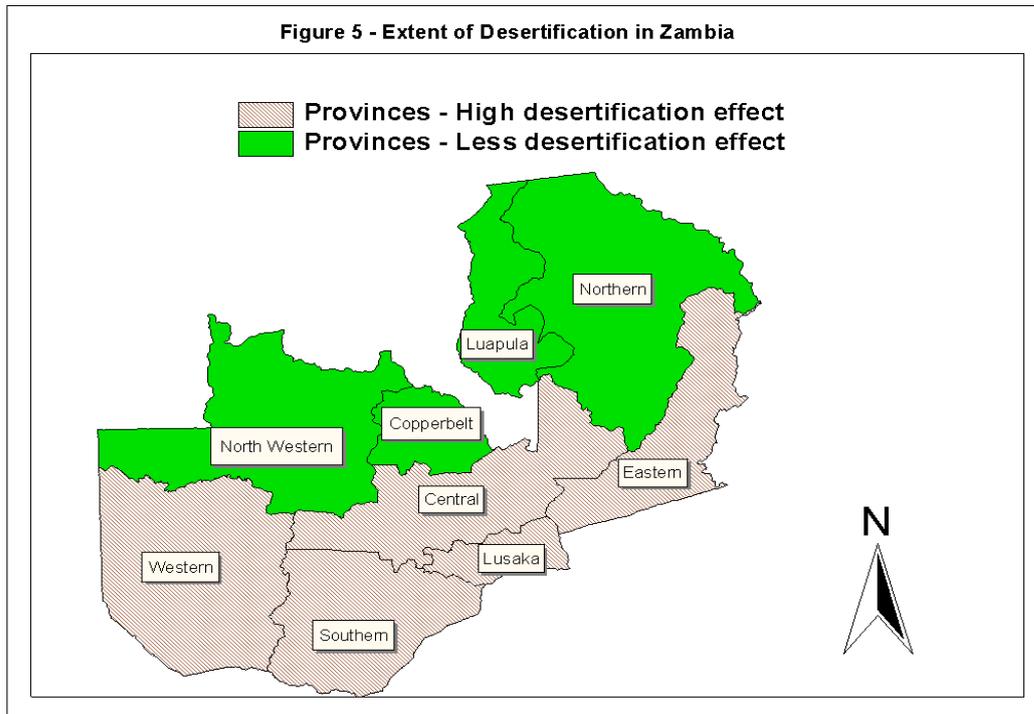
### **Southern Province**

In Southern Province, the following form the list of desertification problems that were prevalent: indiscriminate cutting down of trees, soil erosion, weathering of rocks, inadequate pastoral lands, windy and dusty conditions, siltation, low water level, low yield and poor road infrastructure. The causes of which included the following: high energy demand, land clearing for farming settlements, poor methods of farming, uncontrolled rangeland management, late burning, intensive and rain storms and bare-land.

### **Western Province**

Desertification problems in Western Province included the following: soil erosion, deforestation, loss of soil fertility, drought, drying of rivers, aridity, climatic variation, loss of biodiversity, poor rangeland and sedimentation. The causes of desertification were listed as follows: uncontrolled cutting down of trees, overstocking, high localised density population, poor information and communication, poor drainage, poor harvest, over cultivation and poor pasture management.

Figure 5 - Extent of Desertification in Zambia



## 7.5 DESERTIFICATION ASSOCIATED PROBLEMS IN ZAMBIA

### 7.5.1 Root Causes Of Desertification Associated Problems

The desertification problem in Zambia is caused by several factors and has negative impacts on the people and the environment. Some of the root causes of this problem include among others Natural, Environmental, Social, Economic and Land Tenure factors, as well as, Institutional, Policy and Legal issues.



Picture 7.2 Weathering of rocks as a result of extreme environmental pressure, Mkushi, Central Province

### 7.5.2 Natural and Environmental Factors

Zambia's biophysical environment is quite sensitive and fragile, particularly the southern half of the country in terms of steep slopes (escarpment areas), soils, climate and water availability.

#### Geomorphological Systems

Most of Zambia is a plateau, but due to geomorphologic processes that have taken place over a geological time-scale, this plateau and some hilly areas have been degraded. This is particularly true for eastern and southern parts of the country, which are covered by hilly escarpments and complex zones that form parts of the rift valley systems. These parts of the country have slopes of over 12%. The escarpment system is a very sensitive zone, in terms of the erosion hazard. Any disturbance to the vegetation cover in these areas can cause severe land degradation. Even though 80% of the country has no erosion hazard (NCS, 1985; Chipungu, *et al*, 1994; Chiti, 1989), there are many localised areas where the

problem of erosion has been severe due to an inter-play of natural factors and human activities.



Weathering of rocks as a result of extreme environmental conditions.

### **Soils**

As earlier mentioned, the Zambian soils are susceptible to erosion and rock weathering is also rampant.

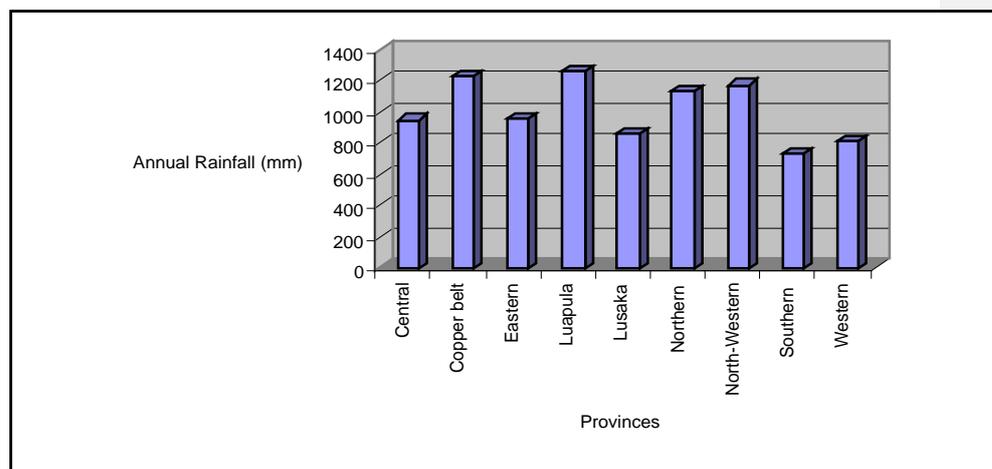
### **Climatic Conditions**

The provincial average rainfall and rainy days in Zambia provided in Table 7.1 below, shows the variability of the rain pattern in the Country. The Annual Rainfall (mm) per province has been presented in Figure 7.2.

**Table 7.1: Provincial Average Rainfall and Rainy Days**

<u>Province</u>	<u>Annual Rainfall, mm</u>	<u>Annual Rainy Days</u>
<i>Central</i>	947	86
<i>Copperbelt</i>	1,231	111
<i>Eastern</i>	961	93
<i>Luapula</i>	1,259	123
<i>Lusaka</i>	857	77
Northern	1,138	107
North-Western	1,173	118
Southern	737	74
Western	808	87
Country Average	1,001	97

**Figure 7.2: Annual Rainfall (mm) per Province**



Due to relatively high temperatures, the average annual potential evapo-transpiration in Zambia ranges from 1,394mm to 1,892mm while the country average is 1,574mm. Potential evapo-transpiration is larger than precipitation in Zambia. This means that Zambia is in a hydrological condition of precipitation deficit that amounts from 100mm per year to – 1,100mm per year. This situation has implications on water availability and management in Zambia, particularly in agro-ecological Regions I and II.

## 7.6 Drought Occurrence in Zambia

There has been an observed global change in climate over the past century due to a combination of natural factors and anthropogenic perturbations to the composition of the atmosphere, such as volcanic eruptions and emissions of green house gasses associated with human activities.

As the atmosphere knows no boundaries, climate change has affected Zambia. Some of the global climate highlights during the period 1994-1998 that have had implications on Zambia include the following (after Chipeta, 2000):

- Floods, droughts and storms continued to inflict massive economic and human distress around the globe (Australia, China, Europe and U.S.A.). Southern Africa suffered a severe drought during 1993-1996. There was a large reduction in agriculture production due to extensive drought in 1994/95;
- The change to a Pacific cold episode (La Nina) of the Southern Oscillation Index during 1995 after five to six years in which warm episode (El Nino) prevailed;
- In 1995, the record for average global surface temperature was 0.39°C above the 1961-1990 normal average temperatures. Recording surface temperatures began in 1860; and
- The earth global temperature is almost 0.7°C warmer than at the end of the 19<sup>th</sup> century.

Zambia's average climatic conditions have varied within normal range over the years but the following tendency has been observed in relation to the global climate change (Ibid).

- The start of the rainy season over the past 5 years has tended to start in the second decade (11-20) or third decade (21-30) of November in many areas of the country. In general, there has been a tendency for late onset of the rainy season since the early 1980s (after Mumba, 1995).
- There has been a tendency on average for early withdrawal of the rains since the 1980s. By end of March, the rains would have virtually stopped in most parts of the country, although a spell of widespread rain may occur in April or sometimes as late as May.
- There is no apparent indication of changes in the trend of total seasonal rainfall over the country but there have been several rainy seasons that have exhibited mean seasonal rainfall below normal.
- In terms of seasonal rainfall changes, the period from 1972 to 1996 has experienced the most severe droughts over the whole country. The most affected has been Region I, which experienced not less than 8 droughts. These droughts have been largely due to the El Nino phenomenon.
- As regards to temperatures, it is shown that since the early 1970s, there has been a modest warming in the cool season (June, July and August) mean minimum temperature, whilst considerable warming (by about 1°C) of the mean maximum temperature has been observed in the hot season (September, October and November) especially over the northern half of Zambia (Chipeta 2000, after Mumba, 1995).

It should therefore be noted that the effect of variable climatic factors of El Nino, poor precipitation, high temperatures and excess evapo-transpiration, particularly in the drier southern region of the country has in a number of years culminated into drought periods. This exerts stress on primary and agricultural production systems and other human activities dependent on rainwater. As for primary production, there is a strong correlation between plant biomass and rainfall, since rainfall influences vegetation production (WMO, 1997).

The 1967/68 season is said to have marked the beginning of a period of successive dry years across Africa, including Zambia and wet years have been rare. The effects of drought have included shortages of drinking water, food shortages, high mortality rate to both livestock and wild animals, reduced hydro-generated power and shortage of water transport.

The problem of prolonged drought has linkage and reinforces the problem of desertification in Zambia.

Proper contingency planning and adequate mechanisms for preparedness should be put in place to take care of the problem to minimise its impacts. Management and efficient use of the water resources and promotion of appropriate water harvesting and irrigation systems are important aspects for mitigating the negative effects of drought.

## **7.6 Water Availability**

Zambia is endowed with both surface and groundwater resources, though some parts of the country experience severe water shortages. This is due to human activities, which have tended to induce erosion and sedimentation, in combination with climate variability and variations in hydrogeology from the northern part of the country to the southern and the valley regions. There are remarkable differences between the regions in the water regimes of either underground or streams and rivers. The northern plateau region, which is well watered, provides the headwaters of most streams and rivers. These rivers are perennial. The streams that drain the southern and valley parts of the country are, however, (seasonal) ephemeral, as they only flow after a heavy down pour. Seasonal flush flooding is a common phenomenon, which given the impermeable sub-surface layers leads to flooding in the lower valley regions.

## **7.7 Ecosystems Resilience**

The ecosystem complexity is a function of climatic elements including rainfall, temperature, evapo-transpiration, hours of sunshine and total solar radiation.

## **7.8 Social Economic Factors**

### **Poverty**

Poverty is a cause, as well as, a consequence of land degradation in Zambia as outlined in earlier sections.

## 7.9 Land-Tenure and Property Rights

It is generally argued that a significant cause of environmental degradation lies in inadequate institutions particularly ill defined property rights.

Property rights can be defined as consisting of bundles of entitlements defining rights and duties in the use of natural resources, and property rules under which those rights and duties can be exercised (Hanna & Munasinghe, 1995). There are four types of property right regimes namely: private, common, state and open access.

In Zambia, land is divided into Customary and State Land. Customary land as defined by the 1995 Lands Act is land falling under traditional rulers and chiefs and constitute 94% of the total land area in Zambia. State land is mainly along the line of rail and is owned by the state. It constitutes 6% of the total land surface area of Zambia.

The 1995 Lands Act abolished the distinction between two types of land but combined them into customary land under customary tenure. The local residents through chiefs can obtain title to land. This entails assigning ownership to individuals and guaranteeing to those owners control of access and to the right of socially acceptable uses. This Act recognises the traditional systems and the role of traditional leaders in natural resources management through community participation.

## 7.10 Land Use Practices

### Agriculture

Agriculture is the mainstay for the majority of households in Zambia. It provides the bulk of food and cash requirements. Much of this is dominated by small-scale farmers representing 79% of the farming community (IFAD, 1993). Current estimates put the total number of small-scale farmers at 600,000 (MAFF, 1998). Large-scale farmers are estimated at 1% of the total farming population, while emergent/medium scale farmers constitute 20% of the farming population. The sustenance of agricultural production and land productivity at certain levels have meant adoption of farming systems and technologies by different types of farmers depending on the agro-ecological zone.

Clearing forests for agricultural production is the major cause of deforestation. In Zambia, it is estimated to account for about 90% of forest clearing. Most of the agricultural activities such as large-scale agricultural clearing systems, cultivation along streams or riverbanks and the semi-shifting cultivation prevalent in Zambia have resulted into detrimental effects on the environment. It has been observed that the cut and burn semi-shifting cultivation practice in areas where population densities are high and the poor method of cutting trees is used, slows down the regeneration process.



Defaced forest: a recipe for environmental problems such as drought, water deficiency, habitat loss, biodiversity loss and so on.

### Wood Fuel Use

Energy resources available in Zambia include wood fuel, electricity, petroleum, coal, solar and wind. The national energy consumption in 1996 showed that 72% was wood fuel (firewood and charcoal). It is important to note that out of the total energy resources available, households consume 68.5%. Wood fuel constitutes the largest resource base. In the same year it was reported that households consumed 88% of firewood and 96% of charcoal. Charcoal is used by 85% of urban households for cooking and heating (Siamwiza, 1999).

The current trend of wood fuel consumption is projected to increase by 79% and the amount of wood that is converted to charcoal is expected to increase by 119% in the year 2016 (ZFAP, 1998). This demand has implications on the available forest resources. Due to the high demand and high prices it fetches in urban areas, charcoal is increasingly becoming an important source of income for the peri-urban people.

The effects of charcoal production as a deforestation factor has been well documented. In Zambia, one full-time charcoal producer is capable of clearing 0.5 ha per year (Chidumayo, 1988). With increasing demand and as many people are entering into this venture as an economic activity, the hectare cleared per year is indeed great. Due to this clearance, most of the forests around Lusaka have been deforested, such that the pattern of charcoal production and supply has shifted from the western and north-western in the 1970's and early 1980's to the Central and Eastern parts of Chongwe District during the 1990's (Ibid.).



Mulundu Area, Luapula Province – The tree in the picture tells a story of the remains of what used to be a thick Riverine forest. There are no measures currently to reverse the deteriorating trend.

Charcoal production is done through the kiln method. This method impacts on woodland regeneration at two levels of intensities: the cut-over area in which most of the trees are cleared and the kiln spot where regeneration is severely affected due to thermal effects on plants and soil. Tree regeneration is known to be impaired on kiln spots up to two decades (Chidumayo, 1998). The problem of deforestation as caused by charcoal production is said to have a great significance on the Central, Copperbelt and Lusaka Provinces, where 76% of the urban population live (NEAP, 1994).

The other environmental problem associated with charcoal production is the production of green house gases during carbonisation in the earth kilns, and this could be contributing to the climate change problems facing Zambia. As for firewood, the problem of deforestation is not severe in low-density rural areas where the use is specifically domestic.

This is because, dead wood is mostly collected and used as firewood. However, studies in Siavonga (Kalyocha, 1997) and Luangwa (Kalyocha, 2000), show that firewood collection is a major problem causing deforestation around villages along the Rivers. Firewood, in such circumstances is used mainly for fish smoking.

Some tree species are reported to be completely destroyed, for instance, the Mopane along the Zambezi River. In densely populated and high fuel wood demand areas, it has also been noted that trees are felled in order to obtain firewood and charcoal.

### **Bush - Fires**

Setting of bush-fires is a common phenomenon in the Zambian society. Some fires are set indiscriminately. Various communities set bush-fires for a number of reasons which include among others the following: vegetation control and clearing of fire-breaks around homesteads and gardens, clearing of fields for cultivation, provision of potash, visibility improvement during hunting, as well as, gathering and pasture management.

Fire destroys the vegetative cover in the agriculture area, which is meant to add organic matter to the land. Indiscriminate late bush fires have been observed to reduce wood annual increment by 50% in miombo woodland (NEAP, 1994). However, deliberate late burning of pasturelands can indeed increase their productivity (a late season burn favours regeneration of grasses, rather than woody species). In woodland areas, 75% of trees of less than 3m high are generally susceptible to destruction (NCS, 1985) and late fires destroy 84% of the herbage biomass (Chiti, *et al*, 1989). In tree-less areas, and in the dry season, burning may promote soil erosion by wind and by water at the on-set of the rain season before sufficient herbage cover develops (Ibid.). These factors reduce the potential of the woodland to regenerate.

Impaired growth due to unprescribed fires



### Over-Grazing

Zambia has on average a total herd of cattle of slightly over 2 million animals but varies annually mainly due to animal mortality. In terms of sheep and goats the numbers are fragmented and only estimated at about 0.1 head of livestock per person which translates into an approximate combined total of about one (1) million head. The issue of over-grazing and deforestation in Zambia depends on the type of management practices such as no rotational grazing, no supplementary feeding system, no control of animal numbers according to carrying capacity of the land and concentrating grazing pressure in localised pastoral areas. The potential available pastureland is estimated at 10 million ha and only 2.7 million ha is available for dry season grazing (NCS, 1985). Dry season grazing is concentrated in dambos and flood plains. The potential grazing land gives a carrying capacity of 15 ha per animal as opposed to 5 ha per animal at the present use. Most of the animal concentrations are in Regions I and II and most of the grazing is free-range on communal areas. The concentration of grazing effort in localised areas without a controlled range management system has resulted in over-grazing.

There is noticeable evidence of this phenomenon in Lusitu in Southern Province, Katete (Kagoro) in Eastern Province and Luangwa in Lusaka Province.

Over grazed areas are bare with signs of gully formations and thus inducing lots of soil erosion (Kalyocha, 2000).

The reasons for overgrazing and soil erosion are that:

- There are too many animals on a piece of land leading to over-grazing and trampling causing compaction whose aggregates results into soil erosion.
- Young bushes and trees are destroyed through browsing. Goats are particularly destructive in this respect, leaving the land devoid of vegetation.

In the affected provinces, there have been some gradual deterioration in pastoral resource base in localised areas linked to over-grazing and eventual soil erosion. The low productivity and deaths of livestock reported in Eastern, Lusaka and Southern Provinces: Veterinary Department Annual Reports) could be attributed to disease, poor management and range land degradation (NCS, 1985). This leads to a decline in the animal productivity of range land vegetation.

The problem of over-grazing has also been observed in wildlife areas, especially in the Luangwa Valley due to high densities of elephants in the 1970s (Caughley, 1975) and hippos in the Luangwa River stretch (Kalyocha, 2000; Jachmann, 1994). Due to high concentrations of the elephant populations in the 1970s, this exerted high browsing pressure on the vegetation, particularly Mopane woodland and large areas were left bare. With drought and the impact of fire, most of these areas have not regenerated and have remained bare or have been converted into grasslands (Ibid). The increase in concentrations of hippos in the Luangwa River (Central Luangwa Valley) in densities of over 40 animals per km river stretch in recent years has been observed to correlate with the elephant 'problem' but in turn is also causing grazing pressure on the riverine areas (Jachmann, 1994). Signs of grazing pressure in form of soil compaction due to trampling, erosion hills and gullies are evident in the Luangwa.

Due to nutritional stress as a result of habitat degradation in hippos, the reproductive rate is delayed and the animals are susceptible to high mortality when there is a disease out-break, particularly anthrax (LIRD 1996, Annual Report).

### **Encroachment and New Settlements**

Deforestation is also caused by in-migrations in some areas that are forested and sensitive to degradation. Out-migrations from Southern Province into Lusaka Rural due to shortage of arable land is causing areas to be opened up for new settlements. A case in point is the area from Chongwe to Rufunsa where new immigrants from Southern Province have been settled in the margins of the Lower Zambezi National Park (Kalyocha, 1997). About 400 ha have been deforested by new settlements and there have been cultivations in the National Park (Kalumba, 1997). Similarly Munyama Forestry Reserve in central province have been damaged due to encroachment and illegal settlement.

### **Indigenous Knowledge and Technologies**

There exist within the traditional land-use systems, practices that encourage conservation of land resources and maintenance of soil productivity. They include

zero tillage, inter-cropping, crop rotations, strip farming, mulching, use of manure and many others. These need to be documented and used in combating land degradation.

### 7.11 Institutional, Policy and Legal Issues

Zambia lacked a clear and consistent environmental management policy until the mid 1980s. Accordingly, environmental concerns were not a major input in the social and economic development processes of the country. In addition to the absence of a consolidated 'environmental policy', there has been a myriad of various pieces of legislation dealing with different aspects of the environment, some dating as far back as the pre-independence era and others have not been reviewed. These pieces of legislation were scattered in different Acts relating to many activities such as use of water, wildlife, land, mining and others. These have been noted to be rudimentary, sectoral, scattered and at times contradictory to each other (Mweene, 1998, after Imboela, 1996).

The government attempted to overcome this problem through the formulation and implementation of the National Conservation Strategy (NCS) in 1985. This saw and marked the beginning of serious attempts by the government to incorporate environmental management considerations including issues of land degradation in the mainstream development process of the country. Apex institutions, Environmental Council of Zambia (ECZ) and the Ministry of Tourism, Environment and Natural Resources (MTENR) were created, including the enactment of the Environmental Protection and Pollution Control Act (EPPCA).

Despite these developments, environmental management efforts are still sectoral, scattered, out of date with present circumstances and uncoordinated with limited institutional enforcement capacity and support (MENR, 1999). Currently, there is still no consolidated policy and legislation for the environment, though the matter is being addressed through the Environmental Support Programme (ESP). There is also inadequate policy addressing desertification and drought. Zambia ratifying the UNCCD in 1996 has since incorporated it in wildlife and forestry legislation. A draft policy has been formulated with regard to overall disaster management issues, but has not yet been ratified by Cabinet. The decentralisation policy is also not yet ratified. A few sectoral policies and legislation have been reviewed so that they are in line with socio-economic changes in the country. The revised policies and legislation include:

- Wildlife Act
- Forests Act
- Water Act and
- Fisheries Act

At this point primary focus is on the Forest Act. The forestry policy of 1998 and forest legislation of 1999 emphasises community and stakeholders involvement in sustainable forest resources management and utilisation. The Act provides for the establishment of the forestry Commission and defines its functions. Presently the government is reviewing the Water Act and Fisheries Act to provide for stakeholders participation in water and fisheries management and sustainable use.

MTENR is addressing the problem of land degradation through the Environmental Support Programme, existence of a National Focal Point (NFP) and National Steering Committee (NSC) of the UNCCD. In order to adequately address the land degradation problem, it is important to strengthen the co-ordination structure and also establish frameworks at all levels that bring together stakeholders on the subject.

## 7.12 Manifestations And Effects Of Desertification Problems

Land degradation manifests itself through deforestation, biodiversity loss, soil erosion, soil infertility, siltation, sedimentation and flooding.

### Deforestation

Deforestation is the widespread removal and disappearance of vegetative cover as a result of clearing of trees. In Zambia, the average rate at which forests are deforested is estimated at 250,000-300,000 hectares per annum and the annual forest decrease factor is 0.5% on average. The annual decrease factor of forests by the province is as follows: Copperbelt and Lusaka have the highest at 20% per annum, followed by Southern (0.7%), Central (0.6%), Eastern (0.5%), Luapula (0.5%) and Northern (0.3%). The least are Western (0.2%) and North Western (0.2%). Deforestation is taking place both in forest reserves and open areas. Management efforts appear to fail to halt the situation. These figures are, however, conservative ones, as these estimates are based on the 1980s inventories and the rate of deforestation could be higher at the present moment.

Field observations show clear signs of the problem the country is facing particularly around big urban settlements. Statistics from isolated case studies based on analysis of land cover maps, satellite images and aerial photography interpretation show that the problem is a serious one. Four percent (4%) of Siavonga District, for instance, is reported to be deforested (Kalyocha, 1997). Around Lusaka, particularly in east Chongwe, forests have decreased on average at a rate of 3.2% per annum between 1989 and 1998, with a highest rate of change of 8.8% occurring in munga woodland (Kalyocha, 2000 after Chaposa, 1999).

### Biodiversity Loss

The increased over-exploitation of forest resources in peri-urban areas coupled with high population centres have posed problems resulting into deforestation and consequently loss of biodiversity.

Some tree species that are threatened in Zambia include *Daniellia alsteeniana*, *Entandrophragma devevayi*, *Baikiaea plurijuga*, *Podocarpus milanjanus*, and *Encepharlotos goetzi*. An example on tree species under pressure in Luangwa District as a result of human population pressure and deforestation are presented in Table 7.2 below.

With regards to wildlife, some species under threat due to either habitat destruction and/or over utilisation are elephant, cheetah, eland, sable, roan, hartebeest, blue

monkey, leopard and wild dog (Kalyocha, 2000). A study of the trade and utilisation of game meat in Zambia also added other species under threat to the list due to increased hunting pressure. These include buffalo, kudu, warthog, impala and duiker (Kalyocha, 1998).

As for fish resources, some species have been recorded to be threatened due to over utilisation and poor catch methods, for example, the lower Zambezi-Luangwa Valley fishing system has recorded mud suckers, sailfin fish, breams and tiger fish to be threatened (Ibid.). Farming activities are also reported to degrade the fishery habitats and breeding areas of the wetlands due to drainage of water through cultivation. The conservation and management of these fishery areas and important animal habitats in the dry lands are very crucial for purposes of biodiversity conservation.

**Table 7.2:** Tree species extensively used and which are under Pressure in the Luangwa Valley

Tree Species	Most important use of the Tree	Other Uses
Mubuyu - <i>Adansonia digitata</i>	Fibre	Fruits, young leaves for relish
Mululu-Khaya <i>Nyasica (anthotheca)</i>	Timber and Canoes	Firewood and medicines
Mulombe- <i>Pterocarpus angolensis</i>	Timber	Medicine
Muzumba- <i>Kirkia acuminata</i>	Timber	
Mubanga- <i>Pericopsis angolensis</i>	Poles for Construction	Firewood, timber
Mupani- <i>Colospospermum Mopane</i>	Fire-wood, charcoal hard wood poles	Used locally in bridge construction, handles for hand tools
Mvungula (sausage Tree) <i>Kigelia africana</i>	Making of pounding mortars	
Milaza (palm) <i>Hyphaene verticosa</i>	For making hand-crafts, for example, baskets, hats and many others	Food source in hunger periods.
Reeds (Matete)- <i>Phragmites mauritianus</i>	Making mats, chicken run, coffins, and many others	
Bamboos - <i>Oxytenanthera</i>	For baskets (important in plateau areas)	
Black ebony- <i>Dalbergia melanoxylon</i>	Carving (sold to markets in Lusaka)	

Source: Kalyocha, 2000

### Soil Erosion

There are many localised areas in which the problem of soil erosion has manifested itself (Chiti, 1991, Chipungu, *et al*, 1994). Actual rates of erosion countrywide have not been estimated, but visible evidence of the problem is observed in localised areas of Central, Eastern, Lusaka and Southern Provinces.

These areas have the most productive soils, which the country entirely depends on for agricultural production. Given that in most Zambian soils, the highest nutrient concentration is in the top 0-10 cm layer, soil erosion can result into considerable losses of plant nutrients (NEAP, 1994).

The causes of erosion are rooted in poor land-use practices such as cultivation on sloppy areas without conservation measures, shifting cultivation, continuous monocropping and over-grazing which result into deforestation. Soil erosion in Zambia is correlated or associated with areas with high rural population densities, high livestock populations and high percentage of land under cultivation. The cost of soil erosion in terms of agricultural productivity is very high. The most prevalent indicators of soil degradation are low crop yields and low livestock productivity, causing shortages of food and food insecurity. Farmers have therefore resorted to

selling their animals, though of low quality, as a risk avoidance strategy and at the same time raising income to purchase food.

#### **Other factors Leading to Soil Infertility**

Poor land management can lead to soil infertility. Apart from the problem of acidification and soil compaction, the problem of salinisation due to irrigation is yet another problem in Zambia, though on a small scale. It is not a major problem as yet, partly due to the fact that only a small hectareage (2%) of the estimated potential of the irrigatable land, (450, 000ha) is under irrigation. But given the irrigation potential and the strong need to expand irrigation schemes in these dryland areas as a result of drought, the problem of salinisation can be exacerbated which can lead to soil degradation.

The need to properly investigate and provide the appropriate irrigation system is strongly emphasised. The key to good irrigation is good drainage. If irrigated land is not drained properly, the soils first become waterlogged and then salinised or alkalised. It, therefore, becomes difficult to cultivate as the evaporation of water from the soil increases, reducing the available moisture for crops.

#### **Siltation, Sedimentation and Flooding**

There is visible evidence of the problems of siltation, sedimentation and flooding in Zambia, although the rates and extent of the problems are not well documented and known particularly in the southern region. These problems were clearly cited in all the five provinces of Regions I and II at the provincial workshops.

Deforestation in uplands and cultivation along river/stream banks, culminates in soil erosion and choking up of streams/rivers with silt and sediments. When there is an intensive storm, this results in flush flooding of these streams. For example, the Luangwa (formerly known as Feira) District, Lusitu area in Southern Province and Central Luangwa Valley area in Eastern Province are cases in point where these processes have been seen to occur (Kalyocha, 2000; Siamwiza, 1999; Kalyocha, 1988 and Larsen, *et al*, 1985).

These processes also make people who cultivate along the stream/river banks to lose their crops due to flooding and layering of the fields with sand/silt after a flood (Kalyocha, 1988; 2000).

There is a problem of drying-up of streams and rivers. This problem is due to a combination of low ground water recharges, soil erosion and drought (Kalyocha, 2000). In recent years, however, even seasonality has rapidly diminished for most of the streams/rivers. Water is only available just when the rain falls, but quickly runs off or dries up in a few days.

### 7.13 The Implications Of The Desertification Problem

#### Some Consequences and Costs of Desertification

The impacts of desertification at a local scale are very negative. These cause low productivity of the land to support natural veld, livestock and crop. They in turn have social economic consequences.

Other environmental costs, at a local scale, that are directly or indirectly associated with land degradation are loss of shade, shelter and visual amenities. Any changes in the productivity of the land have consequences on agricultural production in Zambia and in turn on the social economic well being of the people. The increasing spates of drought occurrence and prevalence of land degradation problems have had dramatic impact on agricultural production, especially on small-scale farmers in the severely affected provinces (Agricultural Statistical Bulletin, Policy and Planning Division, MAFF, 1999/2000).

In Zambia, there has been a general decline in total cultivated hectareage from 1, 004, 300 in 1989/90 to 701, 500 hectares in 1997/98, a decline of over 30%. Furthermore, the average maize yield (the main staple food crop in Zambia) per hectare decreased from 1.48 tons in 1989/90 to 1.27 in 1997/98. The 1989/90 yield is three times less than the expected average yield.

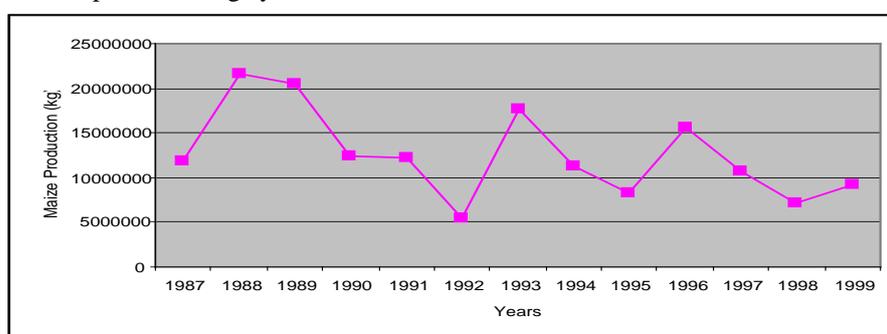


Figure 7.2: Maize Production (kg) from 1987 to 1999 (Agricultural Statistical Bulletin, Policy and Planning Division, MAFF, 1999/2000).

The poor performance of the agricultural sector has been attributed to the following drought related problems, which stand out as most significant:

- Reoccurring droughts in the 1990s have made farming rather unpredictable and risky
- High costs of inputs. With land degradation problems, the need for farm inputs (fertilisers) becomes imperative. The 1990s have been characterised by the full implementation of the market policies, resulting in total removal of subsidies on all agricultural inputs. This has made many farmers unable to access agricultural inputs.
- Reduction in the number of work oxen has been mainly due to animal disease exacerbated by drought.

At global level, land degradation has implications on flood occurrence, ground water recharge systems due to high run-off rates and siltation/ sedimentation of rivers. The consequences of vegetation cover removal have implications on sinks for carbon dioxide and this can result into destabilisation of the climate particularly temperature regimes.

## 8.0 ENVIRONMENTAL LAW AND POLICY FRAME WORK

Environmental Law in Zambia is not a new phenomenon. Some of the environmental legislation were inherited from our colonial masters at independence in 1964. The environmental legislation inherited at independence was mainly that directed at the protection of natural resources with very little regard for protecting the quality of the environment i.e. pollution control.

The genesis of the environmental law inherited at independence in Zambia protecting natural resources lay in the 1933 London Convention. The London Convention was signed by the colonial powers of Belgium, United Kingdom and Northern Ireland, France, Italy and Portugal to apply to their African Territories. The other signatories were the Union of South Africa, Egypt and the Anglo-Egyptian Sudan.

The London Convention provided for the establishment of national parks and strict nature reserves, the creation of native settlements outside the parks and reserves and the creation of buffer zones for the reserves. The London Convention also provided for the preservation of forest reserves for the best indigenous forest species. Species in the forest reserves and national parks were to be protected by prohibitions against the taking and destroying, internal controls of exports and imports, and by regulations on the hunting and collection of selected species.

The London Convention is thus the parent of our national parks and forestry legislation as well as other natural resources protection legislation in general such as the Water Act and the Natural Resources Conservation Act.

The National Conservation Strategy which was until recently the main policy document on the environment identified deforestation, soil erosion, the degradation of traditional pastures, pollution and poaching as the major environmental problems in Zambia. In this regard the National Conservation Strategy was able to match these areas of concern with relevant institutions and legislation, but found that with regard to pollution the institutions and legislation were inadequate. To this end the National Conservation Strategy led to the formation of environmental institutions and legislation directed at combating pollution. Hence the enactment of the Environmental Protection and Pollution Control Act, and the establishment of the Environmental Council under that Act.

The process of implementing the National Conservation Strategy and the Environmental Protection and Pollution Control Act was also responsible for the introduction of pollution control measures in the mining industry through the new Mines and Minerals Act, No. 31 of 1996 (Cap. 213, volume 13). The other consequence was the repeal of the Action for Smoke Damage (Prohibition) Act enacted in 1996. This Act prohibited actions or claims against mining companies for nuisances affecting the enjoyment of land and damage to land arising from their mining operations if the mining companies have indemnity agreements with the President. This is clearly reflection of the importance of the copper mining

industry to the economy of the country even to the extent of ignoring the adverse impacts of the industry on the environment.

The Government after the United Nations Conference on Environmental and Development (1992) decided to update the National Conservation Strategy through the National Environmental Action Plan (NEAP). The NEAP was adopted by the Government in 1994 as official policy.

The NEAP identified the following priority areas in relation to Zambia's environment:

- Land degradation and soil erosion from agricultural practices, including the excessive use of fertilizers and pesticides
- Deforestation which not only affects watershed management but also habitats of wildlife species including animal and plant species
- Poaching and over exploitation of wildlife
- Contamination from mine dumps and industry as well as water, land and air pollution resulting from their operation.

In addition the increase in frequency of drought in recent years has resulted in massive losses of natural resource habitat, wildlife and livestock. The drought situation has increased an urgent need for effective environmental planning and management for resource particularly related to water, soil and energy.

The NEAP further identified the need for enshrining the right to a clean and healthy environment in the Republican Constitution to foster the involvement of the public in enforcing environmental regulations. In this regard the 1996 amendments to the constitution provide under Part IX the Directive Principles of State Policy and Duties of a citizen, that amongst others things:

- A the state shall endeavour to provide clean and safe water, adequate mechanical and health facilities and decent shelter for all persons, and to take measures to constantly improve such facilities and amenities,
- B The state shall strive to provide a clean and healthy environment for all; and
- C The state shall promote sustenance, development and public awareness of the need to manage the land, air and water resources in a balanced and sustainable manner for the present and future generations.

These provisions however, are not in themselves justifiable and are not legally enforceable in any court, tribunal or administrative institution or entity.

### **8.1 Environmental Legislation In Zambia**

There are twenty-eight pieces of environmental legislation in Zambia. These pieces in general provide for the conservation of natural resources or for the protection of the quality of the environment i.e. pollution control. In this regard the major pieces of legislation providing for conservation of natural resources are the National Parks and Wildlife Act, the Forests Act, the Fisheries Act and the Water Act

## 1. THE NATIONAL PARKS LEGISLATION

The Zambia Wildlife Act No. 12 of 1998 –

- establishes the Zambia Wildlife Authority and defines its functions;
- provides for the establishment, control and management of National Parks and for the conservation, protection and enhancement of wildlife ecosystems Biodiversity and for the promotion of opportunities for the equitable and sustainable use for the special qualities of National Parks;
- provides for the establishment of Game Management Areas;
- provides for the sustainable use of wildlife and the effective management of the wildlife habitat in Game Management Areas;
- provides for the enhancement of the economic and social well being of local communities within Game Management Areas and provides for the involvement in the management of Game Management Areas;
- provides for the development and implementation of management plans;
- provides for the regulation of game ranching;
- provides for the implementation of the CITES, RAMSAR and the Biodiversity Convention as well as the Lusaka Agreement on Cooperative Enforcement Operations Directed at Illegal Trade in Wild Fauna and Flora.

The Zambia Wildlife Authority established under the Act is vested with the function of -

- (a) controlling, managing, conserving, protecting and administering National Parks, Game Management Areas, bird and wildlife sanctuaries;
- (b) sharing with local communities the responsibilities of management through the preparation and implementation of management plans for National Parks, Game Management Areas, bird and wildlife sanctuaries in consultation with the local communities;
- (c) adopting methods to ensure that the sustainability, conservation and preservation in the National State of ecosystems and Biodiversity in the National Parks, Game Management Areas, and bird and wildlife sanctuaries and to ensure the proper balance between the sustainable use of wildlife and the management of ecosystems in these areas;
- (d) enhancing the economic and social well being of local communities in Game Management Areas;

- (e) granting hunting concessions in partnership with local communities of hunting outfitters and tour operators; and
- (f) assist and advise the community resources boards in management of human and natural resources in Game Management Areas and in areas which fall under their jurisdiction.

Community resources boards are registered under the Act for the promotion and development of an integrated approach to the management of human and natural resources in Game Management Areas or an open area falling under their jurisdiction. The community resources boards are composed of not more than ten members from the local community, a representative of the local authority and a representative of a chief in whose area the board is established. The Act further empowers community resources boards to establish funds into which moneys in respect of licenses, concessions and services rendered for the use of wildlife shall be deposited as may be agreed with the Wildlife Authority. The fund also may receive donations or grants from any source within Zambia and with the approval of the Minister, from any source outside Zambia. The purpose of the fund established under the Act by community resources boards is to enhance the economic and social well being of the local community within the jurisdiction of a board.

The establishment of National Parks and Game Management Areas is the prerogative of the President, after consultation with the Wildlife Authority and the local community. The purpose of a National Park is to conserve, protect and enhance wildlife, ecosystems, biological diversity and natural beauty. On the other hand the purpose of establishing Game Management Areas is for the sustainable utilization of wildlife.

The grant mining rights within a National Park is subject to an environmental impact assessment conducted in accordance with the procedures specified by the Environmental Council. Similarly there is a general provision for wildlife impact assessment where any person has reasonable grounds to believe that any proposed or existing government plan or activity or the activity of any other organization or person may have adverse impacts on wildlife species or communities in National Park, Game Management Areas, or open area.

## **2. THE FOREST ACT**

The Forest Act provides for the establishment of forests reserves as National Forests and Local Forests, the protection of forests and trees and the licensing and sale of forest produce.

## **3. THE FISHERIES ACT**

The Fisheries Act provides for the regulation of commercial fishing, the control of fishing methods and the registration of fishermen and their boats.

## **4. THE WATER ACT**

The Water Act provides for the control, ownership and use of water excluding that of the Zambezi, Luapula and that portion of the Luangwa River which forms part of the boundary between Zambia and Mozambique.

## **5. THE ENVIRONMENTAL PROTECTION AND POLLUTION CONTROL ACT**

With regard to the protection of the quality of the environment or pollution control the principal legislation is the Environmental Protection and Pollution Control Act promulgated in 1990 (EPPCA). The Environmental Protection and Pollution Control Act has as its primary objective, protection of the environment and control of pollution. The Act establishes the Environmental Council whose function is to protect the environment and control pollution so as to provide for the health and welfare of persons, animals, plants and environment. To this end, the Council has charge over water and air pollution, disposal of wastes and radiation. The Council also regulates pesticides and toxic substances. To protect the quality of the environmental impact assessment and is empowered to:

- (a) identify projects or categories of projects, plans and policies which require environmental impact assessment to be supervised by the Council;
- (b) identify, promote and advise the Government on projects which are likely to enhance the conservation, sustainable development and protection of the environment;
- (c) monitor trends in the use of natural resources and impacts on the environment.

There are to date five subsidiary regulations issued under the EPPCA, namely the Water Pollution Control (Effluent and Waste Water) Regulations, (Statutory Instrument No. 72 of 1993); the Waste Management (Licensing of Transporters of Wastes and Wastes Disposal Sites) Regulations, (Statutory Instrument No. 71 of 1993); the Pesticides and Toxic Substances Regulations, (Statutory Instrument No. 20 of 1994);

the Air Pollution Control (Licensing and Emission) Standards Regulations, 1996 (Statutory Instrument No. 141 of 1996); and the Environmental Protection and Pollution Control (Environmental Impact Assessment) Regulations, 1997.

## 6. THE LOCAL GOVERNMENT ACT

The Local Government Act is another major piece of legislation which provides for both the protection of the quality of the environment and the conservation of natural resources. The local authorities have power to -

- (a) take measures for the conservation of natural resources, prevention of soil erosion and the maintenance and control of local forests and woodlands;
- (b) establish and maintain sanitary services for the removal and destruction of or otherwise dealing with all kinds of refuse and effluent and to compel the use of such services;
- (c) provide and maintain supplies of water and for that purpose establish and maintain water works and water mains; and
- (d) take measures and require the taking of measures for the conservation and the prevention of pollution of supplies of water.

The Local Government Act impacts directly on the mining industry through the Local Administration (Trade Effluent) Regulations, 1985 (Statutory Instrument No. 161 of 1985). These Regulations:

- prohibit the discharge of trade effluent into a water course or any land area without a permit from the Council;
- provides for the conditions and standards of the clerical and physical parameters for the trade effluent to be discharged into a public sewer and into a public water course;
- regulates the discharge of trade effluent in terms of volume, rate of discharge and the hours of discharge. These Regulations to date apply to Mufulira (Mufulira District Council) (Trade Effluent) Regulations (Application) Order, 1987; and to Kabwe District Council (Trade Effluent) Regulations (Application) Order, 1988.

Finally, the other pieces of environmental legislation worthy of note are the Factories Act (Cap. 441); the Petroleum (Exploration and Production) Act (Cap. 439) and the Public Health Act (Cap. 25).

### C International Perspectives Of Environmental Legislation In Zambia

The most fundamental rule in international relations is that States are sovereign entities and that subject to international law, they have authority to exercise sovereign rights over all natural resources on their territory. Thus each State may conserve, exploit or destroy, or allow them to be destroyed as they wish.

The concept of sovereignty has historically embodied freedom of action in relation to the natural resources contained within a nation's boundaries. This control over resources is an integral part of the right of self determination which is particularly cherished by developing countries, formerly under colonial rule. The right of nations to self determination and to freely dispose of their natural resources without prejudice to any obligation arising out of international economic cooperation has been accepted by the international community. For example, the international Covenants on Economic, Social and Cultural Rights and the International Covenant on Civil and Political Rights, 1966 and the 1962 United Nations Resolution on Permanent Sovereignty Over Natural Resources – declared that the right of nations to permanent sovereignty over their natural resources must be exercised in the interest of their national development and of the well-being of their people. See also the 1966 United Nations Resolution on Permanent Sovereignty Over Natural Resources – on strengthening the ability of developing countries to undertake development using their natural resources by recognizing that the natural resources of developing countries constitute a basis of their economic development in general and of their industrial progress in particular.

Environmental issues however go beyond national boundaries, there is a growing realization that the resources of the earth are intertwined in a web of intimate ecological interdependence. Due to the extra-territorial impacts of national environmental degradation, for example, massive deforestation by one region can alter another's hydrological cycle and world's carbon cycle even as it diminishes the global stock of resources. There is now a growing awareness of global stock of resources. There is now a growing awareness of global risks that can threaten the planet as a whole, and as such in the area of environmental protection the line between national and international environmental problems is fast disappearing. International cooperation among sovereign States in the area of environmental protection and sustainable natural resource management has become of paramount importance.

Therefore, although the principle of state sovereignty over natural resources has been expressly recognized in Principle 21 of the Stockholm Declaration and Principle 2 of the Rio Declaration 1992, this is connected to the corresponding duty of States to ensure that activities within their national jurisdictions or control do not cause damage to the environment of other States or to areas beyond their jurisdictions.

The other aspect, which underlies international conventions in the environmental arena is the link between environmental protection, sustainable management of natural resources and economic development.

The Stockholm Declaration is a result of the 1972 United Nations Conference on Human Environment. The Stockholm Conference was the most important even in the growth of environmental awareness. The Conference highlighted the possibility of halting or reversing development as a result of the interactions between human population, growth, pollution and resource constraints and, the concept of sustainability. Developing countries were initially suspicious due to lack of appreciation of environmental problems and lack of development. Their fears were that environmental issues would restrict their strides in development and their ability to deal with essential social tasks, i.e., the alleviation of poverty.

There is now a growing realization that environment and development are mutually inclusive and interdependent.

“The protection and improvement of the environment is a major issue which affects the well-being of peoples and economic development throughout the World”.

## 9.0 AN ANALYSIS OF RELATIONSHIPS

### 9.1 Analysis of multi-sectoral Environmental Programmes in relation to the NAP

#### 9.1.1 NEAP and ESP

The 1985 National Conservation Strategy that aimed at incorporating environmental management in the national development processes of the country was recognised to have a few inadequacies. These included the following:

- The economy was undergoing a period of liberalisation, and as such, there was need to review and integrate environmental concerns into the social and economic development process of the country, consistent with the country's new market economic orientation. These formed the main guiding objectives for the NEAP.
- Against these, there was need to make provisions for new opportunities for involvement of local communities, the Private Sector, NGOs and CBOs in the management of the environment while at the same time recognising the important role for government in monitoring, regulation and enforcement of appropriate resource-use in the interest of sustainable development.

The other reason for the preparation of the NEAP was that the main recommendations of the NCS had been implemented, hence a re-orientated programme was a necessity.

The NEAP is a comprehensive document that was developed through the participatory analysis of the environmental situation and management, which resulted in the identification of key environmental issues facing Zambia. The five major environmental problems isolated in the NEAP are land degradation, deforestation, air pollution in the mining areas, water pollution and inadequate sanitation, and wildlife (game and fish) depletion. It reviewed the weaknesses in existing legislation and institutions and provided strategy options for improvement of environmental quality. The NEAP also provides updated environmental policy actions and forms the basis for the future development of an investment plan for its implementation. The need for supporting the public, the private sector and community based approaches in environmental and natural resources management was strongly recommended. This is consistent with the guiding principles of the Convention to Combat Desertification.

The areas of relevance to the Convention to Combat Desertification from the NEAP document include the following:

- Institutions and Environmental Legislation
- Economic Development and the Environment
- Agriculture
- Renewable Natural Resources
- Human Population
- Energy Resources

- Environmental Education, and
- Environmental Issues in the Provinces.

There are some areas which, do not feature prominently in the NEAP but are of great concern under the CCD. These include the strengthening of the early warning systems, utilisation and development of indigenous knowledge, transfer of appropriate technology to the community level and the area of information collection, management and exchange including the aspect of impact indicators. These gaps are very important areas of entry and support by the NAP.

The recommendations of the NEAP are being implemented through the Environmental Support Programme (ESP), an environmental investment fund, mainly supported by IDA (World Bank). The ESP is aimed at mainstreaming environmental and natural resources management in Zambia's development processes at both the national and local level, so as to tackle the root causes of environmental degradation. The ESP Phase I was initiated in 1998 and will run up to 2003, under the auspices of the MTENR. The major components covered by the programme are:

- Strengthening the Institutional, legal and regulatory framework. This includes implementation of the Community Environmental Management Programme (CEMP),
- Strengthening Environmental Education and Public Awareness,
- Undertaking pilot activities to strengthen community-level environment and natural resources through provision of matching grants through Pilot Environmental Fund (PEF) for community initiatives and for environmental studies,
- Building environmental information management systems, and
- Community Based Natural Resources Management Programme in Western Province.

As Zambia aims to reduce poverty from the current level of over 70% of the households to 50% by the year 2005, the above areas are pivotal to the sound environmental conservation, which in turn are important elements in achieving a clean and healthy environment. Their achievements are, therefore, a necessary pre-condition to achieving sustainable development.

This is in line with provisions of the Agenda 21, which recommended that member states make provisions for their national development plans, programmes and policies to be in harmony with sustainable development goals.

The implications for NAP are that the NEAP/ESP already forms a foundation on which to build upon, as these programmes are consistent with the CCD. Therefore, the NAP needs only to add value to the strategies identified, putting emphasis on community-based approaches and increased participation of stakeholders.

### 9.1.2 National Biodiversity Strategy and Action Plan (NBSAP)

Zambia is a party to the Convention on Biological Diversity (CBD) which it ratified on 28<sup>th</sup> May 1993. In trying to meet its obligations, the Government in 1997, through the MTENR initiated the preparation of the NBSAP to provide a basis for the implementation of the CBD.

The NBSAP Document was finalised and adopted by Government. This Document reviewed and provided information on the following with regard to biodiversity conservation in Zambia:

- Current status of biodiversity,
- Pressures and threats to biodiversity, and
- Institutional and legal frameworks.

The above analysis provided a framework of strategies and actions to address the following areas:

- Conservation of biodiversity,
- Sustainable use of biodiversity,
- Equitable sharing, and
- Bio-safety.

Arising from this strategy and action plan, several biodiversity programmes have emerged:

- Lake Tanganyika Biodiversity Project, formerly known as Pollution Control and other measures to Protect Biodiversity in Lake Tanganyika under ECZ,
- The Integrated Dry Land Biodiversity Conservation Project in Semi-Arid Areas of Lower Zambezi-Luangwa Valley Region (ICBD),
- The Lukanga Swamps Biodiversity Conservation, and
- Reclassification and Sustainable Management of Zambia's Protected Areas System

The ICBD, Lukanga Swamps Biodiversity Conservation and Reclassification and Sustainable Management of Zambia's Protected Areas System Programmes/Projects are still in their preparatory stages.

The UNCCD has synergies with other global conventions (CBD, UNFCCC) and these programmes form part of the UNCCD initiatives and shall need to be supported in terms of completion of their preparation and implementation phases.

### 9.1.3 Analysis of other Environmental and Natural Resources Programmes in relation to the NAP

Parallel to the developments above, the Government has been implementing processes aimed at reviewing various natural resources sectoral policies and

legislation to give more explicit rights to stakeholders, communities and the Private Sector. These sectors include forestry, wildlife, water, energy and fisheries.

### **The Forestry Sector**

The status of the forestry resources has been deteriorating over the past years. Given the importance of the forestry sector to the economy and the environment, the Government initiated a process in 1984 to 1997 to prepare a 20 year Zambia Forest Action Plan (ZFAP) to address the deforestation problem. The main objective of ZFAP is to provide for the national management and conservation of forest resources in order to enhance the contribution of the forest sector to social economic development, poverty reduction and the improvement of food security. This process has led to the review of the Forest Policy of 1965 and Forest Act of 1973. The main essence for the review of the Policy and Act was to provide for a mechanism to enhance the participation of local communities and other stake-holders particularly the Private Sector in the management of the forest resources. The Government has since adopted the New Forest Policy of 1998 and enacted the Forests Act No.7 of 1999. As earlier mentioned the revised Forests Act of 1999 provides for the establishment of the Zambia Forestry Commission (ZAFCOM) which has been charged with the following responsibilities:

- Conservation control and management of forest resources in protected forest reserves and open areas.
- Establish and promote the establishment of forest plantations.
- Promotion of community participation through collaborative forest management
- Development of forest management plans to guide the management and sustainable utilisation.
- Undertake and support adaptive research and development of forest resource management, farm forestry, agroforestry, agriculture and forest products at national, regional and local levels.

The action programmes elaborated by ZFAP include the following:

- The Indigenous Forest Management and Biodiversity Sub-programme,
- The Tree and Forest Development Sub-programme,
- The Forestry Industry and Non-Wood Forest Products Development Sub-programme, and
- The Wood fuel Energy Development Sub-programme

The above sub-programmes are front-line activities with direct impact on the forest sector development objectives. They are complemented by the supportive sub-programmes and a series of forest sector policy actions and institutional strengthening activities, which promote sustainable forest resources management namely:

- The Forest Education and Training Sub-programme,
- The Forest Research and Extension Sub-programme, and
- The Policy, Planning, Monitoring and Evaluation Sub-programme.

- Gender, governance and institutional reforms

These will require to be reinforced by encouraging the Private Sector and NGOs to participate in sustainable forest management. The actions to strengthen these programmes need to be supported by the Private Sector incentives, to encourage investment in sound forest management.

The Forest Department in Central, Copperbelt, Luapula and Southern Provinces is undertaking the promotion of forest management involving indigenous systems, as well as, local district administration.

The Provincial Forestry Action Programme (PFAP), which is being funded by FINNIDA focuses on Joint Forest Management Systems (JFMs), a participatory methodology which is action oriented and promotes co-operation and the sustainable management culture. The client groups and stakeholders of PFAP include individuals and households dependent on forests, rural and urban communities, Private Sector enterprises, NGOs, CBOs, forestry industry, mining and politicians.

The project also undertakes vegetation mapping through ground surveys, aerial photography and use of remote sensing satellite imagery to determine the status and trends in forest resources and the extent of their utilisation. The statutory instrument has been approved and this will enable full implementation of the JFMs.

The Forest Resources Management Programme (FRMP) supported by a loan from the International Fund for Agricultural Development (IFAD) is being implemented in North western and Luapula provinces. The project aims at securing a sustainable income base for the rural poor communities depending on forest resources represented tangibly by enhanced household income levels in forest areas in the medium term. The implementation of this project will contribute to the national objective of poverty reduction within the framework of the Poverty Reduction Strategy Paper (PRSP). The project will subsequently contribute to the implementation of the millennium development goals to which Zambia has accented.

The overall objective is to increase the incomes of the poor people depending on the exploitation of the forest resources both in the short term through increased productivity and more efficient marketing and in the long term by maintaining productivity activities at levels that do not deplete the forest resources. In short the project has two components thus; community Development in Forest areas and sustainable income generation.

The ZFAP is, therefore, a very promising model in terms of its aims to contribute to sustainable economic development through its sub-programmes. However, support and investment in the sub-programmes is still required to meet the objectives of ZFAP. The UNCCD-NAP has an opportunity for complementing ZFAP initiatives.

ZFAP ultimate objectives and programmes are in line with those of the UNCCD since they focus on contributing to social economic development through sustainable economic growth and reducing poverty. The support of the UNCCD-NAP to the implementation of ZFAP will require an assessment of current investment gaps and support requirements in the forest sector to determine and optimise UNCCD-NAP's commitments. Since the PFAP initiative is operational only in four provinces of Zambia, two of which do not fall in the NAP priority areas, there is need through the NAP to extend the programme to the other provinces of Regions I and II.

### **Wildlife Sector**

The wildlife resource despite its importance and potential in contributing to social economic development and biological functioning of ecosystems has been depleting over the years due to poorly financed and poor management systems supported by weak legislation. These threats necessitated the Zambian Government to review its management systems as early as the 1980s. This review resulted in the assertion that the problem of the wildlife resource decline was largely due to social economic factors, which had not been considered in the conventional management designs. This called for an integrated approach to wildlife management including community participation in decision-making, revenue sharing and resources management through the Village Wildlife Scout Programme. This saw the implementation of the Administrative Management Design (ADMAD) and the South Luangwa Area Management Unit (SLAMU), as community-based wildlife management approaches. The ADMAD programme differs from LIRDP in terms of revenue sharing mechanisms (systems) between the community and the Government.

- Although the concepts are highly innovative and could contribute significantly to wildlife conservation, the successes of these programmes have been limited and mixed, due to various reasons including inadequate legal backing to support community participation (Kalyocha, 2000). However, the Government in 1998 formulated the Wildlife Policy and reviewed the principal Wildlife Act of 1991. The Policy and the revised Act of 1998 provides for the formation of ZAWA.

In this light, UNCCD-NAP has the basis for intervention in ZAWA to support biodiversity management in the areas of institutional capacity building and community participation.

As wildlife can contribute to economic development through tourism, ranching and safari-hunting, efforts to support these industries, for example, infrastructure development and support to conservation efforts including those emphasising private entrepreneurship need to be strengthened. The support should be directed at ecologically marginal areas for agriculture but suited to wildlife management, particularly in the five provinces of Regions I and II.

### **Water Programmes**

The Government in 1993, developed a water policy to guide developments in the management, demand and supply of water as an important resource in the country. This is in line with the changing macro-economic environment, as well as, to address an inherent weak institutional capacity, which is unable to prevent deterioration of facilities and service delivery. In addition, the Government in 1995 prepared the National Water Resources Management Plan and the Water Resources Action Programme in the year 2000. Sustainable water resources management is an integral requirement for the Convention and is certainly a NAP activity, especially in implementing the recent Water Resources Action Programme. It is important to identify and assess programmes to be supported by the NAP. Such programmes can include facilitation of community management of water supply points, capacity building in the Department in feasibility studies and construction of irrigation facilities, resource mobilisation and allocation for construction of water facilities, training, promoting sustainable water harvesting techniques and many others.

Current on-going water development projects that need to be consolidated in terms of implementation through NAP include:

- Groundwater development (Northern Province),
- Ground water development (Central, Copperbelt and Lusaka Provinces),
- Rural water for Health (North-western),
- Groundwater Development (Eastern),
- Groundwater Development (Southern),
- Rehabilitation and Construction of Dams,
- Rural Water Development, and
- Water Resources Assessment.

Constraints hindering successful implementation of the above projects, particularly the GRZ supported projects include: inadequate capital allocation; late releases of capital funds; inadequate developed human resources due to brain drain, inadequate transport and equipment and community participation projects which are slow in implementation. These are clear and obvious areas for intervention and support by the NAP.

### **Fisheries Programmes**

The Fisheries Industry does contribute to desertification along riverbanks or lake shores because firewood is used for drying fish. Cutting trees for firewood leads to deforestation. Deforestation can lead to soil erosion, biodiversity loss, land degradation, soil infertility, siltation and flooding along riverbanks and lakeshores.

To address this concern the Government has prepared programmes on fish conservation. These programmes provide a basis for NAP intervention, especially in the areas of finding alternative methods of drying fish and having fish as alternative livelihood for rural communities living in land degraded areas

#### **9.14. Analysis of Programmes promoting Sustainable Development in relation to the NAP**

##### **ZAMSIF and PRSP**

The Zambia Social Investment Fund (ZAMSIF) formerly, Social Sector Rehabilitation Programme (SSRP) is a programme under the Ministry of Finance and National Planning and is supported by the European Union (EU) and World Bank. It aims to promote social development and reduce poverty through increased GRZ financing to the social sector. ZAMSIF has sub-programmes, namely, Micro Projects Programme (MPP), the Social Recovery Project (SRP) and Social Safety Net (SSN). MPP supports projects that are proposed and implemented by the local people, including administration of funds. The SRP supports community initiatives to help protect the poor during the SAPs. The projects under this programme include health, nutrition, education and economic infrastructure. However, in both the MPP and SRP communities contribute labour, material or cash, as a way of sustaining the projects.

The Social Safety Net (SSN) provides cushion from the impacts of SAP on vulnerable groups. This is done by providing material support for self-help projects and financial and skills training to the poor.

The role of UNCCD-NAP in ZAMSIF shall be to encourage Debt-Swaps and ensure that debt-relief-savings are invested in the economic and social sectors. In recognition of the fact that these programmes did not put emphasis on environmental and natural resources management, the ESP established the PEF under MPP to integrate environmental concerns in community development. The PEF is aimed at facilitating community participation in small-scale environmental studies and micro-projects. There is strong need, therefore, for close collaboration on issues dealing with land degradation.

The Zambian Government has worked on the Poverty Reduction Strategy Paper (PRSP) that elaborates and provides additional programmes to the existing efforts directed at poverty reduction. The paper was prepared through analysis of current developmental issues and efforts in the sectors of Agriculture, Mining, Industry, Tourism, Health, Education, Water, Sanitation, Environment, Housing and Resettlement. The PRSP has proposed action areas and strategies to reduce poverty and support income-generating activities.

##### **The Agricultural Sector Investment Programme (ASIP)**

ASIP was originally designed to rationalise donor support to the Ministry of Agriculture and Co-operatives (MACO) in order to create an enabling environment to support agricultural development in 1992. The programme only started in 1996 and was financed as follows: 60% from multilateral and bilateral partners and 40% from Government.

The ASIP development goals were:

- Food security at both household and national level;
- Sustainability of the existing agricultural resources (land, water, and air);

- Generation of incomes through employment creation;
- Contribution to the Country's sustainable industrial base; and
- Contribution to the country's balance of payment support through agricultural exports.

The above goals were to be realised through the following broad-based strategies:

- Diversification of crop production and promotion of drought tolerant crop species (millet, sorghum and cassava) in drought prone areas;
- Efficient delivery of services to small scale holders;
- Expanded opportunities for outlying areas;
- Improvement in the economic status of women;
- Improved use of available water resources; and
- Emphasis on sustainable agriculture.

Sustainable agriculture, among other things is to be achieved through some of the above stated strategies, which promote production of both cereal and leguminous crops on a rotational basis and improved water management. Other measures embedded in sustainable agriculture are reduction of soil erosion through appropriate farming practices such as contour ploughing and minimising adverse effects of changing technologies on the environment.

Most of the works on sustainable agriculture are being implemented through the Land Management and Conservation Farming Project (LM&CF) supported by SIDA. The project has been in operation in some of the areas of Regions I and II since the 1980s. Its main objective is to promote improved and sustainable agricultural productivity through technologies that emphasise good management of the organic matter of the soil and rainwater. The main activities of the LM&CF Programme carried out with a gender perspective include training, promotion of physical and biological soil conservation structures, soil fertility, rain water management, farm forestry, range and pasture management.

At the moment, MACO is working on Agricultural Commercialisation Programme (ACP), as a successor to ASIP. The NAP can contribute to agricultural development through support to the strategies, which are aimed at achieving food security, land resources conservation, economic development and poverty reduction.

### **The National Population Policy**

The National Population Policy was adopted in 1989. This Policy recognises the need to integrate population issues into development planning. To translate this into an action oriented tool, Government prepared a National Population and Development Programme of Action (1996-2015). This document further reviewed the Population Policy in the light of current social economic conditions (MoFED, 1996). The National Population and Development Programme has a strong relevance to the implementation of the CCD, in that reduced population growth will entail reduced dependence on natural resources such as woodfuel and reduced expansion of settlements and cultivated areas, which increase the problem of

deforestation. The NAP should, therefore, support the implementation of the National Population Development Programme in order to reduce the impact of human population and its activities on the quality and availability of land resources, thereby improving the quality of human life.

### **The Energy Policy**

Zambia's energy policy aims at investigating and developing other forms of energy using appropriate technology which is environmentally friendly. Currently, the Department of Energy is implementing a project in the Eastern Province on the use of solar energy for lighting. The University of Zambia through the Technology and Development Unit and the National Institute for Scientific and Industrial Research in collaboration with the Institute of Social and Economic Research has been working on developing these technologies.

Similar programmes under the rural electrification project and works by NGOs and other supporting agencies such as YWCA, Africare, GTZ in the promotion of heat saving stoves, biogas, coal briquette braziers and low cost sources of lighting have been encouraged under the Energy Policy. This is a very good avenue for NAP intervention.

### **Gender Policy**

It has been noticed that segregation and imbalances exist in the Zambian society between various social groups, in particular men and women. The Zambian Policy on Gender focuses on reducing the gap, by emphasising the involvement of women in all development aspects and promoting the welfare of women as well as other disadvantaged groups particularly the girl child. This is in line with the requirements of the NAP, which places emphasis on gender considerations in all programmes.

#### **9.1.5. Other on-going programmes in relation to the NAP**

In addition to the above initiatives, Government has continued to implement and support other on-going programmes that improve the quality of life in Zambia. These include the Road Sector Investment Programme, the Education Sector Integrated Programme, Health Sector Reform Programme and the Public Sector Reform Programme. The common feature of all these programmes is the increased recognition of decentralization of power to lower levels, paying particular attention to capacity building, provision of infrastructure and equipment, logistics and adequate funding. Limited capacity by Government to support the implementation of the reforms has resulted in the failure to achieve the intended objectives and support to institutions and promote social welfare. In view of this, attention could be paid to some NGO led programmes with objectives on desertification.

In line with the Convention, the NAP should elaborate and implement sustainable income generating activities to improve livelihood and reduce poverty, which is one of the root causes of land degradation.

## 10.0 PAST AND CURRENT PROGRAMME AREAS AND INTERVENTIONS

### 10.1 Cooperating Partners Programmes and Initiatives

A number of cooperating partners have contributed to the natural resources management and conservation in Zambia. Outlined below are the past and current cooperating partners on various programmes and interventions.

#### A) World Bank

As from last year (2002) the World Bank will substantially finance the proposed \$ 15 Million Biodiversity Project, which is aimed at revamping the conditions of Mosi-oa-Tunya and Kafue National Park. This will be achieved with the help available funds in form of a grant from Global Environment Facility (GEF) and an advance from International Development Association (IDA) to the Government of Zambia. Currently the Project comprises the preparatory phase with funding support amounting to US\$ 500,000 for various studies, capacity building and emergency support for resource protection in Kafue and Mosi-oa-tunya National Parks. The components undertaken include;

- i) Projects Coordination at ZAWA
- ii) Development of Kafue National Park as a model of sustainable economic use and biodiversity conservation in a management –extensive environment
- iii) Development of Mosi-oa-Tunya National Park as a model of sustainable economic use and biodiversity conservation in a management – intensive environment
- iv) ZAWA's Community Based Natural Resources Management Programme in customary land surrounding the Kafue and Mosi-oa-Tunya National Park
- iv) ZAWA's Research, Planning and Information Programmes Directorate's functions in the Mosi-oa-Tunya and Kafue National Parks and surrounding customary land
- v) Public Awareness

The Biodiversity Project is a sub-component of the Tourism Project. The entire project tends to stimulate Zambia's economy using tourism as an entry point. The project will come to an end by 2007.

Being a sector investment programme under the MTENR the ESP has been requested to supervise the activities of the CBNRMP in western province and Kasempa and Mumbwa. The programme is being supported by the International Development Association (IDA) under the World Bank, UNDP, Nordic Development Fund (NDF), The Royal Netherlands Embassy (RNE) and GRZ.

#### B) European Union

A direct investment programme has been developed amounting to Ecu 10 Million for resource protection. The European Union (EU) has also supported the transformations in ZAWA. In addition the European Union funded the consultancy for the development of

the five year sector based strategic plan. The strategic plan provides a framework for effective management in the Conservation and Commercialization of the protected areas in Zambia. Furthermore, EU has also agreed to support resource protection in the Lower Zambezi NP and build the capacity of the new institution to implement the 5-year strategic plan.

This year it has also provided Ecu 350,000 for the village scouts programmes in 14 selected communities involved in wildlife management. The EU has also set aside about Ecu 250,000 for emergency support to ZAWA.

**C) World Wide Fund for Nature (WWF)**

WWF have had a long-standing partnership with ZAWA. It has supported with technical and financial resources some wetlands programmes and various projects countrywide. Among the areas of support were the infrastructure development, law enforcement and community based natural resources management and planning initiatives. WWF has actively worked in Kafue flats and Bangweulu swamps.

**D) United States Agency for International Development (USAID)**

The USAID has been very supportive of natural resources conservation efforts in Zambia and has been the brain behind a lot of the programmes being undertaken currently. In spearheading these efforts the USAID contracted the Environment Conservation Association of Zambia in mid 1998 to perform a range of monitoring evaluation, adaptive research and impact assessment services for an initial period of one (1) year.

The USAID in close collaboration with other stakeholders participated in the US\$ 224,527 ECZ/WRMU Project whose main deliverable was the Aerial sample Survey of the Central Luangwa Valley, which covers South Luangwa National Park, Luambe National Park, Lupande Game Management Area, Part of Lumimba, Munyamadzi, West Petatuke, Sandwe and Part of Chisomo Game Management Area (GMA's) in 1999.

The USAID also supports CLUSA (Cooperative League of the United States of America) an NGO, in undertaking community based forest preservation programmes in the Eastern Province of Zambia. Specifically the projects are conducted in Chipata, Petauke and Katete. The value of the project which concludes in December 2003 (next year) is US\$ 3.6 million.

Community-based NRM and Sustainable Agriculture (CONASA) is another initiative sponsored by the USAID and placed under the tutelage of the international Union for the Conservation of Nature (UICN).

On the all the USAID has a far wider portfolio of environmental interventions some of which refer to crosscutting themes while others are funded through the American embassy, like the GISP programme again under UICN.

**E) Danish Assistance Development Agency (Dannish)**

The Dannish have participated in supporting ZAWA's efforts by directly funding Conservation Lower Zambezi (CLZ). The logistical and financial support has been utilized

in wildlife resources protection, surveys and community based initiatives. In 2002, CLZ provided support for undertaking base line survey in the Lower Zambezi National Park for generating baseline data for ecological rehabilitation of the protected areas (ZAWA, 2002).

**F) Norwegian Agency for Development (NORAD)**

NORAD has been funding the management of the South Luangwa National Park and the surrounding Game Management Areas in particular, the Upper and Lower Lupande GMA for over 10 years. It also actively developed Community Based Natural Resources Management Programmes.

An extension to Phase V of the Norwegian Government Support to South Luangwa Area Management Unit, a major elephant range area, is under review. Considerations so far are to fund the national community-based wildlife management programme.

NORAD support to the Community-based Natural Resources Management Program (CBNRM) and ZAWA ('000), see Table 10.1 below:

Table 10.1: NORAD Support to CBNRM & ZAWA

Year	2003	2004	2005	2006
CBNRM	1015	1559	1554	1531
ZAWA HQ	455	350	180	100
<b>Total</b>	<b>1470</b>	<b>1909</b>	<b>1734</b>	<b>1631</b>

The Royal Government of Norway has also agreed to provide a total of US\$ 1.2 Million as support for a national-wide resource protection programme. A total of US\$ 498,000 has already been given to ZAWA for the purpose. After a trial run in Kafue National Park, the programme will be extended to other protected areas in the country.

In addition the Nordic Development Fund (NDF) contributed US\$ 73,039.67 to the Environmental Support Programme (ESP)

**G) African Wildlife Foundation (AWF)**

Over the years AWF has been supporting ZAWA in the wildlife management. The main interests have been in the creation of capacity building, supporting community development, law enforcement and conservation management. Recognition is made for its transfrontier initiatives in the Four Corners (Zambia, Zimbabwe, Botswana and Namibia).

The African Wildlife Foundation funded by the USAID has agreed in principle to finance the rehabilitation of the housing and office accommodation for wildlife police officers starting with Kafue National Park. The Foundation is already supporting resource protection activities in the Lower Zambezi system.

#### **H) The Japanese and American Governments' Support**

The Japanese government has shown interest to extend support to the Kafue National Park and the ZAWA Head Office as soon the Strategic plan is approved by the ZAWA Board.

The American government through the USAID is providing support through the provision of computers for Internet and Intranet connectivity for effective monitoring of the wildlife resource.

#### **I) The Frankfurt Zoological Society**

The Zambia Government and the Frankfurt Zoological Society (FZS) executed a 10-year Agreement for resource protection and infrastructure maintenance in the North Luangwa National Park. Since 1986, FZS has supported ZAWA on various programmes of law enforcement, research and community development in and around the North Luangwa National Park.

#### **J) United National Development Programme (UNDP)**

The UNDP has been supporting the ESP through annual contributions towards its NEAP implementation programmes. The institution provided a total of US\$ 202,256.87 against the budgeted US\$ 213,366

#### **K) Canadian International Development Agency (CIDA)**

CIDA is very instrumental in providing appropriate and meaningful environmental interventions. Most importantly it has long been recognised that the ECZ depends on the government for financing which is very irregular. CIDA has however been supporting ECZ for over ten (10) years and facilitated organisational design, establishment of the organisation and formulation of its strategic plan.

CIDA is also involved in a joint venture with Zimbabwe in undertaking the strategic environmental assessment of the developments around the Victoria Falls. The project is called the Victoria falls Environmental Capacity Enhancement and Master Plan Project and has been running in Zimbabwe for the past two years and an extension to the Zambian side is being sought

CIDA is working in conjunction with International Centre for Research in Agroforestry (ICRAF) in the Mwekera area of the Eastern Province of Zambia promoting Agroforestry as a vehicle for improved productivity, poverty alleviation and soil preservation. This is a regional project with total funding amounting to US\$ 9,348,228 (or Canadian \$ 14.8 million) of which Zambia's benefit is a total of US\$ 2,779,203 (or Canadian \$ 4.4 million). The project was for an initial 5year period.

For the last decade (1991 to 2001) CIDA has been financing the Regional Tree Seed Network intended to address deforestation and land degradation in Zambia, Mozambique, Malawi, Zimbabwe and other countries by promotion of tree seed production and

availability. Financing to the mentioned countries was in the order of US\$ 8,969,245 (or Canadian \$ 14.2 million)

In furtherance of its support for the preservation of Zambian Wetlands CIDA through the project executing agency, IUCN, financed the Zambezi Basin Wetlands Conservation and Resources Utilisation Project in western province. The project's focus was to conserve the critical Zambezi Wetlands ecosystems while facilitating their sustainable use. The project has been in operation for five (5) years and is intended to span another five (5) years, implying a ten (10) years planning horizon with financing of up to US\$ 5,248,903 (or Canadian \$ 8.31 million).

More recently, capacity development support is being provided for environmental management in the mining sector, focused on mine safety department of the Ministry of Mines and Mineral Development of Zambia. The financing package totaling US\$ 2,526,548 (or Canadian \$ 4 million) is designated for utilisation between 2002 and 2004.

CIDA in conjunction with NORAD helped set up the Institute of Environment Management as a fully autonomous unit (within the Copperbelt University) and provided laboratory equipment, training and documentation/brochures all amounting to US\$ 55,000.

In addition to the foregoing and other projects and programmes not mentioned in this report CIDA also finances a wide range of projects with crosscutting themes.

#### **L) The Government of the Republic of Zambia (GRZ)**

The Government of the Republic of Zambia (GRZ) provides not only the institutional framework for the preservation of natural resources. Due to lack of financial resources the government normally provides counterpart funding to augment the financing efforts of cooperating partners and as a measure of commitment to natural resources and environmental conservation. The government normally supply between seven (7) and ten (10) percent as counterpart funding towards various donor funded projects depending on the conditions of the agreement and source.

#### **M) The INTERNATIONAL fund for Agricultural Development (IFAD)**

The INTERNATIONAL fund for Agricultural Development (IFAD) supports a multiplicity of projects environmental conservation. Effective from June 2002 IFAD embarked on a massive US\$ 15.6 million Forest Resources Management Programme. IFAD is providing loan finance of up to US\$ 12.6 million while Germany Technical Aid to Zambia (GTZ) an Irish Aid will provide a grant amounting to US\$ 3 million. The programme is to run for six (6) years. The project purports to harness and develop forestry products with a view to commercialisation and improving the quality of life of the people of Luapula nad North western provinces.

#### **N) The Finnish Development Agency (FINNIDA)**

The Finnish Development Agency (FINNIDA) is collaborating with other stakeholders on a community based programme called Provincial Forestry Action Programme being implemented in Luapula, Copperbelt, Central and Southern Provinces. The programme has a funding portfolio of up to US\$ 4.6 million with an additional seven (7) to eight (8)

percent government counterpart funding. The program has been running for four (4) years and will be consummated in December 2003

Other major contributors to environmental conservation include such institutions as the GTZ, Irish Aid and the Food and Agricultural Organisation (FAO).

**The support by donors is a means:**

- To protect Zambia's natural resources and biodiversity,
- To promote economic growth and economic diversification based on tourism,
- To enhance institutional capacity in establishing a cutting edge CBNRM programme thereby contributing to poverty alleviation; and
- That institutions' ability to tackle difficult issues innovatively and creatively is enhanced, and is able to maintain its character as an independently managed body corporate.
- Accountable, performance management processes with sound, transparent monitoring mechanisms and checks and balances.

Zambia therefore, sees the bridging support for recurrent costs, especially resource protection, from the cooperating partners as critical to the management of biodiversity and improved livelihoods for local communities.

## **10.2 FUTURE AND PLANNED PROGRAMME AREAS AND INTERVENTIONS**

### **10.2.1 Programme Vision**

To restore land productivity by using sustainable means of conserving it in order to reduce poverty and foster sustainable development.

#### **Programme Purpose**

The purpose of NAP is to identify the factors contributing to desertification and put in place practical measures necessary to combat desertification and mitigate the effects of drought.

#### **Programme Objectives**

The NAP aims at contributing to sustainable environmental management through the reduction/control of land degradation, thereby contributing to poverty reduction, food self-sufficiency and food security and ultimately contributing to economic growth. Its immediate objectives are to:

- Reduce the destruction of land resources in affected areas,
- Promote sustainable use of land resources,
- Increase public awareness and information dissemination on matters of land degradation,

- Provide a suitable policy and legislative framework for the implementation of the NAP,
- Establish and support effective administrative and co-ordination of the NAP,
- Introduce and improve on assessments, planning and monitoring systems for the effective management of the NAP, and
- Establish partnerships with multi-lateral and bilateral institutions in the management of arid, semi-arid and dry sub-humid areas.

### 10.2.2 Identified Programme Areas of Intervention

To achieve the stated objectives, the following programme areas have been proposed according to their priority:

- Early Warning and Preparedness,
- Forestry, Ecosystems and Species Conservation,
- Water Catchment and Energy Conservation,
- Collaboration and Networking,
- Capacity Building of Programme Co-ordination Unit and Other Focal Persons,
- Extension, Public Awareness and Information Dissemination,
- Land Degradation Assessments, Monitoring and Reporting,
- Easy to use environmentally friendly technologies including Indigenous Knowledge,
- Livelihood Improvement,
- Food Self Sufficiency and Food Security,
- Human Settlement Management, and
- Legal and Policy Reviews.

#### 10.2.2.1 Early Warning and Preparedness

Zambia produces crop weather bulletins every ten (10) days during the rainy season. Crop forecasts are issued by the National Early Warning Systems (NEWS). The problem of few reliable weather stations, limited network of rain gauges and communication radios affects the accuracy and quality of data. However, satellite information is used to complement these efforts.

The methods of crop forecasts have severe limitations in terms of producing reliable data. Current methods do not take cognisance of inter-crops in individual farmers' fields. There are problems of estimating planted areas and yields for crops grown. There are errors in estimates, which affect the results of the information produced on crop forecasting (The Zambian Farmer, Vol. 4, No. 4, September, 2000). Apart from the above deficiencies, the response capacity in Zambia on the part of Government is limited due to inadequate financial resources (Mtolo, pers. commun).

Given this situation, the strengthening of the early warning and preparedness systems, which is also emphasised in the CCD, shall be achieved through the following interventions:

- Assess the current early warning and preparedness systems,

- Improve the early warning and response capacities,
- Evaluate current strategies and methodologies (for example Vulnerability Assessment Mapping) for assessing the impacts of climate variability on natural resources and humans in terms of easy-to-use, accurate information collected and quick production of results,
- Utilise predictions of climatic variability in an effort to mitigate the effects of drought by ensuring that information reaches decision makers, planners and affected populations in good time,
- Develop sustainable and appropriate programmes for both crops and livestock,
- Establish alternative livelihood support projects that could provide income in drought prone areas, and
- Support national centres/ institutions by providing them with adequate financial resources, better equipment for the enhancement of procurement, processing and dissemination of information about natural disasters, such as drought and floods.

#### 10.2.2.2 Forestry, Ecosystems and Species Conservation

There should be a deliberate effort to protect and manage existing forests and conserve sensitive ecosystems. The following are the suggested interventions:

- Broaden the focus of ZFAP and build the capacity to formulate and implement the programme through participatory and cost effective processes with full support from government, private sector, NGOs and the donor community.
- Instituting measures to alleviate rural poverty.
- Promote and support a programme of afforestation, reforestation, community forestry and agroforestry,
- Direct work of extension on organising and training communities in preparing and maintaining community owned nurseries and fodder banks for supplying planting materials, managing wood lots and in sustainable utilisation of these resources,
- Promote awareness creation and train communities to draft and implement by-laws in order to sensitise communities to reduce indiscriminate cutting of trees,
- Introduce and implement an incentive scheme to encourage communities to plant and replant trees within their vicinities,
- Emphasise on selection and proliferation of appropriate indigenous drought tolerant species especially leguminous species and promotion of indigenous technologies,
- Determine the current status of forests and deforestation by land-cover maps, use of remote sensing techniques and ground surveys in order to manage the forests properly,
- Review the list of species being affected as a result of deforestation and land degradation,
- Revise legislation on endangered species accordingly to provide for their protection, and
- Develop policies for Forestry Sector that should keep prices of forestry products at commercial levels.
- Establish mechanisms for more equitable sharing of the benefits from the forests

### 10.2.2.3 Water Catchment and Energy Conservation

To effectively manage the catchment areas, the following programme interventions are proposed:

- Promote preparation and implementation of community catchment plans on public and customary forestlands on a sustainable use basis,
- Promote techniques for the development of surface and ground water for humans, agriculture and livestock,
- Encourage rain water harvesting including damming for interception of seasonal streams, grass strips and crop mulching,
- Promote small scale irrigation schemes as well as adoption of appropriate irrigation methods,
- Promote increased tree planting in degraded areas,
- Promote reduced use of wood fuel through the use of fuel-efficient stoves for wood and charcoal using models that are culturally adaptable,
- Develop and promote low-cost alternative sources of energy (non-wood fuels), for example
  - briquetting of agricultural residuals and coal,
  - solar drying for preserving perishable foods, vegetables and fish,
  - solar water distillation technologies for water supply,
  - wind pumps for water supply and irrigation,
  - wind turbines for grain milling,
  - biomass gasifiers and biogas digesters,
  - promotion of rural electrification, and
  - production of non-edible and edible seed oils as diesel fuel extenders and substitutes in remote rural areas with suitable ecologies.
- Promote photo-voltaic electricity applications for:
  - rural health centres,
  - water supply and irrigation, and
  - cottage industries.
- Promote awareness among the local population through massive campaigns about the value of the water catchments and trees in particular.

### 10.2.2.4 Collaboration and Networking

There is need to forge and strengthen regional linkages and collaboration on matters of land degradation through promotion of exchange of research data, training, public awareness and early warning. Collaboration could also be enhanced with regional institutions such as:

- The Regional Early Warning System based in Harare for SADC,
- The Eastern and Southern Africa Early Warning System based in Nairobi,
- The SADC- Environment and Land Management Sector based in Lesotho, and
- The Kalahari-Namib Programme with headquarters in Gobabob, Namibia.

Collaboration should be enforced through training programmes, exchange visits, workshops and meetings.

#### **10.2.2.5 Capacity Building of the Programme Co-ordinating Unit and Other Focal Persons**

The success of the proposed programmes shall depend on the capacity of Government and other stakeholders including the local population to manage the programmes. This shall require adequate training of the personnel. The Programme interventions include the carrying out an overall needs assessment of the various stakeholders' requirements as a prerequisite to supporting the various institutions, although the capacities of NGOs and CBOs have been assessed.

Some of the training programmes that need to be advanced to the grassroots, in particular, should cover the following areas:

- Provide adequate training to personnel and communities, in technical and administrative skills, as well as, handling equipment and managing logistics,
- Environmental management for development,
- Integrated natural resources management,
- Development and leadership skills including those of women,
- Planning, management and co-ordination,
- Training of trainers in project management and communication skills, and
- Provide support to the Regional Disaster Management Training Centre in Kabwe

#### **10.2.2.6 Extension, Public Awareness and Information Dissemination**

Availability and timely provision of information is vital in the decision making process at any level. The following interventions are proposed in the area of extension, public awareness and information dissemination:

- Formulate an effective outreach programme through extension, public awareness and information dissemination mechanisms,
- Conduct massive campaigns to educate the people on the problems of desertification and general natural resources management in the affected areas. This could be done through mass media, distribution of pamphlets and booklets, newsletters, exhibitions and popular public theatres and drama,
- Arrange and support exchange visits for farmers' groups, extension and project management staff to visit other similar programmes in the country and/or in the sub-region, and
- Undertake skills training for farmers and extension workers to enhance sustainable natural resource utilisation and income generating activities such as training in pit-sawing and carpentry, bee-keeping and honey processing, and other various resources-use activities that need to be highly supported to enhance self-employment opportunities.

#### **10.2.2.7 Land Degradation Assessments, Monitoring and Reporting**

The assessment and monitoring of desertification should include:

- Provision of bench marks for assessing land degradation,
- Assessing the extent and status of land degradation,
- Ensuring that environmental impact assessments for all major proposed interventions are conducted,
- Putting in place monitoring and reporting mechanisms, particularly through monthly, quarterly and annual reporting on desertification,
- Putting in place mechanisms for annual, mid-term and end of phase reviews, and
- Promoting the participation of all stakeholders in land degradation assessments, monitoring and reporting.

#### **10.2.2.8 Easy-to-use Environmental Friendly Technologies including Indigenous Knowledge**

Interventions under this programme area shall include:

- Undertake an inventory of existing indigenous knowledge and technologies,
- Use identified indigenous knowledge systems in combating land degradation and mitigating the effects of drought,
- Emphasise on increased awareness and incentive scheme support to increase farmers' adoption rates,
- Promote technological transfer through conventional management and conservation technologies. The technologies being promoted by LM&CF include contour ridging, vetivar grass strips, use of green manure, improved fallow, rain water harvesting, deep rip ploughing, farm forestry, intensification aspects in the right direction, and
- Use of traditional rulers and their administrative structures to spread knowledge and energy conservation practices.

#### **10.2.2.9 Livelihood Improvement**

The programme interventions suggested to improve livelihood are Agricultural Development (crops and livestock, irrigation and infrastructure development) and Community Management of Game, Forests and Fisheries.

#### **10.2.2.10 Promote Development of Economic Infrastructure**

The following interventions are suggested under the development of economic infrastructure:

- Improve feeder roads. The improvements would include grading, making side drains and putting gravel in all agricultural strategic roads. Such activities need to be community based where manual labour is to be employed. The use of manual labour would create employment opportunities to the local people.
- Identify and develop areas with already high concentrations of human settlements as development centres, and
- Provide market facilities in these places together with other social services.

### 10.2.2.11 Game Management

Under Game Management, the interventions proposed are:

- Empowerment of the local communities to manage the game resources. Currently, the majority of local communities do not feel adequately involved in the management of their wildlife. This attitude needs to be reversed.
- Promotion of income generating schemes for the communities and the Private Sector, for example, ranching, culling schemes, safari hunting and tourism through provision of incentives.
- Preparation and implementation of management plans (Sustainable land use).
- Capacity building of local communities on various aspects of wildlife management.
- Review and strengthen the village scouts programme under ADMADE.
- Introduce informer networks, involving local communities, headmen and chiefs.
- These should be complimented by systems of bonuses or incentives to support law- enforcement, and
- Promote other income generating activities, for example, bee-keeping, carpentry and many others.

### 10.2.2.12 Food Self Sufficiency and Food Security

Current agricultural practices are inadequate to realise good productivity. Furthermore, some of them result into land-use conflicts and land degradation. To achieve food security, a number of agricultural interventions need to be implemented and supported. The following interventions are proposed:

- Promotion of soil fertility and conservation measures. Such measures should emphasise on biological and physical ones rather than chemical ones.
- Enhancement of crop diversification.
- Effecting a seed multiplication programme in the target areas.
- Strengthening of the existing agricultural extension services and mobilisation of local farmers into cohesive farmers groups.
- Improving overall farm management. The introduction of alternative sources of draught power such as donkeys need to be stimulated and propagated. Donkeys are better than oxen because of their resistance to trypanosomosis, especially in the valley areas.
- Enhancing agricultural production through promotion of small-scale irrigation schemes which will entail the following:
  - Feasibility studies for dam construction
  - Rehabilitation of weirs and canals
  - Training of farmers in maintenance of the dams and weirs, and
  - Training of farmers on basic maintenance and management of fish ponds through exchange visits and mobile courses
- Boost overall agricultural development through development and promotion of drought tolerant crop varieties for both local consumption and marketing, including:

- promotion of women activities,
- use of appropriate fertilisers, and
- development of pricing mechanisms of agricultural commodities, as well as, market conditions.
- Promote improved Livestock Production through:
  - Creation of pastoral network through grassroot organisations for the exchange of experiences,
  - Provision of subsidies to pastoralists,
  - Promotion of diversification of resource-base,
  - Development and maintenance of water points, as well as, spacing of boreholes,
  - Re-seedling of rangelands for forage and pasture development,
  - Provision of veterinary services,
  - Rotational grazing on rangelands, and
  - Fire control and management of rangelands to improve the quality of pasture.

#### 10.2.2.13 Human Settlement Management

The following programme interventions are proposed:

- Prepare and implement general-purpose regional land-use and development plans. These shall require assessment and provision of information on resource potentials, land capabilities, conservation and development needs which should result into land zonations thus categorising the land according to its potentials and limitations.
- Within the broad land zonations and for development to be sustainable programmes will promote land management and conservation practices together with human livelihood programmes,
- Develop land-use plans together with the local populations and local leadership in a participatory manner to ensure their implementation,
- Promote and provide family planning programmes and control human population increase in certain areas identified that are marginally suited for settlement and agriculture. Under this intervention, efforts should be made to identify development zones where people need to be attracted through development services, for example, feeder roads to facilitate agricultural production and marketing, provision and improvement of community social services, such as schools, clinics and many others

#### 10.2.2.14 Legal and Policy Reviews

The following policy and legislative intervention measures are suggested:

- Formulate a coherent and consolidated policy on environmental matters,
- Formulate a policy on measures to combat desertification and mitigate the effects of drought,
- Formulate subsidiary legislation to allow/permit all sectors to operate as one inter-sectoral organ, at the district level. These structures should be replicated at lower levels, for example, chiefdom and village levels,

- Revise principal Acts to facilitate raising levels of penalties through subsidiary legislation for offences regarding resource-use. The present penalties are too low to deter illegal exploitation of the resource-use,
- Revise principal Acts to enable communities manage their natural resources through community committees. The Acts should allow communities to police their by laws by using community scouts. The community committees should work in collaboration with the District Councils Natural Resources Committees.
- Review the land tenure system to rationalise and encourage proprietorship/ ownership and user-rights to promote sustainable utilisation of resources, and
- Revise principal Acts to enable local communities to benefit from the management of their natural resources.

#### 10.2.2.15 Logical Framework and the Action Plan

For the NAP to have a meaningful impact, adequate time and resources are required for its implementation. A period of 5 years is proposed to implement the NAP beginning in 2003. However, possibilities of extension depending on performance should also be taken into consideration.

To logically measure the impact of the NAP over this proposed period, an action plan is outlined and is based on the Logical Framework Approach (LFA). The approach shows, in matrix tables, the vision, purpose, outputs, interventions/ activities, performance indicators, means of verification and assumptions, as illustrated in Appendix 6.

The data and information from the proposed inventory shall be used to:

- Formulate rational plans for the development and use of the country's forests and define the practical domestication of the national forest policy at district and community level
- Outline the implementation of the policy as a set of plans and national programmes
- Facilitate the establishment of the necessary organizational structure to carry out and execute these programmes in the future as well as provide detailed classification of forest areas.

#### 10.2.2.16 Planned Forestry Inventory Project

##### Background to the Planned Project - Agenda 21 recommendations

Since the Earth Summit at Rio, forests have continued to be a priority issue on the international policy and a political agenda. In spite of the highly controversial deliberations on forests at Rio, with polarized positions of the developing and industrialised countries, the agreement on "Forest Principles" and on Chapter 11 of Agenda 21 marked a significant step toward the management, conservation and sustainable development of all types of forests. The deliberation on forests at Rio reaffirmed the rights of sovereign nations to utilize their national priorities and policy objectives.

The Government of the Republic of Zambia (GRZ) has identified and recognized deforestation, water pollution, inadequate sanitation land degradation, air in mining areas as factors which all lead to biodiversity loss. The development of the Zambia Forestry Action Plan (ZFAP) forms part of the National Environmental Action Plan (NEAP) adopted by the Government of the Republic of Zambia a policy frame work in 1994.

The ZFAP was set in place in response to the 1985 summit on Environmental degradation recommendation that National Forestry Action Plans should be developed to address the problems of deforestation and to enhance the contribution of forestry sector to national social economic development. However, the objectives as outlined in the Zambia Forestry Action Plan appear far from being achieved owing to a chronic shortage of information on the dynamics, content, context and extent of the country's ecological profile.

### **Statement Of The Problem**

The Zambian government has recognized that protection, conservation, improvement, Vegetation studies and natural resources inventories are the fulcrum for sustainable development (NCDP, 1994). In 1990, parliament passed the EPPCA No. 12 which provided for the formation of the ECZ –a body instituted in 1992 to prevent and monitor, among other issues, natural resources and supervise EIAs. Government holistically revisited the National Conservation Strategy (NCS) through the development of the National Environmental Action Plan (NEAP, MENR, 1994) whose priority areas include, among others, forests and Vegetation.

Despite these impressive documents, there has been no management plans of natural resources in the post-independence era compounded by the lack of information which could otherwise, had been developed through intensive and extensive inventories of Zambia's ecology. In general, wasteful traditional agricultural methods, instincts of survival arising from poverty levels and population pressure has accelerated the depletion of natural resources, albeit without statistical records.

Increased official rhetoric on the virtues of community based resource management and growth in the number of programmes, projects and in some instances forest inventory and or Vegetation studies are welcome developments. However, they are insufficient to ensure the success of sustainable forestry management and development.

The key thrust of planned forestry inventory project will focus on the following:

- Provision of information on the forest, its structure or constitution, the availability of forests and their economic values as well as their capability for multiple use (e.g. recreation, amenity, amelioration of the climate, soil protection etc...)
- Identify and devise measures to protect and conserve forests against their enemies and specifically against fires.

- Sustainable production of wood so as to meet the requirements of local industries and of rural population
- Proper management of forest resources to meet the rapidly expanding public demand for recreation and tourism development
- The outcome will serve as an information base on the different constituents of Zambia 's environment. Its dynamic ecological status, the variety of species of flora and fauna, their usage and derive information on the management to provide services other than exploitation and also contribute to the international debate and understanding.
- Conservation of different environmental parameters such as flora, fauna, ecosystems etc.
- Promote primary health care especially public health
- Expansion of forest cover into deforested areas for service purposes only other than wood production e.g landscape, recreation, protection etc.
- Determination of the different ecological components of the natural resource base and collect information on their sustainable usage, development and conservation
- To create public awareness on the consequences of increased depletion of forest in local communities
- To provide a training base for the people in order to understand the dynamics of the ecology, their values, their management and promotion

The main objective of the Forest Inventory and Vegetation study will be put through in order to clarify the identities of information according to the forest Inventory and Vegetation study and the decision on what kind of information must be collected, a number of elements concerning the forest resources shall be emphasized with the highest accurate evaluation of forest and Vegetation resources. Since each element influences the design of an inventory, a priority class has been the design assigned according to the type of the inventory and its aim.

## 11.0 CONCLUSION

With particular reference to specific environmental concerns and allied natural resources sustainability and preservation, society are more involved with natural resource exploitation on one hand while government has concentrated on revenue collection from resources whose extent is virtually unknown. Environmental degradation of vital ecological resources has inevitably increased the labour of most rural based individuals resulting in areas with severe natural resources deficits and loss of biodiversity.

Despite the strong interaction of society, government with the environment and natural resources, there has been no scientific effort to document the extent, content and structure of Zambia's natural resources. The initiative to address natural resources inventory in finding solutions to designing comprehensive management plans and sustainable use of these resources has been confounded by the lack of financial resources.

Plant resources contribute to our welfare in innumerable ways, some direct and others indirect. There are plants that produce food and many of the raw materials we use, others may form the basis of new crops or act as new sources of medicinally or industrially valuable substances. Plants may act as indicators of particular soils, minerals, water or climate. Others may be valuable as fodder herbs or culinary additives. Trees are also used in such multiple non-wood functions as recreation and amenity, aesthetic influences. On the debit side, some are weeds poisonous to people, or animals and cultivated plants. Knowledge here is the key to control. Most importantly is, perhaps the fact that all plants, whether small or big, and as part of the Vegetation, contribute to the stability of the environment. If we destroy this Vegetation; effects such as erosion, loss of soil, loss of fertility loss of productivity crop failure, wildlife reduction and eventual ruin will inevitably occur.

Every kingdom, division and species of plants form a unique pact of the diversity of nature, which, if once is destroyed, it is lost to us forever. It is essential to conserve plant species and cultivars for the future, as unique reservoirs of genetic material, which may be used to aid the constant fight against hunger and malnutrition. Such eventualities can be abated within the prism of natural resources and biodiversity inventory studies and characterisation of their habitats. This underscores the essence of the various interventions emanating from cooperating partners and multilateral institutions. The main problem however remains that of sufficiency of the financial resources and technical support provided by the stakeholders and support institutions.

Zambia, as a developing nation, is faced with a serious environmental threat- the destruction of forests, soil degradation, disappearance of wetlands, drying up of aquifers and general biodiversity loss. The danger is emanating from a combination of degradation of local ecosystems and habitat depletion. Massive injection of resources in the preservation of these natural resources is an objective necessity. In addition involvement of communities in which these are found in concentration marks the importance of ensuring that resource conservation takes place within the normal rhythm day-to-day life of the communities. This also ensures internalization of ownership and commitment to ensuring that the resources are secured against any adversity.

This has adversely affected food production in the country resulting in the growth of food insecurity. In general, wasteful traditional agricultural methods have also led to the depletion of essential natural resources. It has been estimated that since the 1950s, Zambia, as a country has not carried out any major inventory of ecological dynamics resulting in severe uncertainties on the stability of the constituents of the environmental sector.

Lack of information and understanding of ecological resources such as forests, animals, birds, soils etc. has adversely affected the availability of suitable teaching and demonstration materials. The environment of plants includes the atmosphere, the biosphere, the lithosphere and hydrosphere. All the living things depend on their environment and on their interaction with it. The task of introducing sector wide natural resources evaluation regarding the registration of the inter-relation and their effects between the various organisms and their environment, that is; of all the organic and inorganic factors resulting from the particular location should command centre stage.