THE REPUBLIC OF UGANDA

THE DRAFT NATIONAL ENVIRONMENT ACTION PLAN FOR UGANDA

National Environment Action Plan Secretariat
Ministry of Natural Resources
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THE DRAFT NATIONAL ENVIRONMENT ACTION PLAN FOR UGANDA

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LIST OF ACRONYMS

DEO	-	District Environment Officer
DEC	-	District Environment Committee
DEP	-	Department of Environment Protection
DLS	-	Department of Lands and Survey
DMGS	-	Department of Mines and Geological Surveys
DRC	-	District Resistance Council
EO	-	Environment Officer
EA	-	Environment Audit
EIA	-	Environmental Impact Assessment
EIP	-	Environment Investment Programme
EIS	-	Environmental Impact Statement
ELO	-	Environment Liaison Officer
FAO	-	Food and Agriculture Organisation
FD	-	Forest Department
FI	-	Factories Inspectorate
ILO	-	International Labour Organisation
IMS	-	Internal Monitoring System
IMU	-	Internal Monitoring Unit
KCC	-	Kampala City Council
LEC	-	Local Environment Committee
LGC	-	Laboratory of the Government Chemist
MAAIF	-	Ministry of Agriculture, Animal Industry and Fisheries
MGS	-	Mines and Geological Surveys
MI	-	Mines Inspectorate
MIS	-	Management Information System
MOH	-	Ministry of Health
MYOP	-	Multi-Year Operational Plan
NEAP	-	National Environment Action Plan
NEIC	-	National Environment Information Centre
NEMA	-	National Environment Management Authority
NBS	-	National Bureau of Standards
NWSC	-	National Water and Sewerage Corporation
NGO	-	Non Governmental Organisations
OAU	-	Organisation of African Unity
OHHD	-	Occupational Health and Hygiene Department
RC	-	Resistance Council
UFFRO	-	Uganda Freshwater Fisheries Research Organisation
UK	-	United Kingdom
USA	-	United States of America
UNDP	-	United Nations Development Programme

LIST OF KEY NEAP DOCUMENTS

1. Issues Papers on:

   i) Environmental Policy, Legislation and Institutional Arrangements

   ii) Environmental Education, Research and Human Resource Development

   ii) Land Management: Agriculture, Livestock and Rangelands

   iv) Wetlands, Water and its Resources: Aquatic Biodiversity

   v) Forestry, Wildlife and Tourism: Terrestrial Biodiversity

   vi) Mining, Industry, Hazardous Materials and Toxic Chemicals.

   vii) Population Health and Human Settlements

   viii) Energy and Climate Change

   ix) Karamoja

   x) Environmental Information Systems

2. Topic Papers on (titles as in (ii) - (ix) above)

3. The National Environment Management Policy Framework

4. The National Environment Management Policy

5. Framework for Environmental Legislation

6. Environmental Management Bill, 1993

7. Institutional Framework for Environmental Management in Uganda

8. Framework for Environmental Impact Assessment for Uganda

9. Guidelines for Environmental Management at District Level

10. The State of Environment Report for Uganda, 1994

11. The Environmental Investment Programme - Part A and B

12. Design and Implementation of a District - based Environmental Management Information System.

EXECUTIVE SUMMARY

The backbone of the country's economy is its natural resources. Vital to the livelihoods of millions of Ugandans are the country's agricultural lands, lakes and rivers, fish and wildlife, pastures, hydropower, construction materials and minerals. Compared to its size, Uganda also has one of the highest levels of biological diversity in the world due to its varied topography, moderate climate, and its unique geographic position where the East and West African floras and faunas overlap.

In striving for economic and social progress, wise management of natural resources assumes increasing importance. Despite the country's high natural resource potential, factors such as poverty, population growth, unpalatable economic policies, the desire for a steady increase in per capita income, and other pressures of the development process are putting severe strain on the environment and natural resources. This strain has resulted in a number of problems including increased soil erosion, deforestation, drainage of wetlands, loss of biodiversity, reduced rangeland carrying capacity, fuelwood shortages, increased air, land and water pollution, and increased incidence of environmentally-related diseases.

The absence of comprehensive and coordinated environmental policies and inadequate environmental legislation combined with institutional conflicts, rivalry and the lack of effective cooperation and coordination both within and outside government have also contributed to the degradation of the environment and depletion of the country's natural resources. Inadequate information on the environment and natural resource combined with a lack of trained natural resource management specialists exacerbates the problems.

Since 1991, Government has been developing a National Environment Action Plan (NEAP) which provides a framework for addressing the above problems as well as a strategy for integrating environmental issues into the national socio-economic planning and development process. This Action Plan presents practical solutions and options in the areas of policy, legislation, institutional reforms and new investments with the view of promoting sustainable socio- economic development by changing peoples ways of utilizing and conserving natural resources.

Chapter One of the Action Plan gives a general overview of Uganda from a historical, physical, socio-economic and macro economic perspective. Political upheavals and general economic mismanagement of the 1970's and early 1980's greatly contributed to the decline of infrastructure and social services such as hydro power, water supply, communications, health and education. This decline combined with government's inability to reinvest in the environment and other sectors as well as a lack of alternative means of income generation for the majority of the population, contributed significantly to environmental degradation.

After several years of political turmoil, however, the country is emerging into a stable nation. The country's Rehabilitation and Development Program, launched in 1987, aims at creating economic conditions that would reinvigorate the economy such as mobilizing domestic investment, attracting foreign investment, and attaining a viable balance of payments. Through grants and loans, the program has received strong support from multilateral and bilateral donor agencies. Uganda's economy has responded well, with growth of GDP rising from about two percent per year in 1986 to about seven percent during the first half of 1993.

The chapter concludes by suggesting that the country's socio-economic progress will depend in great part on the skill with which Government invests in natural resources, the environment, and health and how it balances economic growth objectives with sustainable resource use and management.

In the country's quest to increase productivity, various socio-economic activities have greatly affected the state of the environment. **Chapter Two** summarizes the present state of the country's natural resources and environment from a development perspective. This chapter analyses the processes that continue to degrade the natural resource base and the environment.

Soil erosion and land degradation are highly pronounced particularly in the highland areas which are themselves the more favoured agricultural areas. Increased erosion is largely due to deforestation in the watersheds and inappropriate farming methods which do not allow for soil conservation measures. Soil erosion has contributed to declines in soil fertility with subsequent reduction of agricultural yields. It has also resulted in silting of many rivers and lakes.

Deforestation is widespread in the country. By the turn of the century, 45% of the country (108,450 sq. km.) was covered with forest and woodland compared to about 21% today. Gazetted forest cover presently stands at about 14,900 sq. km. (7.7%) of the total land area. The remaining forests occur on private and public (communal) land and being unprotected, are subjected to rapid deforestation.

Loss of biodiversity has reached alarming proportions. Plant and animal species are disappearing due to uncontrolled harvesting and loss of habitat. For example, the White Rhino is now probably extinct while elephants and numerous other large mammals have become considerably reduced in number, thus jeopardizing tourism potential.

Wetlands, vital for water storage and filtration and important habitats for biodiversity, are being drained extensively for dairy farming and crop cultivation particularly in the southwest and east of the country, and for industrial expansion mainly around Kampala. Already, adverse micro climatic

and hydrological changes are being experienced in areas of extensive wetland drainage.

Fishing grounds are under serious threat from over-exploitation in some lakes and streams as well as the rapid invasion of waters by the water hyacinth. The high population of the Nile Perch which feeds on smaller fish is believed to be upsetting the ecological balance in Lake Victoria.

Due to **overgrazing** particularly in the southwest, central and north-eastern (Karamoja region) parts of the country the quality of the rangelands has declined considerably resulting in reduced carrying capacity.

High rates of deforestation have resulted in severe **woodfuel shortages** in many areas of the country. Ninety four to ninety six percent of the population depends on woodfuel for all their energy requirements. Uganda uses 10.8 million cubic metres of wood per annum for energy purposes. This is believed to be about 17% above sustainable yield. With a high rate of population growth (2.5% per annum) woodfuel consumption exceeds sustainable yield in several districts. There are few alternative sources of energy available and because of the widespread poverty, the population cannot afford them.

There is a moderate level of **pollution** of the land, water and atmosphere as a result of inappropriate disposal of domestic and industrial wastes, inappropriate use of agricultural chemicals and fertilizers and gaseous releases from vehicles, especially in Kampala. These problems are compounded by lack of environmental standards to guide appropriate actions to be taken to reduce pollution to an acceptable level.

Environmentally related diseases are prevalent. The high infant mortality rate of about 110 per 1,000 arises mainly from such preventable diseases as diarrhoea, measles, worm infections, respiratory diseases, malaria and malnutrition. Such diseases are common due to poorly planned urban and rural settlements which are characterized by poor sanitation, polluted water, poor housing quality, overcrowding and low dietary status.

This Chapter concludes by discussing other problems facing environmental management. Specific problems include: inadequate information on the environment and the natural resources of the country; ill-equipped and inadequate environmental monitoring systems; and a lack of personnel specialized in various aspects of environmental management. The absence of comprehensive and coordinated environmental policies, a coordinating environmental institution and inadequate legislation on the environment have also contributed to the degradation of the environment and depletion of the country's natural resources; inter-ministerial conflicts and lack of effective cooperation and coordination both within and outside Government have resulted in ineffective implementation of programs geared

towards reversing environmental degradation. Finally, the levels of awareness on the need to sustainably manage the environment and its resources are low and the human capacity to manage the resources sustainably is inadequate.

Drawing on analyses presented in the previous chapters, **Chapter Three** of the Action Plan presents a strategy for reorienting national and local efforts to address environmental problems in a more comprehensive, coordinated and integrated manner. This strategy forms the basis for achieving overall policy goal of "sustainable socio-economic development which maintains and enhances environmental quality and resource productivity to meet the needs of present and future generations". To achieve this re-orientation, three key initial actions are required. These include: (i) the review and development of cross-sectoral policies and legislation; (ii) the revision and modernization of sectoral policies, legislation and regulations; and (iii) the creation and establishment of an appropriate institutional and legal framework.

Cross-sectoral policies presented include those on land and resource tenure, land use planning, environmental information management, conservation of biological diversity, water resources, wetlands conservation and management, environmental economics and macro economic policy, environmental impact assessments, environmental standards, control of pollution, climate, population health and human settlements, gender integration, environmental education and human resource development, public participation and international cooperation.

Recognizing that day-to-day implementation of environmental management activities will, for the most part, be carried out by sectoral ministries, departments and other public and private sector institutions, each ministry/institution will operate under sectoral policies developed within the framework of the cross-sectoral policies described above. Sectoral policies presented in this chapter include those on agriculture, forest conservation and management, wildlife conservation and management, livestock and rangeland resources, fisheries and other aquatic resources and energy.

Drawing on the proposed cross-sectoral and sectoral policies, an analysis is made of the present legal status with regard to the environment and natural resources and a framework for environmental legislation is proposed. This framework includes enforcement strategies for environmental legislation, proposed reforms for sectoral laws and analyses and recommends international conventions and treaties to which the country is or should be signatory and party.

The chapter concludes by presenting institutional reforms required in order for implementation of the Action Plan to be effective. First and foremost among these reforms is the creation of the National Environment Management Authority (NEMA) to be responsible for the coordination and management of

the environment in Uganda. Mechanisms for oversight and guidance of the Authority, the role of technical committees and the composition of the Authority are discussed as are institutional linkages between the Auhority, line institutions and the districts. This includes creation and establishment of Environmental Liaison Units in line ministries, Environment Committees at the District level, and Local Environment Committees at county and sub-county levels.

Because of constraints on financial and managerial skills, it will be impossible to satisfy all the national demands from the resource base. Scarcity of finance and other inputs implies that some activities of the Action Plan are implemented at the expense of others. The framework is one of systematically identifying and evaluating alternative investments, both in natural resource sectors and in relation to all other productive uses of capital. Drawing on the previous chapters, **Chapter Four** provides the basis for this framework in the form of a prioritized investment programme, an implementation strategy for the programme, and a system for monitoring and evaluation to determine both policy and programme impacts.

The **Investment Programme** to support the implementation of the Action Plan concentrates on the areas of (i) Capacity Building in Environment Management; (ii) Enhancement of Resource Productivity; (iii) Biodiversity Conservation and Use; (iv) Environmental Health and Pollution Management; and (v) Environmental Education and Public Awareness. Specific programs and projects under these broad categories are prioritized and linked to the Rehabilitation and Development Program.

This Chapter also spells out duties and responsibilities expected to be carried out by sector institutions of government and outside government in the implementation of the Action Plan. These institutions include the Authority itself, government ministries, local government institutions, academic and research institutions, NGOs and the private sector.

The Chapter concludes by presenting a detailed monitoring and evaluation plan for both the environment in general and the Authority as an organization. Indicators are provided for each recognizing that the Action Plan initiates a continuous process of review and refinement over the next decade. This process is the cornerstone of Uganda's commitment to development planning which is environmentally sustainable and which brings benefits of a better life for this generation and those to come.

CHAPTER ONE

OVERVIEW OF UGANDA

1.0 Introduction

Uganda's economic and social welfare and its environmental quality depend on the effective and efficient management of the natural resource base. Changes in population, employment, settlement patterns and industrialization can affect resource use and environmental quality. At the same time, macro-economic variables such as balance of payments, foreign debt, inflation and interest rates and investment levels, will be important determinants of how resources will be used and managed. In this context, the purpose of this chapter is to provide a brief overview of Uganda from an historical, physical, socio-economic and macro-economic perspective.

1.1 Historical perspective

Uganda became independent from Britain in 1962 under a federal constitution. However, in 1966 the Federal Constitution was abrogated and a Republican one promulgated providing for an executive president. In 1971 the government was over thrown in a military coup led by Colonel Idi Amin.

Amin's regime was characterised by a vicious military dictatorship with a high degree of violence against the civilian population yet unmatched in Africa. It is estimated that during this regime 500,000 Ugandans perished and 200,000 were exiled. As many as I million more were internally displaced. Amin's economic mismanagement was equally unmatched. During this period, Uganda's GDP declined by 25%. Following the overthrow of Amin in 1979, the country entered a period of political confusion, violence, large internal displacement of the population, poor management of the economy and resources, a heavy military expenditure and abuse of human rights.

The country did therefore experience long intervals of instability characterised by intensive human rights abuse, mismanagement of the economy and poor political leadership. This shattered the economic base and reduced the country to one of the poorest in the world. This situation also intensified environmental degradation.

In 1986, the National Resistance Movement (NRM) - after mounting a successful guerilla war in the bush - took over the reigns of government. The NRM Governments' economic recovery, reconstruction and development programmes have included decentralisation and devolution of administrative powers to the local authorities by the institution of the Resistance Councils and Committees at all levels. A constitutional making exercise has been set in motion. A new land tenure system has been proposed. A structural adjustment

programme for the economy is in progress. The government has further embarked on rationalisation and restructuring of the Public Sector and divested herself of certain public enterprises to the private sector.

1.2 Physical features

Uganda is a landlocked country, lying astride the equator between about 4°N and 1°S latitude and stretching from about 29.5°E - 35°E longitude. It is bordered to the north by Sudan, to the west by Zaire, to the south by Tanzania and Rwanda and to the east by Kenya.

It has an area of 241,020.95 sq. km being comparable to the United Kingdom in size. It has an average altitude of 1,400 meters above sea level with about 1.3% of the total area lying above 2,000 meters and 9.3% lying below 900 meters. The distribution of the land by major land use category is presented in Table 1.1.

Table 1.1: Land area by major use

Type	Area sq.km	Percent of Total Area
Open water	36,327.76	15.1
Permanent Swamp	7,707.46	3.2
Mountains (over 2000m)	2,036.00	0.8
Game Reserves and National Parks	15,620.00	6.5
Ranches	2,566.00	1.1
Urban Centres	506.00	0.2
Forest Reserves	15,250.31	6.3
Arable land	178,459.67	74.0
TOTAL	241,020.95	100.0

SOURCE: Lands and Surveys Department (1975)

1.2.1 Climate

In spite of its equatorial location, Uganda has a comfortable climate resulting from modification of the tropical climate by altitude, relief, and the presence of large water bodies. Climatic conditions are dominated by a clear two season rainfall regime. Total annual rainfall ranges from 500 mm in the driest parts (North East) to over 2000 mm in the wetter areas of the south bordering the large lakes. Temperatures are moderate with maxima around

27°C and minima around 16°C in the higher areas of the plateau and slightly higher in the lower areas. The diurnal range is more mark ed than the seasonal range of temperature. The country's climate is classified as moderately humid.

The country enjoys a steady sunshine regime all year round although this is modified from time to time by cloud cover during rainy seasons.

1.2.2 Topography

The main topographical features to the north of the country lie towards the eastern and north-eastern borders and include three large miocene volcanoes, Moroto (3,890 m), Kadam (3,070 m), Napak (2,540 m) and a number of hills and mountains composed of basement rocks. Similar plateau elevations are found in West Nile in the North West of the country. Many of these volcanoes and mountains have been extensively scoured by erosion. Relative relief is low, seldom more than 20 - 30 m. Southward form the northern plains, which range between 750 m and 1,110 m, the plateau level rises towards the lake Victoria watershed, through a narrow zone of flat-topped hills in the central and west-central parts of the country. In this zone, the relative relief is in the order of 150 metres. While similar land forms are found in the offshore islands of Ssese, Kome and Buvuma, the hill tops are generally lower, but to the west of the lake the hill top level rises.

As the plateau level rises to the east and west, it is emphasized by the impressive mountainous topography found along the borderlands. To the west lie the Mufumbiro volcanoes, the Rwenzori and part of the deep trough of the western rift valley. To the east, the approach of the Kenya border is marked in the south by the Mt. Elgon (4,320 m) and the stamp of Tororo rock and a complex of similar eroded volcanic plugs. Relief contrasts are greatest in the west. From the high peaks of the Rwenzoris to the hot arid flats around lake Albert to the north, there is a height difference of nearly 4500 m. The highest point in the country, the summit of Mt. Stanley on the Rwenzori range, rises to nearly 5,040 metres above sea level. The lowest part is in the far northwest on the Sudan border, close to Nimule, where the valley of the Albert Nile sinks to around 600 metres above sea level.

1.2.3 Drainage

Most of the southern part of the country drains into lake Victoria, from where the waters escape through the Owen falls dam into the Victoria Nile, and so by way of Lake Kyoga to Lake Albert. It then flows out of Lake Albert at the same end as it flows in. The Kagera and Katonga rivers all rise at present in the swamp filled gaps in the up-warped rift rim of western Uganda and flow sluggishly east to the lakes and are joined on the way by a series of

barbed tributaries. The rivers and lakes that form this drainage are presented in Tables 1.2 and 1.3 below.

Table 1.2: Major rivers and their lengths

River	Length (km)
Victoria Nile	426
Aswa-Moroto	357
Dopoth-Okot	314
Paget	232
Albert Nile	257
Katonga	182
Mayanja-Kato	175
Mpologoma - Malaba	173

SOURCE: Atlas of Uganda (1967).

Other notable rivers are the Kafu draining into Lake Albert, and the Mpanga and Mubuku into lake George. The country has part of lake Victoria, the second largest in the world, and regular faulted basin lakes of the rift valley- Albert and Edward. Even more similar to lake Victoria in terms of its intricate outline, is the back-filled lake Kyoga system and the Koki lakes in Mbarara and Rakai. The smaller lakes in Kabale and Kisoro result from volcanic damming by lava or craters, while the crater lakes of the western rift valley and the tarns on Rwenzori are of different origin.

Table 1.3 : Major lakes of Uganda

Major Lakes	Total Area (sq. km.)	Area in Uganda (sq. km.)	Maximum Depth (m)
Victoria	68,423	28,640	82
Albert	5,333	2,911	51
Edward	2,202	645	117
Kyoga/Kwania	2,046	2,046	7
Bisina	308	308	-
George	246	246	3

SOURCE: Atlas of Uganda (1967)

1.2.4 Soils

The country is underlined by some of the worlds oldest rocks which have been modified and altered by deep-seated tectonic activity. These rocks are overlain by predominantly ferralitic, and to a much less extent ferruginous soils as the most widely distributed soil types, occurring in both forest and savanna ecosystems. The profile of the these soils consist of a thin (20-30 cm) top soil and a deep (5-10 m) subsoil. Organic matter and nutrients are strongly concentrated in the top soil. These soils range in texture from clay loams to sandy loams. Red clay loams tend to predominate in wetter regions and are reportedly more fertile, while in the drier northern reaches of the country, sandier soils containing fewer nutrients are quite characteristic. Hydromorphic, podsolic, high altitude and dark ferralitic soils are highly and easily leached and are thus acidic and deficient in plant nutrients. Where vertisols appear, they are characterised by water-logging and poor internal drainage.

1.3 The Socio-Economic Perspective

1.3.1 Demography

Population trends since 1929 are presented in Table 1.4 which suggests a population doubling period of 28 years given a 1991 population of 16.7 million with a growth rate of 2.5% per year. Life expectancy is 46 years for men and 49 years for women. Of the total population, 14.8 million (88.7%) live in the rural area while 1.9 million (11.3%) live in urban centres. Only 49.3% of the population are of working age (15 to 64 years of age). The rest are dependants of the working population. Of the national population, 8.5 million (51.2%) are female and 8.2 million (48.8%) are male. Women of reproductive age (14-49 years) make up 23% of the national population or 43% of the female population. The average number of children per woman (the fertility rate) is 7.3. Adult literacy rate for females is 45% compared to 70% for males. Of the total women population, 88% live in rural areas and account for 80% of agricultural production. Only 7% of females own land.

Children (0 - 14 years) account for 9.2 million or 55% of the total population. Infants (0 - 1 year) make up 8.3% of the children population. The infant mortality rate estimated at 122 per 1000 live births. The main causes are malaria, diarrhoea, acute respiratory infection, AIDS/HIV infection, neonatal tetanus, anaemia meningitis and nutritional deficiencies. 45% are stunted or chronically undernourished. School enrolment is also poor as only 50% of eligible children (5-14) years are at school.

It is projected that even with the highest estimated prevalence of AIDs (i.e., 12% in 1993, 15% in 1998 and 20% in 2003), the population of Uganda would reach 36.4 million people in 2018. This would create a massive impact on the natural resource base simply through increased demand. Moreover, this demand would far outstrip the country's current and projected capacity to address the resulting environmental problems.

Table 1.4: Population trends

Year	Number
1929	2,960,000
1959	6,600,000
1969	9,500,000
1980	12,600,000
1991	16,700,000

SOURCE: Population Secretariat (1992).

1.3.2 Social services

The economic status of a society may be analyzed from the quality of social services availed to it. However, the provision of social services has been greatly subdued by the political turmoil and insecurity that Uganda has experienced in her recent history.

1.3.2.1 Education

Enrolment is low for those of school going age, drop out rates are high, education standards low and the distribution of facilities between the urban and rural setting is not uniform. The enrolment status is summarised in Tables 1.5 and 1.6 below.

Table 1.5: Enrolment status

Type of Population	In School	Out of School
Children 5 - 14 years	2,539,549	2,372,567
Adolescents 15 - 19 years	235,245	1,555,718

SOURCE: Background to the Budget (1993/94).

Table 1.6: Enrolment status for all institutions

Type of Institution	Enrolment Status			
	1985		1992	
	No. of Institutions	Enrolment	No. of Institutions	Enrolment
Primary Schools	7,025	2,117,000	8,325	2,364,078
Secondary Schools	500	159,702	575	226,805
Teacher Training Colleges	73	11,229	64	16,561
Technical Schools and Institutions	52	6,932	57	11,993
Teacher Colleges	10	1,650	10	3,987
Uganda Technical Colleges	5	1,505	--	---
Uganda Commercial Colleges	8	1,090	---	3,209
Other Higher Institutions	-	-	15	3,452
Universities	1	5,271	5	10,090

SOURCE: Background to the Budget (1993/94).

1.3.2.2 Health services

Provision of health services is shared between Government and the private sector. The private sector is composed of individual practitioners, religious institutions and NGOs with government as the largest provider. Available facilities for curative service are summarised in Table 1.7.

Table 1.7: Provision of health services

Type	Govt. owned/ supported	NGO owned/ supported
Hospitals	50	36
Health centres	118	66
Dispensaries/clinics	612	165
Total in-patient beds	8474	5343

SOURCE: Health Planning Unit - MOH (1992)

Compared with the national population, there is:

one physician to 24,700 people;
one nurse/midwife to 8,900 people;
one enroled nurse to 4,400 people;
one medical assistant to 20,500 people; and
one health inspector to 58,000 people.

It is also estimated that 200,000 people share one health unit and 800 people share one health care bed. Provision of health services is well below that of developed countries as Table 1.8 indicates.

Table 1.8: Health service provision; Uganda compared with some developed countries

NO. OF PEOPLE	Uganda	USA	UK	Sweden	Germany	Japan
per hospital	200,000	35,200	22,800	8,400	19,800	12,700
per physician	24,700	418	619	360	370	640
per hospital bed	800	190	130	70	90	90
Life Expectancy						
Female	49	79	78	81	79	82
Male	46	72	72	74	72	76

SOURCE: WHO PC Globe 1991.

This situation varies from district to district. The rural areas are worse off than urban centres. Most of the service delivery system is located in urban areas. This is more so for health personnel. The proportion of health workers located in urban areas is:

physicians	90%;
nurses/midwives	80%; and
medical assistants	62%.

The current expenditure on health care relative to the GDP is:

preventive health	0.1%; and
curative care	1.3%.

The result is an escalation of preventable diseases (malaria, diarrhoea, pneumonia, tuberculosis, anaemia and meningitis). Preventable diseases contribute 53% of hospital-based mortality.

The above data suggest that the health care service is inadequate for the population. Additionally, life expectancy is correspondingly low which also supports this hypothesis.

1.3.2.3 Housing

Most housing is family or self-built using traditional skills and materials. On the whole housing is inadequate in both quality and quantity. About 51.6% of the existing housing stock needs replacement while 44.5%

requires upgrading; only 1.9% of the stock is suitable in quality and therefore the majority of Ugandans live in poor housing conditions (Household Budget Survey 1989).

The housing situation varies with rural or urban locations. In the rural areas the houses are predominantly made of mud and wattle with grass thatched roofs and are randomly dispersed into homesteads. These houses usually have only one room, are vector prone, have poor ventilation and are very temporary in nature. They have no water or electricity supply. This situation is conducive to poor health of the occupants. Moreover, in the rural setting the high demand for building poles and wattle has led to deforestation especially where there is no corresponding woodlot establishment.

In towns and in administrative and trading centres, the houses are usually made of bricks and mortar and usually have corrugated iron or tile roofs, particularly in executive areas. Some of these dwellings have water and electricity and in major towns, are occasionally connected to a sewerage system. However, major towns also have slum areas where water and sanitation are inadequate. Additionally, in the urban setting, the demand for woodfuel for brick burning has similarly caused deforestation at the periphery of every town. Furthermore, cast mining of clay and sand from wetlands has interfered with wetland ecology and caused landscape damage.

The housing construction industry like other socio economic activities was severely hit by the economic decline. The resulting effects include inadequate housing policies and programmes, inadequate financial resources, shortage of building materials and the general collapse of the industry. Although the industry is recovering, the rate of construction of new houses is still low and the cost is high.

1.3.2.4 Water supply

The majority of people still draw water from unprotected sources (rivers, lakes, water springs, run off from rain etc.). This is primarily the case in rural areas where only 30% of the population has access to safe water compared to 60% in urban centres as of 1994. Boreholes and protected wells are the safe water sources in these areas. Furthermore, the distance travelled to collect water in rural areas is far from the homes. Traditional urban centres have piped water but the network is limited to the central areas of the towns; the service is yet to be extended to settlements that have grown up at the peripheries. These settlements rely on springs and wells for their supply. Even in Kampala city there are frequent water supply failures owing to bursting of old pipes in the old network and the population has to resort to water springs. The water supply is inadequate and has contributed to the escalation of preventable water borne disease such as worm infestation and diarrhoea.

1.3.2.5 Transport and communications

Transport and communications are key sectors in the economic development process. Good transport and communications improve settlement patterns, the vitality of economic activity and the development of tourist industry. However, both of these critical sectors suffered decline during the period of political instability.

Road Network

The road network is comprised of trunk roads, urban roads, and rural feeder roads. Of the trunk roads, 1,979 km are tarmac while 7,939 km are murram. Trunk roads in the country are in good condition having been rehabilitated in the last five years. The urban road network, however, is inadequate in both quality and quantity. It is only in Kampala city that many of these roads are tarmac and in good state. Consequently, Government has embarked on an urban roads rehabilitation programme. Rural feeder roads connect trunk roads to rural areas and are of significant economic importance. Government therefore has undertaken a massive programme to reopen these roads and ensure routine maintenance with a view to increase rural accessibility. By 1991/92 the Government had rehabilitated 620 km, opened 555 km and light graded 500 km of feeder roads and this programme is continuing.

Railways

The railways system was shared under East African Community service until the latter collapsed in 1977. The Uganda Railways corporation was then formed to manage the railways system. However, the collapse of the East African Railways Corporation deprived Uganda access to the centralised system of train traffic control and maintenance facilities in Nairobi. This problems was aggravated by a shortage of rolling stock and equipment, a poorly maintained track and an outdated signal and communication system. This, in turn, resulted in a major shift of traffic from rail to roads. Since 1986, Government policy has emphasised the shift of long distance freight traffic from road to rail. As a result, rail haulage is increasing.

Water Transport

Most of the water transport consists of small canoes and motorboats. In 1987, Government acquired 5 ferries which operate on lakes Victoria, Kyoga and Albert. There are several ferries operating on other lakes and rivers. This has greatly facilitated transportation of goods and people across these lakes. Water transport, however, threatens water bodies with pollution arising from waste disposal from the vessels. Of particular concern are the oil spills from petroleum products.

Air Transport and Aviation

Uganda has one international airport at Entebbe and several airstrips. Prior to 1977, the international airport was mainly served by the East African Airways. After 1977, Uganda established Uganda Airline Corporation (UAC). The management of civil aviation is assured by the Civil Aviation Authority. Currently there are over ten international airlines operating in the country with several others operating on irregular schedules. The international airport is currently under rehabilitation to conform with international standards. As reorganisation of UAC takes place, anticipated activities during this decade will include: re-equipping of the airline fleet by bringing in new aircrafts tailored to a new network; joint operations with other regional airlines; additional emphasis on marketing and profitability; computerisation; and full rehabilitation of Entebbe Airport and the internal airfields network.

Posts and Telecommunications

Posts and telecommunications services were largely destroyed during the said years of political and civil strife in the country particularly during the 1979 war. Effort is being made to rehabilitate them.

Telecommunications

Since 1986, efforts have been concentrated on restoring postal and telecommunications services to their previous level. A number of radio overhead trunk routes as well as telephone exchanges have been restored throughout the country. However, postal services are still inadequate.

Transmission

Radio and television links are being rehabilitated and new ones installed. In addition, radio call facilities have been installed to link remote areas of the country. Commercial radio and television transmission has been liberalised. As a result two commercial stations have commenced radio

broadcasting and commercial television companies such as CNN are now telecasting via satellite.

Telephone Exchanges and Subscriber Apparatus

Telephone exchange services are being rehabilitated to enhance subscriber dialling facility with financial assistance from German Commodity Aid. A variety of equipment was received in 1989. As a result communication with the rest of the world has improved.

1.4 The Macro-economic perspective

Uganda's economic position in Africa fell from relative prosperity to relative impoverishment in two decades. Until the early 1970s, Uganda was a fast-growing country. From 1961-1970, the growth of GDP averaged 5.1 percent annually. During this era Uganda enjoyed a favourable trade balance, low inflation, and industrial development among the fastest in Sub-Saharan Africa. The country had established good roads, high standards of railway service, satisfactory delivery of health services, and a well-trained and respected civil service. Resource productivity was also high because degradation was negligible; human encroachment on protected areas was minimal and manageable and extension staff were more efficient and effective.

The economy and infrastructure started to crumble shortly after the onset of Idi Amin's military coup in 1971. During the troubled years 1971-1986, the country was severely set back by civil wars, violations of human rights, and general economic chaos. The growth of GDP averaged a mere trickle in the early 1980s - less than population growth - while annual monetary inflation soared to 127 percent by 1985. In the three years leading up to 1986 and the beginning of the NRM government, the industrial sector had declined by 17 percent. The country suffered from debilitating corruption, speculation, and the decline of almost all basic infrastructure: energy, water, transportation, health, and education. Environmental degradation grew rapidly because of political instability, misguided policy, poor economic mismanagement and growing population pressure combined with government's inability to reinvest in the environment and other socially desirable sectors.

1.4.1 Current effort

Many macro-economic policies have been prescribed since 1981 to correct the adverse structural shifts and to redirect economic development. Very little impact from these policies was felt before 1986 because political instability continued. Included in the policies were those to correct distortions

in the interest rates and foreign exchange market, and those to stabilise the local currency. Price incentives were also announced for farmers.

The Rehabilitation and Development Programme, launched in 1987, aimed to create economic conditions that would reinvigorate the economy. The aim has been to mobilize domestic investment, attract foreign investment, and attain a viable balance of payments. Through grants and loans, the programme has received strong support from multilateral and bilateral donors. The economy appears to have responded well, with growth of GDP rising from about two percent per year in 1986 to about seven percent during the first half of 1993. Under the discipline of Structural Adjustment and other pressures, Government has worked hard to contain money supply, bring down inflation, increase savings, expand domestic credit, liberalize foreign exchange, attract investment, and win the confidence of the public for its policies.

Government has made positive steps to privatize some of its parastatal companies, and to handle the complex issues of previously expropriated Asian properties. From a position of virtual collapse by the mid-1980s, industrial production has been rising impressively, increasing 55 percent from 1987 to 1990. In fiscal 1992/93 industrial production grew by 21 percent, mainly in chemicals, paints, soap, beverages, tobacco, and food processing.

For the last two years, the value of the Ugandan shilling has remained more or less stable against major world currencies. The Ugandan shilling is increasingly seen as a regional hard currency. The restructuring of bank debt has begun, domestic savings have increased, and the Bank of Uganda has been able to increase its gross reserves. Although still inadequate, Government's revenue collection increased by one-fourth between fiscal 1991/92 and 1992/93.

1.4.2 The debt burden

Despite these improvements, the economy is still faced with several constraints. The balance of payments account is in deficit by $128 million (Background to the Budget 1993/94). Terms of trade for Uganda since 1986 have been declining. Coffee, which contributes 65 % to foreign exchange earnings now, is four times below its level of 1986 due to falling coffee prices. Failure to generate enough of its own foreign exchange has forced the country to depend on foreign aid for investment. At the moment, the national debt of $2.8 billion is greater in value than the annual GDP. The debt service ratio (foreign exchange paid as a percentage of foreign exchange earned) is over 60% not including interest. The above constraints will limit the government's ability to mobilise adequate funds with which to invest in its natural and human resource bases, for some time to come.

1.4.3 Impact on the environment

The country's current level of development and its prospects for sustainable economic development are dependent on its rich and diverse natural resource endowment. As stated above, about 90 percent of Ugandans live in rural areas, mainly as a farming population on small plots of land. Almost 40 percent of the country's economy comprises subsistence production, i.e., is not within market sectors. An estimated 54% of Gross Domestic Product [GDP] comes from agriculture while almost 100% of export are natural resource based. The manufacturing, energy and tourism industries also heavily rely on land, minerals, water, wood and wildlife resources.

The underlying issues of material importance for the vast majority of Ugandans undoubtedly include land productivity (broadly defined) and household health. In each sphere, indicative studies identify large losses to be avoided or income to be realized by investing in environmental management. These losses have been estimated to be between 1.4 to 12 percent of the country's GDP (Slade and Weitz 1991; Converey 1992). However, historic experience has shown that whether a rich resources endowment promotes economic growth depends not so much on the resources themselves but on how they are valued, used and managed. To a very great extent, that also depends principally on the governance, institutions and economic policies of the country.

In this context, it is government's basic macro-economic objective over the 1994/95 planning period to maintain economic growth while reducing macro-economic imbalance in the economy in order to achieve a sustained improvement in the economic and social welfare of the population of Uganda (Rehabilitation and Development Plan 1991/92 - 1994/95). Many leaders in government, business, and the international community share an intangible optimism that Uganda's future looks bright, given the country's impressive progress since 1986. Whether Uganda becomes a success story in Africa or not will greatly depend on the skill with which Government invests in natural resources, the environment, and health and how it balances economic growth objectives with sustainable resource use and management.

CHAPTER TWO

THE STATE OF THE ENVIRONMENT

2.0 Introduction

Nine of every ten Ugandans make their living from the products and services of the country's soil, water and biota. However, the interactions between society and the environment are complex; the condition of the environment bears directly and widely on the country's human productivity and vice versa. In the country's quest to increase productivity, various socio-economic activities have greatly affected the state of the environment. Particular processes that have been unleashed include deforestation, soil degradation, loss of biodiversity, drainage of wetlands, pollution, and general emergence of unsanitary conditions. These processes and so many others continue to degrade the natural resource base and the environment in general. Unfortunately, Government has not been able to commit adequate budget or personnel to regularly and systematically monitor and assess the condition of its biophysical environment; in some cases, accurate data simply are not available. However, the following diagnostics, based on the most current information available, briefly summarizes the present state of the country's natural resources and environment.

2.1 Land Resources

Land is by far the most important natural resource in the country. About 90% of the country's population live in rural areas and directly depend on the land for cultivation and grazing. However, the current pattern of land management and utilization as well as the increasing demand for land present numerous environmental problems. The most serious of these is soil degradation which has led to declines in productivity and agricultural earnings in many areas.

Soil erosion is the single most important form of soil degradation and a large part of the country has been affected to one extent or another. Some of the most seriously affected areas include the steep slopes of Kabale, Kisoro, Bundibugyo, Mbale and Kapchorwa districts. Even in the relatively flat areas such as Iganga, Kamuli, Tororo and Kumi, soil erosion has occurred at an alarming rate largely through rill and sheet erosion and thus leading to gradual but steadily increasing losses in soil productivity. Many of the drier areas, particularly rangelands, have also been seriously affected.

Apart from the rapid decline in fertility and productivity of the original land, soil erosion has also led to the siltation of lakes, rivers and streams. Lakes Kyoga and Victoria are growing shallower owing to this phenomenon. In addition to the physical obstruction, the sediment is also rich in nutrients

and thus encourages eutrophication. This, in turn, deprives the fish populations in these waters of oxygen when the excessive vegetative growth decays as a result of bacterial action. This phenomenon is observable in most of the rivers and lakes but more particularly in the Manafa, Kafu, Nyamwamba and the Nile rivers.

2.1.1 Underlying causes

The causes of soil degradation are complex and involve interaction between several factors which are very briefly discussed below.

2.1.1.1 Land fragmentation

Despite the existence of surplus arable land, there is a serious problem of land fragmentation. Close to 40% of agricultural holdings in Uganda are comprised of two or more non-contiguous small holdings. Furthermore, 85% of the rural households produce both food and cash crops and raise livestock on holdings of less than 2 hectares. Land fragmentation is most serious in the heavily populated districts of Kisoro, Kabale, Mbale, Kapchorwa and Bushenyi. The most notable consequence of land fragmentation is over-cultivation very often without adequate soil conservation or regeneration measures. Additionally, the traditional system of shifting cultivation or bush fallow - critical in restoring soil fertility - is now more difficult to practice. This situation has led to massive loss of soil through erosion and rapid declines in soil productivity.

2.1.1.2 Inappropriate farming systems

There are at least seven different farming systems in the country each with its own soil degradation problems (see Table 2.1). The actual magnitude of the degradation in each system depends largely on population pressure, vulnerability of the soil to erosion, rainfall amounts and the general relief of the area. The most critical problem, however, is that the majority of farmers have inadequate knowledge of or few opportunities to learn about improved farming methods. For example, crop rotation is often not practised; most farmers grow the same crop on the same piece of land year after year, a situation which leads to serious soil degradation. Improved agro-forestry systems, capable of renewing and regenerating the soil, are also lacking in most farming systems.

2.1.1.3 Soil compaction

Mechanization has been promoted as a means of increasing agricultural production. Despite the advantages of mechanized agricultural production, a number of problems are associated with the technology. First, the use of heavy machinery for land clearing and post clearing operation has led to soil compaction and consequently accelerated soil erosion. Second, the tractor operators are largely uneducated and untrained and hence do not have adequate knowledge of the operations they are required to perform.

TABLE 2:1

Current positive and negative environmental features of farming systems in Uganda

SYSTEM	POSITIVE	NEGATIVE
I. INTENSIVE BANANA-COFFEE SYSTEM (south Mukono, Rakai, east Masaka, Mpigi, southeast Mubende, south Luwero, Ssese islands, Kampala/Entebbe, most of Jinja and Iganga districts	Mixed cropping	Soil degradation in unprotected areas
II. WESTERN BANANA-COFFEE-CATTLE SYSTEM (most parts of Mbarara and Kabarole, Bushenyi, Rukungiri)		- Shorter or even absent fallow periods; - Extensive grazing in sparsely populated parts; - Soil degradation in overgrazed hilly areas and around watering points; - deforestation in some parts; - declining soil fertility in many areas
III. FOREST SAVANNA MOSAIC BANANA-COFFEE SYSTEM (north Mukono, Kamuli, south Luwero, most of Bunyoro, central Mubende, north Kabarole)	- Still relative abundance of large tracts of land un-occupied and covered by savanna and forest; - Fallowing still a common practice; - Generally soil erosion not serious.	- Major constraint to expansion of agricultural land is labour availability; - Some soil erosion and compaction in limited area due to overgrazing
IV. MEDIUM ALTITUDE COFFEE SYSTEM (parts of Bukonjo and Bwamba counties, slopes of Mt. Elgon and Kapchorwa, Rukiga county of Kigezi, Okoro county in West Nile)		- Soil erosion and degradation has reached alarming proportions on steep slopes and poor cultivation techniques; - Land highly fragmented due to customary land tenure and high population density.
V. KIGEZI ANNUAL FOOD CROP MONTANE SYSTEM (northern slopes of Mufumbira Mts. altitude above 1800m of Kigezi)	- Intercropping; - Establishment of anti-erosion bunds; - Household plantation woodlots common.	- Tremendous land shortages; - Serious land fragmentation; - Livestock herded and grazed on marginal hillside, roads and valley bottoms; - Serious decline in soil fertility as a result of fragmentation; - Evidence of silting of streams and small lakes
VI. THE NORTHERN AND EASTERN CEREAL-COTTON-CATTLE SYSTEM (Gulu, Apac, Lira, Karamoja, Kitgum, Kumi, Soroti, Tororo, Pallisa, parts of Mbale)	- There is surplus arable land in many parts.	- Fallow period becoming shorter or have been abandoned altogether in some parts where population density is high; - Generally, low soil fertility; - Communal grazing is a common practice; - Soil erosion by water and wind serious in densely populated areas; - Siltation of rivers beginning to appear.
VII. THE WEST NILE CEREAL-CASSAVA-TOBACCO SYSTEM (Arua and most parts of Nebbi)	- Intensive mixed and double cropping common	Grazing on communal lands

2.1.1.4 Overgrazing

Rangelands occupy approximately 84,000 sq. km and are found in a corridor extending from Moroto and Kotido in the north-east through the flat areas of Lake Kyoga down to the Masaka and Ankole regions. Close to 70% of the livestock in the country is in the hands of traditional keepers while the rest is commercial ranching. In these areas, overgrazing is a serious problem. Particular areas affected are the counties of Ruhaama, Nyabushozi, Kazo, Buruli and the whole of the Karamoja region.

The resulting effects of overgrazing include soil compaction, erosion (particularly gully erosion) and the emergence of low-valued grass species and vegetation with subsequent declines in carrying capacity and therefore low productivity.

2.1.1.5 Agrochemicals

The residual effects of agrochemicals on the country's environment are relatively unstudied. Although purchased physical inputs (agrochemicals, seeds and tools) represent less than 30% of the total cost of crop production indicates, the use of pesticides is becoming more widespread (see Table 2.2). For example, the country's crop diversification policy, especially the encouragement of high value export crops, is likely to contribute to greater use of agrochemicals. Moreover, the major users of pesticides are small holders who have had little, if any, training or skills in pesticide application/use, storage or disposal. When combined with chemicals used in the livestock industry and pesticides used to protect humans (e.g., tsetse fly control), the total quantity of residual chemicals entering the environment is significant.

Table 2.2: Commonly used pesticides in Uganda

Group	Named Example
ORGANOPHOSPHATES	Malathion, DDVP, Diazinon, Methyl parathion, Dursban, Phosdrin, Fenitrothion, Dimethoate (Rogor), Bromophos, Dichorvos
ORGANOCHOLRINES	DDT, Aldrin, Dieldrin, Lindane, BHC, Thiodan, Toxaphene
CARBAMATES	Dithane M45, Dithane M44, Dithane M22, Furadan
PYRETHRINS/PYRETHROIDS	Ambush CY (permethrin), Ripcord (cypermethrin)
BIPYDRIDYLS	Grammoxone (Paraquat), Weedol, Diquat
PHENOXY ACETIC ACID	2, 4 - D, 2,4,5 - T, MCPA
INORGANIC METAL	Shell Copper (copper oxide), Lead Arsenate, Phenylmercuric Acetate, Arsenic trioxide.

SOURCE: Occupational Health and Hygiene Department - Chemical Safety Report, 1989.

2,4 - D = Dichlorophenoxy acetic acid

2,4,5 - T = Tricholorophenoxy acetic acid

BHC = Benzene Hexa Chloride

DDT = Dicholoro Diphenyl Trichloroenthane

DDVP = Dichloro Diphenyl Vinyl Phosphate (vapona)

MCPA = Monochlorophenoxy acetic acid.

2.1.1.6 Deforestation

While there are several causes of deforestation, the conversion of forested lands into agricultural areas has been the principal contributing factor to loss of forest cover. Deforestation for agricultural purposes has occurred in gazetted forest areas through encroachment or official degazzetting, as well as on other unprotected public areas. Between 1973 and 1986 Uganda lost a net acreage of 256 sq. km. of natural vegetation to agriculture, thus exposing the land to the agents of soil degradation.

2.1.1.7 Bush fires

The seasonal burning of grass and bushes occurs widely in Uganda and is carried out as part of land preparation for cultivation or for rejuvenation of pastures or to facilitate hunting of game. After the fires the exposed land is subjected to water erosion in the rainy seasons and wind erosion during the dry periods. Smoke from Africa's bushfires (including Uganda's) contributes to the build-up of atmospheric carbon dioxide and corresponding global climate change.

2.2 Forest Resources

The country's forests cover a wide range of habitats and are rich in terrestrial biodiversity. At the turn of this century, 45% of the country (108,450 sq. km.) was covered with forest and woodland. Some of this was gazetted as forest reserves. A peri-urban plantation programme was initiated in 1918 in Kampala and Entebbe with the aim of increasing forest cover and supplying fuelwood and poles for urban domestic consumption. This programme was extended to other urban as well as rural areas so that by 1968 plantations covered an area of 250 sq. km. Industrial plantations of cypress and pines began in 1941 and by 1968 covered 27,500 sq. km.

Forests generate and protect the soil, ensure sufficient and regular rainfall, stabilise climate, protect water bodies from siltation, provide *in situ* conservation of genetic resources, provide a safe refuge for plant and animal species threatened with extinction, and generally create an environment suitable for human activities. Forest products range from those that can be consumed directly after harvest (fruits, roots, game, firewood, etc.) to those that become raw materials (logs, poles, etc.) for other purposes.

Forests as a resource therefore need to be properly managed in order to ensure sustainable utilisation. It is generally recognized that there was good management of forest resources in the country until the onset of political and economic turmoil in the early 1970's. Rates of deforestation/reduction of

forest cover increased significantly from 1971 to 1986 and are only now beginning to decrease.

2.2.1 Forests today

Gazetted forest cover presently stands at 14,900 sq.km (7.7% of total land area) including 7,500 sq.km in savanna woodland and plantations, 5,900 sq.km in tropical high forest (3% of total land area) and 1,500 sq.km in montane catchment. Thus, the present level of forest land estate is only 21% of its value in 1890. While rates of deforestation have recently decreased due improved political and economic stability, the forests and the biodiversity they contain are still under significant pressure.

2.2.2 Deforestation and its underlying causes

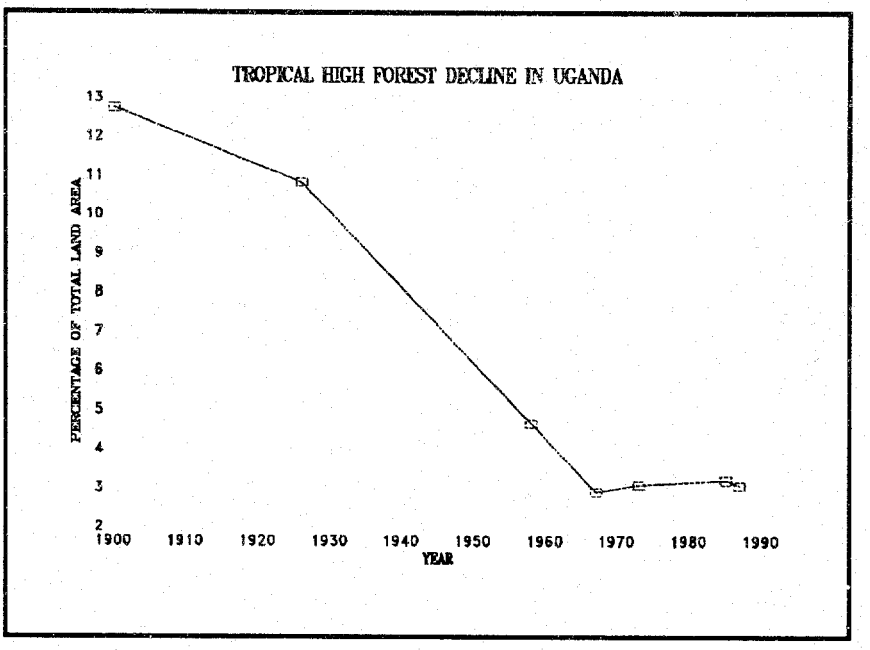
Deforestation and other forms of degradation are manifestations of extreme pressure on the forest estate accompanied by poor management of the estate. The underlying processes causing deforestation in Uganda are as follows:

2.2.2.1 Encroachment

In districts with high population densities, reserves of natural forests (particularly high forests) have been encroached upon by the local communities in an attempt to expand areas under cultivation. During the period of political turmoil (1971-1986) when there was complete breakdown of law and order, gazetted forest reserves were encroached upon and forest products were harvested in total disregard for both the law and sustainable use. Many small forests (both naturally occurring and plantations) have disappeared especially those near towns and urban centres. The decline of tropical high forest cover is presented in Figure 2.1.

Since the late 1980s, however, Government has been clearing all natural high forests of encroachers and illegal farming, opening boundaries and carrying out enrichment plantings. As a result, the forests are now regenerating.

Figure 2.1: Decline in tropical high forest cover



Source: Department of Forestry (Ministry of Natural Resources)

2.2.2.2 Energy demand

As previously stated, about 90% of the population is rural and directly depends on firewood for its energy needs. In addition, the largest fraction of urban dwellers depend on charcoal for their energy needs. Moreover, fuelwood will continue to be the main source of household energy in Uganda for the foreseeable future, in spite of Government efforts to increase hydro-electric power generation and promote the use of renewable energy sources other than wood. As a result, considerable pressure is and will be exerted on woodlands, forest areas and agricultural lands as sources of woodfuel.

The current production of woodfuel is estimated at 15.6 million cubic meters per annum while consumption is about 18.3 million cu. meters per annum (World Bank 1986). Thus, demand exceeds supply by 17% particularly in the districts of Arua, Soroti, Mbarara, Rakai, Masaka, Tororo, Pallisa, Kotido, Moroto and to some extent Kumi. The shortfall in these areas is made up partly by the accelerated harvesting/depletion of forest capital. This practice is not sustainable and leads to devegetation, soil erosion and other forms of land degradation, siltation of water courses and reservoirs, and even changes in local climate.

In order to alleviate the imminent fuelwood crisis - particularly in the above districts - an intensive woodlot and on-farm tree planting programme

needs to be initiated at the at the individual, community, and institutional levels.

2.2.2.3 Pitsawing

Pitsawing started in Uganda in the early 1900s, but was abandoned in the 1950s with the introduction of sawmill and plywood mill technologies. During the period of political turmoil, pitsawing took on a new economic life and it is believed that there are now hundreds of pitsawyers operating illegally. As an example, in 1991, Uganda used 1,000,000 cu.meters of industrial round wood; 95% of this came from hardwood forests of which 96% was cut by pitsawyers (Forestry Department 1993).

Pitsawing has played a significant role in deforestation especially in the Busoga region and in the islands in Lake Victoria. In particular, it is selectively depleting Uganda's prize hardwood species such as mvule (*Chlorophora excelsa*) and mahogany (*Entandrophrgma cylindricum*).

2.2.2.4 Mining and brick making

Lime production has increased recently following the return of peace combined with an enabling economic climate for entrepreneurship. This is particularly the case for those communities located near limestone deposits such as those in Tororo and Kasese Districts. Miners in these areas are depleting forests for fuelwood to fire local lime kilns. This has created a serious deforestation problem in the concerned areas.

The traditional brick making industry has also expanded following the growth of the building industry. Although brick production data is scanty, it is thought that the demand for fuelwood for firing bricks has contributed significantly to the disappearance of forests especially close to rapidly growing towns and urban centres.

2.3 Wildlife resources

Of all the countries in Africa, Uganda is endowed with the greatest diversity of animal and plant species. This is a result of its geographical location in a zone of overlap between ecological communities characteristic of the dry East African savanna and those of the West African rainforest. The country also stands astride the migratory routes of animals between the West and East, and between the North and the South of the continent. Additionally, the variety of altitudes ranging from lowland grasslands to montane forests and from open waters to drier areas gives additional depth to this variety. In short, this position has given the country a unique and priceless heritage. Protected

wildlife areas consist of ten national parks (Table 2.3), eleven game reserves (Table 2.4), twelve controlled hunting areas (Table 2.5), and six game sanctuaries (Table 2.6).

The Uganda National Parks (UNP) and the Game Department are the institutions responsible for the management of National Parks, Game Reserves, Controlled Hunting Areas and Game Sanctuaries. To a large extent previous wildlife management programmes and activities were extensive in character and had greater emphasis on enforcement. This did not lead to effective management as they excluded surrounding communities from participating in the park management process.

Table 2.3: National Parks

National Park	Area (sq.km)
Queen Elizabeth	1,978
Murchison Falls	3,860
Kidepo	1,442
L. Mburo	260
Rwenzori	996
Mgahinga Gorilla	25
Bwindi	330
Mt. Elgon	1,146
Kibale	766
Semliki	220
Total area	11,023

SOURCE: Table 6, P. 29, NEAP Secretariat Task Force No. 5 (1992).

Table 2.4: Game Reserves

Game Reserve	Area (sq.km)
Ajai	158
Bokoa corridor	2,056
Bugungu	520
Karuma	820
Katonga	208
Kibale Forest Corridor	560
Kigezi	330
Kyambura	157
Matheniko	1,604
Pia-Upe	2,314
Toro	555
Total area	**9,282**

SOURCE: Table 7, P. 30, NEAP Secretariat Task Force No. 5 (1992)

Table 2.5: Controlled hunting areas

Name	Area (sq.km)
Buhaka	18
East Madi	1,749
Kaiso Tonya	227
Kanema	241
Katonga	2,273
Lipau	899
Napak	225
North Karamoja	16,676
Sebei	2,531
Semliki	503
South Karamoja	8,972
West Madi	831
Total area	**35,145**

SOURCE: Table 8, P 20, NEAP Secretariat Task Force No. 5 (1992).

Table 2.6: Game Sanctuaries

Name	Area (sq.km)
Dufile, Otze & Mt. Kei	489
Entebbe	52
Jinja	8
Kazinga	207
Malaba	31
Zoka forest	207
Total area	**994**

SOURCE: UNP 1991. Elephant conservation plan for Uganda Table 9, P 31.

2.3.1 The status of wildlife

Wildlife management focuses both on protected areas management and the management of wildlife resources outside the protected area system.

2.3.1.1 Status in protected areas

In the west of the country where a high concentration of protected areas have been established, mountain gorillas, chimpanzees, red colobus, and the forest elephant among other species, are found. In north-eastern Uganda, there are oryx, lesser and greater kudu, klipspringer, Grants gazelle, cheetah and birds associated with arid areas (UNEP 1988).

The forests of Uganda, some of which are included in the national parks and game reserves system, remain particularly important as they are the only location where species common to both West African and East African savanna are found.

In the central plains there are several species of antelopes, while crocodiles and hippopotami abound in the rivers, swamps and lakes. Carnivores such as the lion, hyena, jackal, and many others are also present. Larger mammals present include elephants, buffalo, waterbuck, topi and hartebeest among others.

Animal wildlife in the protected areas is not evenly distributed; some habitats are naturally richer in animal wildlife species than others.

Elephants are found in Murchison Falls, Queen Elizabeth, Kidepo, Kibale National Parks and other forested areas. They have been reduced from

an estimated country-wide population of 40,000 to less than 4,000 in less than 10 years (UNEP 1988). Other major game species also show this drastic decline, though not to the same extent as elephants. Table 2.7 provides a comparison of the populations of selected animals from Murchison and Queen Elizabeth National Parks between 1960-70 to 1991. Reduction in animal numbers was mainly due to ruthless poaching immediately after the 1979 war, and encroachment for agricultural or grazing purposes. With law and order now re-established, combined with strengthening of the anti-poaching unit, the situation is improving.

Table 2.7: Population changes of selected mammalian fauna in the Queen Elizabeth and Murchison Falls National Parks

Species	Queen Elizabeth National Park		Murchison Falls National Park	
	1960-1970	1991	1960-1970	1991
Hippopotamus	15,000+	2,500	14,000	7,600
Elephant	2,500	225	13,550	308
Buffalo	16,000	5,000	25,000	1,600
Topi	4,500	500		
Giraffe			200	80
Black Rhino			200	0
White Rhino			16	0

SOURCE: The Queen Elizabeth National Park (1990) and the Murchison Falls National Park (1992) management plans, R. Olivier Uganda National Parks, Kampala.

The indigenous fauna include more than 40 different species of primates, ungulates, carnivores and other relatively large mammals (Dept. of Lands and Surveys, Uganda 1962). There are 15 mammalian species and sub-species which are endemic to Uganda (UNDP/FAO/UG/86/010 1989). Among these species, the critical ones for conservation include:

Primates Nineteen species occur and those of conservation concern include *l'hoest Guenon* in Rwenzori, Bwindi and Kibale National Parks and Budongo forest reserve; the Uganda red colobus in Kibale National Park and around the Mpanga River near Lake George; the chimpanzee in many of the forests in the West; and the mountain gorilla in the Bwindi National Park and Mgahinga Gorilla National Park.

Antelopes Formerly 30 species occurred but the bongo, bay duicker and white-bellied duicker are extinct; the giant eland has been reduced to small populations in Lake Mburo and Kidepo national Parks, and Steenbok have not been sited for many years and are probably extinct. Another 14 species are considered threatened a result of increased agricultural encroachment, overgrazing and poaching. Similarly the populations of most antelope species are now small. The Uganda kob has also been reduced in number.

Rhinos The northern white rhino (*Ceretotherium simum*) has been poached to extinction, despite efforts made in the 1960s to protect it in Murchison Falls National Park. A few years before 1988, a few black rhinos (*Diceros bicornis*) were said to be still in Murchison Falls National Park, but it is feared that even these have now been exterminated. The situation is similar for the Kidepo Valley National Park (UNEP 1988).

Other Mammals The wild dog is now considered extinct, except for occasional wanderers from Tanzania and Sudan, although recent unconfirmed reports indicate their presence in the Ankole Ranching Scheme in Mbarara district. Jackson's mongoose is widespread but rare. The conservation requirements of both these species need to be assessed. There are ten rodent species of conservation concern. These include: the mountain squirrel (*Funisciurus carruthersi*) on Mount Rwenzori; the groove-toothed rat (*Otomys tropicalis*) in many different habitats in the mountains; Delany's mouse (*Delanymys brooski*) in the mountains of the south-west; the creek rat (*Pelomys hopkinsi*); the climbing wood mouse (*Hylomyscus denniae*) in the montane forest; the large *Thamnomys venustus* in montane forests in the south-west; the mill rat (*Mulomys dybowskii*); and the African pygmy mouse (*Mus acholi*) endemic in the north-west.

Birds There are ten threatened species, six of these are forest birds including: Nathan's francolin, occurring in Mabira, Bugoma and Budongo forest reserves and elsewhere; the African broad bill in Bwindi; the forest ground-thrush in Semliki and the Kibale ground-thrush which is endemic to Kibale; Turner's eremomela in the south-western forests with unspecified localities; and Chaplin's flycatcher in Bwindi. Three others are wetland species including: the shoe bill (*Balaeniceps*) which is widespread around papyrus swamps over most of the country except the east, but probably common around Lake Kyoga and

Kwania; Grauer's swamp warbler in higher altitude swamps in the west and in swamps around Lake George, Edward, Bunyonyi and Mutanda. The Karamoja *Apalis* which occurs in the dry Karamoja region, is known from several localities, including Mt. Moroto and Kidepo Valley National Park.

Crocodiles The Nile crocodile occurs below Murchison Falls. The decline in population has, however, been precipitous having dropped from 700 individuals in 1967 to 80 in 1980. However, in April 1984, between 240-260 crocodiles were counted below the falls (UNEP 1988). Crocodiles have also recently been sighted at Lake Edward near Kazinga Channel. The slender-snouted crocodile might occur but has not been confirmed in recent years. The dwarf crocodile is very rare but has been reported recently (Stuart and Adams, 1990).

Amphibians The National Biodiversity Unit (NBU 1992) reports that 50 species have been described in Uganda, but does not mention localities. Stuart and Adams (1990) mention 10 species of conservation concern (without naming them) and report that there are no endemics.

Five of these species are supposedly shared only with Zaire, two with Zaire and Rwanda, two with Zaire, Rwanda and Burundi, and one with Zaire, Rwanda, Burundi and Tanzania. All of these occur in southern and western Uganda.

Inverte-
brates There are over 100,000 species of invertebrates that are known to occur in the country (NBU 1992). Two species are rated by the IUCN as of conservation concern and include the rare African giant swallow-tail butterfly (*Papilio antimachus*) known from the Semliki, Budongo and Kalinzu forest, and the cream-banded swallow tail (*Papilio lenctaeria*) which occurs in the montane forest of the south-west.

2.3.1.2 Outside protected areas

The present policies and legislation for the management of terrestrial biodiversity outside the protected area system is inadequate. The existing land tenure systems of mailo holdings, leasehold and customary holdings offer little incentive for protection and management of biodiversity in these areas. Maintenance of habitats and species are at the mercy of individual land owners.

While animal wildlife is under considerable pressure and requires more attention for conservation, a few areas outside the protected areas system with

considerable populations of animals have been identified (Stewart 1992). These include: the Ankole Ranch Scheme covering an area of 65,000 sq km; the Uganda Livestock Industry Ranches at Kyampisi and Kiryana in Masindi District covering an area of 268 sq.km; and Nyakiana Ranch of Bunyoro Cooperative Union Ltd covering an area of 150 sq.km. Population estimates for the principal game animal species in these ranches show the presence of viable numbers of impala, zebra, waterbuck, bushpig, bushbuck, eland, buffalo, warthog, oribi, topi and hippo.

Other areas include: Kijunjubwa parish of Kamengo sub-county of Buruli in Masindi with an area of 300 sq Km, having bushpig, bushbuck, warthog, duiker, cane rat and waterbuck; Ngoma and Nakasongola ranches in Luwero District and Olweny Swamp in Lira district where the shoe-bill *Balaeniceps rex* is believed to be in sufficient numbers to warrant protection and conservation as well as a small population of Uganda kob sited during a NEAP field trip in March 1992.

There are also other areas which were once gazetted as game reserves, but were degazetted during the years of political turmoil. These include the former Aswa Lolim Game Reserve/Kilak Controlled Hunting Area, with an area of 102 sq Km of savanna grasslands adjoining the northern border of Murchison Falls National Park. This area served as a buffer zone as well as a breeding ground for Uganda kob. Kikagati Game Reserve also lost the reserve status although it is still relatively rich in biological diversity.

Although no longer official reserves, the conditions of these areas have not greatly changed except for extensive poaching (Williams, 1991). For this reason the Game Department still has interest in them and maintains some staff to police them. They remain the seasonal breeding ground for Uganda kob, and a greatly reduced elephant population, Jackson's hartebeest, Bohor reedbuck, buffalo, lion and leopard. Bird life is similar to that found in the Murchison Falls National Park.

Finally, there are also some biotic communities outside the protected areas system which warrant increased protection. These include the *Butryospermum spp* forest, the dry *Combretum spp.* savannas and the Borassus palm forests (NBU 1992). These areas are homes to a considerable number of animal species serving as breeding and/or nesting grounds to both migratory and non-migratory species.

2.3.2 Loss of wildlife and its causes

The following are the main pressures on wildlife resources.

2.3.2.1 Poaching

Poaching includes the use of both the traditional bow and arrow and traps, and more recently, the automatic rifle. Poaching in and outside protected areas in the past has resulted in major reductions in species populations, some to outright extinction, including both the black and white rhinoceros. Elephant, hippopotamus, buffalo, and crocodile populations, among others were also severely affected. As a result of the past political upheaval, the country's rich wildlife heritage has been severely decimated.

2.3.2.2 Encroachment

Currently, encroachment is still a major problem around Lake Mburo Park area where herdsmen are competing with wild life for grazing land. Although encroachment on other parks has been minimal, pressure is expected to increase in the future as a result of a high rate of human population growth which will be accompanied by a large demand for more arable land.

2.3.2.3 Fishing villages

Fishing villages within the protected area system pose a threat due to expansion of settlement areas outside of delineated borders. The fisherfolk communities also collect fuelwood from within the protected areas resulting in increased deforestation and loss of habitat and its attendant problems. There is also great temptation to engage in poaching activities. This phenomenon is most profound in Queen Elizabeth and Lake Mburo National Parks.

2.3.2.4 Consumptive uses

Hunting, cropping, fishing and wildlife ranching and the export of live wild animals and plants also pose real threats to the conservation status of wildlife. Unfortunately, all the protected areas have experienced this phenomenon in the past and some are currently under this pressure. However, these activities can be controlled as long as there is sound administration and management and protection and conservation practices are in place.

2.3.3 Forest and wildlife-related tourism

By 1970, tourism was the third largest foreign exchange earner, behind coffee and cotton. Between 1971 and 1986, the level of tourism activities declined drastically as a result of insecurity and the complete breakdown of law and order.

Although the country has many tourist attractions, the principal reason why tourists come is the terrestrial biodiversity found in the forest and wildlife protected areas. While there has been degradation of tropical high forests and reductions in animal wildlife populations, the potential for tourism based on terrestrial biodiversity still remains high. Unlike many countries with aggressive tourist advertising campaigns, tourist arrivals in Uganda over the 1985 to 1991 period were largely the result of the country's past reputation as a unique tourist destination not a result of any marketing effort.

Tourism generates both direct and indirect economic benefits and these benefits are expected to increase as a result of improved political and economic conditions in the country. Nonetheless, managerial weaknesses undermine this potential if not addressed early on in the tourism development process. Potential problems include: unplanned human tourist traffic as a result of increased interest in tourism; poor garbage disposal which affects both the physical state and the health of the animals; and a proliferation of poorly planned and sited concessions. The exclusion of the people living adjacent to tourist areas from participation in park management (and sharing of resources and revenue) also has negative effects. In particular, populations which loose traditional use rights from protected areas may become alienated and thus may undertake even more destructive activities.

2.4 Wetlands resources

For its size, Uganda's wetlands are complex and extensive, being found in almost all areas of the country. They occupy an area of about 29,600 sq. km. or about 10% of the total area of the country, including areas of permanent flooding but not open water. Wetlands are comprised of areas with impeded drainage (20,400 sq. km.), swamp forest (365 sq. km.) and swamps (8,800 sq. km).

The country's wetlands ecosystems can be classified into two broad categories: wetlands associated with lakes, and wetlands associated with rivers and flood plains. The wetlands associated with natural lakes and lacustrine swamps include: Lake Victoria, Lake Kyoga/Kwania lake/swamp complex, Lake Albert area, Lake Edward, Bunyonyi lake/swamp complex, Kijanebalola lake/swamp complex, Bisina/Opeta lakes area, Lake Wamala area and other wetlands associated with minor lakes. Lake George within Queen Elizabeth National Park and comprising a total areas of 20,650 sq. km., was designated a wetland of international importance under the Convention on

Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention), in March 1988.

The main wetlands associated with riverine swamps and floodplains include: the Okere, Kafu and the Nile area river systems. All the lakes and river systems including some other smaller units are interconnected and have complex boundaries. In addition, there exist other smaller units of wetlands called "dambos" that are not connected at all to the two categories and have no outlets at all.

2.4.1 Main uses of wetlands

While the general feeling among many Ugandans in the past has been that wetlands are wastelands, many people presently derive numerous benefits from this resource. Most of these traditional uses of wetlands are sustainable but a few of them have had serious effects on the wetland ecosystem as a whole. The main products currently derived from wetlands are presented in Table 2.8.

Table 2.8: Main products derived from wetlands

Wetland's resource	Example of product
Forest resource	Ambatch wood, fishing floats - (Lake Victoria)
Wildlife resources	Sitatunga antelope, birds, fisheries (Tilapia, catfish and lungfish)
Forage	Grasses
Microphyte resources	Papyrus, Typha, Phoenix, phragmites
Agricultural resources	Rice, tallow, palm products, beans Sesbania, Leuceania
Water supply	Water supplied direct or via borehole

2.4.2 Major threats to wetland

There is a variety of threats to wetlands arising from human activities. These are summarised in Table 2.9 below:

Table 2.9: Major threats to wetlands

Activity	Problems caused by this use
Drainage	Abstraction of water results in a net decease in the water table. This has occurred especially in the valley wetlands around Bushenyi and Kabale.
Grazing	Repeated and extensive burning of grasses every year to allow for growth of fresh vegetation for pasture (and to facilitate hunting) leads to change in the ecological character of wetlands.
Brick-making	Removal of soil and creation of water pools that may lead to spread of diseases like malaria and bilharzia. This also causes lowering of the water table and changes the ecological character of the wetland.
Cutting of vegetation	At present most of papyrus harvesting is not sustainable because of repeated harvests at short intervals.
Rice-growing	Has created large areas of monoculture, which among other things has attracted bird pests. Rapid decline of fertility because of poor management practices where rice is harvested and the straw is burnt.
Sewage treatment	This mainly applies to town treatment works: a wetland used for the purpose of effluent stripping must be prevented from silting up or accumulating toxic metal waste.
Hunting of antelope and birds	While not a direct threat to wetlands, there is a dramatic reduction in populations of antelopes and birds especially the sitatunga and the shoe-bill storks due to hunting. Although this activity is regulated by the Game Department, enforcement is inadequate.

2.4.3 Management constraints

Conservation and sustainable utilisation of wetlands in Uganda is also constrained by a number of management-related factors, namely: inappropriate land tenure systems, unregulated and unplanned fisheries development, especially fish farming; some sectoral policies that encourage wetlands drainage and conversion to unsustainable uses; and the unscrupulous activities of some developers. This situation is exacerbated by the fact that available data on wetlands is scanty and inadequate; wetlands remain an area that has not been adequately studied.

2.5 Water resources

Uganda is well endowed with fresh water resource comprising large lakes, rivers and wetlands, which form the beginning of the River Nile Basin. This natural resource is, however, unevenly distributed both in time and space, which in the future could be a limiting factor to socio-economic development.

Located in the Upper Nile Basin, Uganda shares her water resources with the nine riparian countries of the Nile Basin. Developments in some of these countries affect the water resources of Uganda and vice versa.

2.5.1 Surface water

The main hydrological feature of the country is the extensive interconnected system of lakes forming the upper part of the White Nile. Lake Victoria, which drains a total area of about 190,000 sq. km. in Rwanda, Burundi, Tanzania, Kenya and the entire southern part of Uganda itself, has its outlet close to Jinja.

Passing over the Owen Falls Dam the water flows through the Victoria Nile into Lake Kyoga and subsequently into the northern end of Lake Albert. The other branch of the lake system, i.e. Lake George and Lake Edward, is connected via the Semliki River which flows into Lake Albert in the southern end. From Lake Albert the Nile flows north towards the Sudan.

The Ugandan territory is situated entirely within the Nile Basin, and is for operational purposes divided into a total of eight sub-basins. These sub-basins are relatively small contributors to the Nile flow, but their yields dominate the water resources potential within Uganda.

The flows in the main branches of the Upper Nile are to a great extent determined by the water levels of the lakes. In this respect the lake system provides significant storage which helps to smooth out the effects of seasonal as well as inter-annual variations in rainfall and tributary inflows.

While nearly 20% of Uganda's surface is covered by open water and wetlands, this resource is unevenly distributed. Adverse climatic conditions have resulted in unreliable rainfall with respect to quantity and distribution, especially in the southwest and northeast. This has led to scarcity of water for rainfed agriculture and animal industry. The resultant search for water has been associated with many social problems, including nomadism and encroachment on nature reserves and wetlands.

2.5.2 Groundwater

Groundwater represents the main source of domestic water supply for the rural population, and is also important for livestock use. Groundwater abstraction takes place from springs, boreholes, and to a lesser extent from dug wells.

Surveys have identified some 12,000 springs in Uganda of which close to 5,000 have been protected for safe use. About 10,000 boreholes exist, typically drilled to a depth in the range of 60 - 90 metres.

The productive aquifers occur mainly in the crystalline basement rock zones underlying more than 90% of the country. Aquifers are also present in the Western Rift Valley sediments found in and areas around Lake Edward and northwards from Lake Albert. These aquifers are alluvial infills of gravel, sands and clay.

Aquifers in volcanic formations are found at Mount Elgon at the eastern border and at Mufumbira in the extreme southwest of the country.

The basement complex does not represent an extensive homogenous aquifer, and at the same time it is highly variable in terms of characteristics and yield. It is, however, an important source of water for rural communities with as many as 95% of all boreholes sunk in this complex.

Groundwater quality problems are in particular connected to the corrosiveness of the underground water in large parts of the country and the localised occurrences of high levels of fluoride.

2.5.3 Main threats to water resources

Water resources are under threat from two sources: the ever increasing demand due to population growth and development needs, and progressive deterioration of water quality due to invasion of noxious water weeds as well as untreated domestic, municipal, agricultural, mining and other forms of industrial pollution. These problems are discussed in brief below.

2.5.3.1 Water hyacinth

Water hyacinth has affected all the major lakes in Uganda but in particular Lakes Victoria and Kyoga as well as the Nile River. Main dangers posed by the water hyacinth include:

- de-oxygenation of water which disrupts the aquatic food chain and energy transfer mechanism, kills organisms and impairs water quality;
- interference with fish reproduction by carpeting off breeding grounds;
- obstruction of water ways, navigation, hydroelectric and water supply intake works machinery; and
- fostering the spread of water borne diseases such as bilharzia and malaria by increasing/enhancing breeding grounds for their vectors.

Efforts to control this weed are at infancy and have so far not had any positive impact.

2.5.3.2 Pollution

There are many sources of water pollution in Uganda. The main ones include:

- **Siltation of rivers and lakes from soil erosion:** The serious soil erosion observed in many places has been the result of the destruction of soil cover and cultivation on steep hill sides. The soil carried by water from the slopes to the water bodies causes sedimentation on the beds of lakes and rivers, gradually thereby reducing their storage capacity, flow and avails undesired nutrients to aquatic micro-plant life which in turn has led to eutrophication in some water bodies.
- **Pollution from breweries:** Two breweries located off the shores of Lake Victoria produce 5,000 cu. meters of toxic waste per day, discharged into the lake (and eventually the Nile River) untreated. This waste contains caustic soda, yeast, alcohol, fermenting barley and other organic solids. These contaminants have a high Biological Oxygen Demand (BOD) of the order of 3,500 mg per litre. Brewery waste has already produced fish kills in the waters at their immediate vicinity.

- **Pollution from textile industries:** Four textile factories located on the shores of Lake Victoria produce waste from the printing and dyeing processes. Bleaching agents from these processes such as caustic soda and hydrogen peroxide, and sodium silicate and a multitude of dyes are all well known for causing cancer in mammals. The total waste from the mills exceeds 2,000 cu. meters per day and is discharged untreated into the water bodies of Lake Victoria and the Nile River. This degrades the ecosystem, reduces the productivity of the lakes and threatens human health.

- **Pollution from sugar industries:** There are three crystal sugar manufacturing factories each producing waste water at a rate of 500 cu. meters per day. The contaminants include cane wash, celluiose matter, cane juice, molasses waste, and alcohol. A preliminary study of these wastes indicate a BOD level of 130,000 mg/litre for Lugazi Sugar Corporation and 204,000 mg/litre for Kakira Sugar Works. The waste water is currently discharged untreated into the rivers close to the factories. It is believed that the current levels of organic pollution in these rivers exceed their capacity to biodegrade them.

- **Pollution from leather tanning:** There is one large leather tanning facility also located on the shores of Lake Victoria. It discharges 420 cu. meters per day of waste water into the lake. The wastes discharged consists of pesticides such as arsenic, DDT, zinc chloride and various chlorobenzenes. The waste water is highly corrosive, has a high BOD (700 mg/litre) and a high concentration of suspended solids. There is no chemical treatment of this waste to render it inert, prior to discharging it into the ordinary public sewer. Several new leather tanning factories are planned for the Lake Victoria area. The toxic waste discharge will therefore increase. Preventive measures are required.

- **Pollution from mining:** The solid waste from Kilembe Copper Mines contains cobalt sulphide (1.4%). Over the years, this waste has been stockpiled as tailings at Kasese pending future commercial exploitation. The stockpile was finely milled and pumped as a slurry to the tailing lagoons. However, the lagoons were not consolidated, capped or vegetated as they should have been. Consequently, the lagoons are susceptible to water erosion. Surface runoff from rainfall has carried some of these materials into the rivers. This constitutes an uncontrollable discharge of toxic waste into the water bodies. As the water from the rivers in the environs is used for domestic consumption, it is believed that there may be human

intake of metals like iron, cobalt, copper, cadmium and zinc which may cause health problems. The small-scale mining and refining of gold carried out in several parts of the country also raises environmental problems as the prospectors use mercury for extraction of the precious metal.

2.5.4 Water resources management issues

The principal responsibility for water management has traditionally rested with Government. The political instability and the prevailing insecurity that characterized the 1970s and early 1980s seriously damaged the ability of Government to carry out its stewardship role with the result that water resources assessment and monitoring efforts were virtually abandoned.

The current environmental concerns in water resources development and management can be categorized as: inadequate knowledge of the available resources and potential and the demand placed on them for development purposes; the optimal allocation of available water resources to meet demand; and the determination, control and disposal of consequences of development (such as wastes) in such a manner that the ecosystem and development are not compromised in space and time.

2.5.4.1 Watershed management

As discussed in Section 2.1, land degradation is one of the main environmental problems facing the country. Its causes include, inter alia, inappropriate farming methods, bush burning, deforestation, overgrazing and wetland drainage. Land degradation also affects the hydrological regime (rainfall , run-off, evapotranspiration, infiltration, etc.) which has several negative consequences including climate change, siltation and increased flood hazards.

The main ecological concern with soil erosion and siltation is the loss of water storage capacity of the water bodies and wetlands. This influences down-stream fisheries potential and water supplies recharge.

All of these consequences have significant economic costs such as increased treatment costs of turbid water for water supplies, and loss or reduced investment returns when dams and water supply intake works silt up before their project design periods.

2.5.4.2 Water utilisation rights

Most of the surface water in Uganda is part of the Nile Basin which is shared by nine riparian countries; Egypt, Sudan, Ethiopia, Zaire, Uganda,

Kenya, Tanzania, Rwanda and Burundi. While the use of water by the upstream riparian states affects the quantity and quality of the resources in Uganda, those downstream are also affected by the use of water in this country. Since 1900, the downstream countries developed water regulation plans for the storage and control of the flow of the Nile up to Uganda by entering into colonial agreements to achieve their objectives. Some of the provisions in the plans have adverse environmental and socio-economic impacts on Uganda and, therefore, need to be reviewed and modified.

2.5.4.3 Water resources monitoring and assessment

Comprehensive water resources monitoring and assessment is essential in the formulation of effective land and water management policies and programmes to meet the nations increasing water demands on a sustainable basis. Unfortunately, monitoring efforts have been constrained by institutional weakness, inadequate networks for data collection, storage, processing and retrieval, inappropriate technologies, lack of qualified staff and meagre funding.

2.6 Fisheries

Uganda's endowment in lakes, rivers and streams has resulted in an active fisheries sector. Fisheries constitute an important resource to the country. The sector contributes to the nutritional welfare of the people, provides for employment, generates substantial incomes virtually all year round for those engaged in fish harvesting, processing, distribution and marketing, and makes a significant contribution to Gross Domestic Product (GDP).

Over the years, annual per capita fish consumption has varied considerably with some of the lowest levels registered during the period of political turmoil. Other reasons for the variation in per capita consumption are price, product substitution and regional consumer preferences. The net trend, however, is an increase in the demand for fish due to population growth, rapid urbanization and improved transport infrastructure.

This increased demand for fish has in turn led to increased fishing intensity. Between 1961 and 1989, the fish catch peaked in 1978 at about 225,000 tons. In 1992, the quantity of fish caught in the country's waters increased to over 260,000 tons surpassing the 1978 peak. Unfortunately, data on the potential annual yield are incomplete pending more detailed stock assessments and a more accurate recording of annual fish harvesting results. However, one estimate of supply sustainability, prepared in 1983, showed that annual harvest was slightly more than half the sustainable supply.

Fish harvesting has been and is still predominantly artisanal. Similarly, the bulk of the fish caught in Uganda's waters is processed using traditional methods of sun-drying, salting, frying and hot-smoking. Currently, there are a few industrial processing plants in the country. In most cases, these plants are well serviced but the handling facilities of artisanal fisheries remain very rudimentary.

2.6.1 Threats to the fisheries resource

The fisheries resource faces a number of threats including the following :

2.6.1.1 Overfishing

The periodic scarcity of fish in the water bodies of Uganda is not a new phenomenon. In Lake Victoria, for example, catches of tilapia per net dropped from thirty fish in 1921 to six fish in 1928, and then to 1.6 fish in 1950. Nevertheless, it is generally accepted that over-exploitation is occurring in lakes Kyoga and Wamala where tilapia stock levels have not recovered from the time they declined in the mid-1950s.

2.6.1.2 Management constraints

The overriding management concern today, is one of containing the over-exploitation of fisheries resources. To achieve rational and sustainable use, first, the physical, chemical and limnological characteristics of rivers, lakes and streams need to be better understood. Second, since the previous multi-species compositions of the water bodies are either no longer present or altered, new stock assessments must be carried out. Third, the interface between a predominantly artisanal fishing and the growing influence of commercial operators must be examined. Fourth, the impact of traditional fish processing on the environment and on deforestation in particular, must be addressed. Finally, management must be equipped with the necessary resources to accurately monitor fish exports and detect cross-border smuggling. Consequently, the current fisheries management issues and concerns require more efficient research, enforcement, extension and monitoring.

2.6.1.3 Energy scarcity

The predominance of hot-smoking and frying methods of artisanal fish processing contributes to environmental degradation through the

indiscriminate harvesting of fuelwood. To make matters worse, the current increase in fish harvesting, especially in Lake Victoria, is Nile perch-driven. The high fat content of this species lengthens drying time and increases the amount of fuelwood needed to hot-smoke a given quantity of fish. The unwanted effects of deforestation are already evident in certain fisherfolk communities where the populations are experiencing serious scarcities of fuelwood.

2.6.1.4 Health problems

The most common health problem for the fisherfolk communities is malaria, followed by diarrhoea, dysentery and bilharzia. These problems are the result of both the lifestyle of the fisherfolk combined with a general lack of alternatives (including training) to current practices. For example, there is a general lack of clean drinking water and pit latrines. The water bodies - which are their major sources of drinking water - also are used for bathing and dumping place for all forms of waste.

2.6.1.5 Pollution

The principal sources of pollution threatening the water bodies and therefore fisheries resources are discussed in Section 2.5.1 above. Fish populations in Lakes Victoria, Kyoga, and George, and the Nile River, are under the most serious threat from pollution.

2.7 The Energy resource

Energy is a critical vehicle for development, and the stage of a country's development can often be gauged by the level of consumption of commercial energy. Compared to other countries in the region, Uganda's per capita consumption of commercial energy is quite low, having been affected by the economic decline of the 1970s and early 1980s. Energy use in Uganda is still dominated by woodfuels, followed by petroleum and hydroelectricity. Woodfuels alone account for over 94% of the total consumption. Petroleum accounts for about 5% while hydroelectricity accounts for only about 1%. All petroleum products used in the country are imported. Petroleum exploration in the western Rift Valley area (around Lake Albert) is currently underway, but it is too early to expect results. The various sources of energy are briefly discussed below.

2.7.1 Woodfuel

Firewood (or fuelwood) is the most important indigenous energy resource. Charcoal as a component of fuelwood accounts for 4% of total energy consumption. Of the country's commercial energy consumption, woodfuels contribute over 70% (World Bank National Energy balances 1980, 1985 and 1990). Charcoal is now used in almost every urban household. Fuelwood will continue to be the main source of household and commercial energy in Uganda for the foreseeable future, in spite of Government efforts to increase hydro-electric power generation and promote the use of renewable energy sources other than wood. As a result, considerable pressure is and will be exerted on woodlands, forest areas and agricultural lands as sources of woodfuel.

According to the World Bank ESMAP report (1986), the 1985 production of woodfuel was estimated at 15.6 million cubic meters per annum while consumption was about 18.3 million cu. meters per annum. Thus, demand exceeded supply by 17%. Inadequate intervention programmes and a casual assessment of the energy situation at the present moment indicate that this situation has not improved, particularly in the districts of Arua, Soroti, Mbarara, Rakai, Masaka, Tororo and Pallisa. The shortfall in these areas is made up partly by the accelerated harvesting/depletion of forest capital. This practice is not sustainable and leads to devegetation, soil erosion and other forms of land degradation, siltation of water courses and reservoirs, and even changes in local climate. The rest of the shortfall is made up by using agricultural wastes for energy rather than for building up soil organic matter, a practice which also has potentially serious environmental as well as production consequences. Additionally, the increased commercialization of woodfuel is thought to be contributing to air pollution through increased production of greenhouse gases (GHG).

In order to alleviate the imminent fuelwood crisis - particularly in the above districts - an intensive woodlot and on-farm tree planting programme needs to be initiated at the at the individual, community, and institutional levels.

2.7.2 Petroleum

Uganda currently imports all her petroleum requirements. The presence of petroleum deposits has been confirmed in the Western Rift Valley and especially in the Lake Albert and Lake George areas of Uganda. There is, however, no commercial production as yet. Moreover, due to their high cost, petroleum products can not presently be seen as substitute for fuelwood, which will place an additional burden on the country's forests when population and economic growth are taken into consideration.

Additionally, the burning of petroleum products in industry, transport, and power generation inevitably adds to environmental degradation through

the emission of GHG and other atmospheric pollutants. However, these effects have not been accurately quantified.

2.7.3 Hydro-electric power (HEP)

The country's hydro-electric potential is estimated at 3000 megawatts although only approximately 156 megawatts have been exploited. Despite this immense potential, hydro-electricity constitutes only about 1% of total energy consumption. Most of the power - amounting to 150 megawatts - is generated at Owen Falls HEP station, while the rest is derived mainly from mini-hydro power stations. The Owen Falls HEP station is currently being upgraded to an installed generation capacity of 180 Mega Watts. At least 21 mini and micro-hydro power sites have been identified as having the potential for development especially electrification. Unfortunately, the hydropower industry is plagued with severe management, production and distribution problems. Otherwise this significant hydropower potential could conceivably relieve much of the pressure on the nation's forests.

2.7.4 Alternative sources of energy

Uganda has a variety of potentially and economically viable alternative sources of energy including solar, wind, and geothermal sources, as well as non-woody biomass sources including animal and agricultural wastes, and peat. However, these sources are not widely used due to: inadequate awareness of their existence both in the public and private sector; the passive role of Government and the private sector in disseminating available alternative energy technologies; and the high cost of these technologies.

2.7.5 Key issues in the energy sector

The energy sector in Uganda is plagued by a host of problems, the major one being weak economic performance which has, for the last two decades, curtailed commercial energy supplies and depressed the efficiency of energy production and use. Other contributing factors include: a limited choice of indigenous conventional energy resources (hydro-power and fuelwood); the under-utilisation of indigenous resource potential (e.g. inadequacy of electricity supply and lack of development of woodfuel and other renewable energy technologies); a high import bill for petroleum products; and an inadequate institutional framework for energy resource management.

Contributing to the above major problems are a series of other critical issues such as a lack of awareness/energy consciousness, inefficient use of energy, lack of alternative energy technologies, lack of efficient cook

stoves/kilns and the abject poverty of most Ugandans. The net result of these problems, if not addressed, will be unprecedented environmental degradation in the near future. Even current levels of environmental degradation have in some cases already led to climatic instability (droughts and desertification) and many cases of microclimatic change, particularly local warming trends.

2.8 Population and environment

Population is an important and inseparable component of the environment. Underlying the connection between population and environmental degradation is the associated presence of cultural, production and consumption systems that may or may not be compatible with natural resource carrying capacity.

Whatever the affluence of the population, whether rich or poor, the larger the number of users, the more demands they will make on natural resources and therefore the more potential for damage to the environment. This is particularly true for common property resources.

The country's population is largely rural with 88.7% of the total population living in rural areas. The remaining 11.3.% are located in the country's urban centres with Kampala having the largest number of people (700,000) followed by Jinja, Masaka and Mbale.

During the years of economic decline from the mid 1970s to the early 1980s, political and social factors largely influenced population distribution. With political and economic stability, the biggest factor influencing population distribution is and will probably continue to be based on the environment and natural resource factors. Chief among these factors are: climate, soil types, soil fertility and productivity, terrain, vegetation, the presence or absence of disease agents, and availability of social services.

The following are identified as the key issues affecting the population-environment relationship in the country.

2.8.1 Fast rate of population growth and increasing population pressure on environmental resources

Uganda has a high population growth rate. Between 1948 to 1991, the population of Uganda increased from 5.0 to 16.7 million. Given this rate, the country's population is expected to double in 28 years if this trend continues unchecked. The seriousness of the issue is that socio-economic development of a fast growing population calls for increased use of natural resources at a level which may not be sustainable given current management and capital constraints.

Over population is already a serious issue in the districts of Kabale, Kisoro and Mbale. In certain parts of Uganda the symptoms of population and natural resource imbalance are already apparent. Land fragmentation has become quite common. Deforestation, over-grazing and subsequent soil erosion have also become common features of heavily populated and cattle grazing districts like Mbarara, Moroto, Kotido, and Luwero.

Calculations based on population density, amount of arable land and soil fertility (Atiku 1992), suggest that five districts have already reached their critical level of population carrying capacity. These are the districts of Mbale, Bundibugyo, Tororo, Pallisa and Rukungiri.

2.8.2 Poverty

At the national level, the growth rate of GDP is about 7% per annum (1993). However, this growth rate does not appear to be affecting the majority of the population as yet. The Household Budget Survey of 1989/90 revealed that 80.9% of households in Uganda had monthly expenditures of less than U. Sh. 50,000/=; while 50.63% had expenditures of U. Sh. 25,000/= per month or less. Household incomes vary from region to region; income tends to be higher in the central region and is lowest in northern Uganda. Urban areas are also comparatively better off than rural areas. In any case, for a typical household of 6-8 persons, an income of shs. 30,000 per month is well below the poverty threshold required for a humane living (World Bank 1990). Moreover, this analysis takes into account the non-monetary income of the subsistence economy.

The key link between poverty and environment is that poverty affects people's ability to manage their environment sustainably. As they lack resources and appropriate technologies, many farmers must resort to cultivating steep slopes, erosion-prone hill sides, semi-arid lands or encroach on the protected areas in order to meet their various demands. In short, poverty compels them to destroy those very resources that are necessary to relieve them of hunger, disease, and further poverty.

2.8.3 Illiteracy and lack of awareness

The majority of the population is not only poor, but and estimated 45% are also illiterate. Illiteracy combined with a general lack of awareness, understanding or opportunities to learn about the environmental consequences of their actions has also contributed to environmental degradation in the country.

2.9 Environment and health

The state of human health in the country is poor. Inadequate living and working conditions expose people to physical, chemical and biological pollution and to various adverse psychological and social factors especially in the large population centres.

The environment of human settlements is a basic factor governing the health, and the quality of life of the people who live in them. The effect is more pronounced on those who spend most of their time in and around the home, such as infants, young children and the elderly. The majority of the population live in dwellings that are substandard and without basic sanitation.

2.9.1 Nutrition

The level of malnutrition is quite high; kwashiorkor and marasmus are common conditions among pre-school children in both rural and urban areas. Forty-five percent of children of less than 5 years of age are chronically malnourished. Nutritional diseases were among the top ten causes of mortality between 1988 - 1990. Protein calorie malnutrition is more severe in urban centres because the cost of living is quite high and few can afford a balanced diet for their families.

2.9.2 Environmental pollution and health

The underlying issue here is that man uses water and then returns it to the environment usually in a polluted state. Both urban and rural populations are faced with problems of insufficient water supplies and widespread pollution of existing water bodies by human and animal excreta, industrial waste water, agricultural runoff, storm water and urban runoff.

Environmental sanitation includes the supply of clean water, proper disposal of wastes, sewage and refuse, safeguarding of food, provision of good housing, control of insect vectors and other pests, control of animal reservoirs of infection, prevention of atmospheric (air) pollution and elimination of noise and other hazards.

Currently, facilities for monitoring and maintaining the quality of water and air are outdated, broken down, inadequate or non-existent. Collection and disposal of refuse is not done properly nor on a timely basis. It is common in slums and in urban centres to find heaps of decomposing garbage which act as breeding ground for flies and other insects and as a habitat for rodents. Human excreta are an important source of pathogenic organisms especially the causative agents of diarrhoeal diseases.

The sanitary disposal of human excreta is grossly inadequate. This is particularly the case in urban areas where the existing sewage disposal

facilities have not been expanded to match the growing population. Slum dwellers lack proper latrines and even rural inhabitants do not have pit latrines. Programmes for the control of disease vectors, infection reservoirs and pathogens are very thin on the ground and uncoordinated. Industrial processes - themselves not adequately regulated - produce chemical wastes which are hazardous to man and flora and fauna.

2.9.3 Diseases associated with water pollution

As a result of the above described inadequacies a variety of diseases do exist leading to high morbidity and mortality. The main ones are characterised below:

2.9.3.1 Water borne infections

Water borne infections include the bacterial diseases of typhoid fever, cholera and bacillary dysentery. The viral diseases of polio and infective hepatitis are transmitted through the same route. Since these infections are characterised by diarrhoea, they are classified as diarrhoeal diseases.

Diarrhoeal diseases were the leading cause of mortality in 1988, 1989 and 1990 and were responsible for 10.4%, 11.1% and 8.7% respectively of all deaths. During the same period diarrhoeal disease were among the top ten causes of morbidity and mortality among all age groups.

2.9.3.2 Water washed diseases

Water washed diseases arise from lack of adequate water for personal hygiene. Examples are skin diseases particularly scabies and trachoma. In many rural areas women and children have to walk long distances in search of water. In this situation there is usually never enough water for personal hygiene. In urban areas, water charges are very high as there is a shortage of running water. As a result, low income earners lack adequate water supplies. Skin diseases were among the top ten diagnosed causes of morbidity in 1990 affecting equally all age groups. Out of a total of 6,925,681 new cases who attended outpatient clinics in 1990, 17,187 (0.2%) were trachoma cases equally distributed among age groups. This trend is expected to continue at least in the short term.

Improvement of living standards and mass treatment campaigns are very effective methods of preventing trachoma. For scabies, a high standard of personal hygiene must be maintained and this can only be achieved if there is sufficient clean safe water for individual use.

2.9.3.3 Water-based diseases

Water-based diseases are those where the intermediate host lives in infected waters. Examples are schistosomiasis (Bilharziasis) and Guinea worm (Dracunculosis). The intermediate hosts (vectors) of schistosomiasis are aquatic snails belonging to the Gastropods class which breed in ponds, lakes, streams, marshes, swamps, drains, dams and irrigation canals.

Schistosomiasis is a countrywide problem due to various intermediate host snails involved in transmission patterns, and the wide range of man water contact activities. Cases of the disease have been identified in most districts including Nebbi, Arua, Moyo, Gulu, Kitgum, Apac, Lira, Kumi, Moroto, Kotido, Pallisa, Iganga, Luwero, Mpigi, Mukono, Rakai, Mubende, Bundibugyo, Kabale, Bushenyi, Kabarole, Hoima, Masindi, Kasese and Ssese Islands. Both types of schistosomiasis, urinary and intestinal, are very debilitating and very expensive to treat.

Improved sanitation - especially provision of facilities for disposal of excreta - is critical in preventing these diseases

2.9.3.4 Water-arthropod diseases

Water-arthropod diseases are those diseases in which the vectors responsible for the disease breed in water. Examples are malaria and onchocerciasis (river blindness).

Malaria has had far reaching consequences. It is the leading cause of mortality of persons up to the age of 15. From the 17 districts reporting in 1990, 6,953,681 new cases were seen in outpatient clinics and 1,570,260 (22.0%) of these were malaria cases. Resistant strains of Plasmodium have evolved so that the standard anti-malarial treatment with chloroquine is no longer effective. More expensive drugs are now required for treatment and malaria is still the main killing disease.

To prevent these diseases the vector habitat needs to be removed. At present, municipal and urban authorities no longer conduct anti-mosquito campaigns. Allowing grass to grow right into the doorway - and failing to eliminate other breeding places like stagnant water in broken pots, tins, seasonal pools, still wells, tanks and other water containers - contributes significantly to increases in malaria.

Onchocerciasis (river blindness) is widely spread in the country especially where there are fast running rivers suck as Kamuli, Iganga, Jinja, and Kabarole districts. The intermediate host (the black fly) breeds in fast-running well oxygenated streams. The elimination of the black fly is the only preventive measure and additional vector control programmes are required.

2.10 Environmental management issues

Good environmental management - including appropriate institutions, policy, legislation and technology - is a fundamental prerequisite for sustained development. However, these critical prerequisites are currently either weak or outdated.

2.10.1 Environmental legislation and policies

The existing environmental and natural resource policies and laws present a number of problems as described below.

- **Limitations of existing laws**. Most of the existing laws on environment and natural resources are too narrow in scope and content and do not address the many cross-sectoral issues and problems.

- **Lack of involvement of local people.** There is generally a lack of involvement of local people in policy formulation and yet these same people are expected to benefit from such policies. This has not been conducive to grass-roots participation and has led to poor implementation of policies, poor enforcement of legislation and less than majority local participation in the many environment and natural resource programmes and projects. Contributing factors to this situation include: inadequately trained personnel; inadequate logistical support and financial resources; administrative and organizational inadequacies; and lack of comprehensive and well- articulated education and public awareness programmes on environmental laws and policies.

- **Absence of policies and laws** on certain aspects of environment and natural resources such as on wetlands.

- **Lack of co-ordination**: Apart from the forestry and fisheries sectors, management of other natural resources has evolved along sectoral lines. Consequently, policies and laws have been compartmentalized thus making their coordination all the more difficult.

2.10.2 Environmental education and public awareness

There is a general lack of understanding of the place and role of the population in the environment in general and environmental management in

particular. The overall social, economic and cultural attitudes tend to contribute to the formation of negative views about the environment.

While the concept of environmental education and public awareness is relatively new in the country, some environmental education and public awareness activities are now taking place. Problems facing environmental education and public awareness include the following:

2.10.2.1 Formal education

Prior to the current Government White Paper on Education (1992), there was no public policy to guide or facilitate environmental education at any level. However, the new policy provides for the integration of environmental education in the existing syllabi for all levels of formal education. In spite of this policy, several key problems remain including inadequate teaching materials and resources as well as a lack of trained human resources to implement formal environmental education programmes.

2.10.2.2 Informal education

The instability that characterized the last two decades in Uganda rendered the social, political and economic environment unconducive for informal learning. Cultural values were ignored and institutions such as community centres and rural training centres which were established in the sixties to foster informal learning remained unutilized. As a result, the general public today is not well informed and sensitized about environmental matters which affect their lives. Informal means of delivering messages about the environment are making some significant effort through songs, drama, interviews, documentaries and discussions. However, in offering these programmes, many constraints still exist. These include: inadequate logistical support to facilitate large-scale research and comprehensive programme design; and the concentration of media facilities - especially television - in only a few urban areas.

In the non formal education: Apart from the extension staff of line ministries, non-formal environmental education and public awareness is the pre-occupation of non-governmental organizations e.g. Wildlife Clubs of Uganda.

2.10.2.3 Indigenous knowledge

From the time of colonization, a full array of policies began to make their mark on traditional natural resource management systems and has led to the gradual loss of much indigenous knowledge. This is especially so in the

fields of agriculture, forestry, and wildlife. Urbanization, industrialization, education and the use of manufactured goods have drawn people away from traditional systems and only a few persons in the villages still possess indigenous knowledge and practices which might be of valuable use today.

2.10.3 Environmental information

Currently, environmental information systems are experiencing the following problems:

- Inadequate institutional mechanisms for the dissemination of information between the data source and potential users. The current arrangement for the dissemination of environmental information is at best ad hoc.

- Environmental information in Uganda has limitations with regard to availability, quality, coherence, standardization and accessibility which in turn impairs the country's ability to make informed decisions concerning its environment and development.

- At the moment there is no coordinated national environmental information system to monitor the quantity and quality of environmental resources.

- Existing laws on information are not clear in that they do not spell out what information is accessible to users and what is considered confidential or proprietary.

2.10.4 Research in the field of the environment

From the colonial days right into independence and up to the early 1970s, Uganda's research capability was well known and internationally recognized. Also, up to the time of the breakup of the East African Community in 1977, Uganda shared many research facilities and co-ordinated research programmes and priorities with Kenya and Tanzania. However, during the period of turmoil, the country's environment/natural resource research capacity became substantially weak. Although there is now a relatively improved enabling environment for research in general, environmental research still faces some problems. These include:

- **Lack of skilled and competent personnel:** The country has experienced a massive brain drain over the years because of political and economic reasons.

- **Lack of research facilities:** Because of the state of the economy, Government is not able to provide adequate and consistent financial support for the predominantly public sector research institutions. Part of this problem is being alleviated somewhat through the provision of research facilities by donors.

2.10.5 NGO's in the field of environment

There are many NGOs working in the field of environment/natural resources. While NGOs can be instrumental in reaching the grassroots, they are also faced with many problems including lack of capacity, inadequate coordination and occasionally lack seriousness or professionalism in their activities

2.10.6 Environmental impact assessment (EIA)

The EIA process currently only exists on an informal basis. Legally binding provisions for EIA enforcement and the capacity for enforcement and adherence have been absent.

2.10.7 Environmental standards

Uganda has not developed national environmental standards in many areas of concern. Only the water development and occupational health sectors have some relevant standards. Yet standards play a crucial role in environmental management and should be present in every relevant sector.

2.10.8 Disaster preparedness

A number of disasters have been experienced in the country. Of the natural disaster the following are of note: floods, drought, earthquakes. Of the man-made ones the following are common: displacement as a result of civil strife, epidemics of diseases such as cholera, meningitis and HIV/AIDS and technological and chemical accidents. These have made a profound effect on the population and the environment. Uganda continues to be vulnerable to these disasters.

Despite repeated occurrences the country's has no comprehensive disaster management plan and each time disasters occur the country is unprepared.

CHAPTER THREE

THE WAY FORWARD: STRATEGIES FOR THE MANAGEMENT OF NATURAL RESOURCES AND THE ENVIRONMENT

3.0 Introduction

As noted in Chapter 2, despite the country's high natural resource potential, factors such as population growth, economic reforms, the desire for a steady increase in per capita income, and other pressures of the development process are putting severe strain on natural resources and consequently the environment. This strain is characterized by, inter alia, increased soil degradation, deforestation, loss of biodiversity, reduced rangeland carrying capacity, fuelwood shortages, increasing pollution, and increased incidence of environmentally-related diseases.

The inadequacy of existing policies and legislation combined with a lack of inter-sectoral coordination and cooperation have also contributed to the degradation of the environment and depletion of the country's natural resources. Poverty, low levels of environmental awareness, inadequate information, low levels of technology and a lack of managerial and technical expertise in resource management exacerbates the problems.

This complexity of environmental problems requires a comprehensive and coordinated environmental management policy and legislation. Thus, there is a clear need to re-orient national and local efforts to address environmental problems in a more comprehensive and integrated manner. This strategy will constitute the fundamental basis for achieving overall policy goal of sustainable socio-economic development which maintains and enhances environmental quality and resource productivity to meet the needs of present and future generations.

To achieve this re-orientation, three key initial strategies are required. These include: (i) the revision and modernization of sectoral policies, legislation and regulations; (ii) the creation and establishment of an appropriate institutional and legal framework; and (iii) the establishment of an effective monitoring and evaluation system to assess the impact of policies and actions on the environment, the population and the economy. Actions (i) and (ii) are discussed below, while the monitoring and evaluation system is discussed in the context of the Action Plan presented in Chapter IV.

3.1 The National environmental management policy

The National Environmental Management Policy provides the framework to guide environment and natural resource management and is the

cornerstone of the country's commitment to social and economic development that is environmentally sustainable and which will bring the benefits of a better life to all Ugandans.

3.1.1 The overall policy goal

The overall policy goal is sustainable social, and economic development which maintains or enhances environmental quality and resource productivity on a long-term basis that meets the needs of the present generations without compromising the ability of future generations to meet their own needs.

3.1.2 Specific policy objectives

Specifically, the policy seeks to meet the following objectives:

- Enhance health and quality of life of all Ugandans and promote long-term, sustainable economic development through sound environmental and natural resource management and use;
- Integrate environmental concerns in all development oriented policies, planning and activities at national, district and local levels, with participation of the people;
- Conserve, preserve and restore ecosystems and maintain ecological processes and life support systems, including conservation of national biological diversity;
- Optimise resource use and achieve a sustainable level of resource consumption;
- Raise public awareness to understand and appreciate linkages between environment and development; and
- Ensure individual and community participation in environmental improvement activities.

3.1.3 Key environmental principles

Underlying these broad policy objectives are certain key principles which will guide current and future policy development and implementation strategies:

(i) Every person should have a constitutional right to live in a healthy environment and the obligation to keep the environment clean;

(ii) The development of Uganda's economy should be based on sustainable natural resources use and sound management;

(iii) Security of land and resource tenure is a fundamental requirement of sustainable natural resource management;

(iv) Long-term food security depends on sustainable natural resource and environmental management;

(v) The utilisation of non-renewable resources should be optimized and where possible their life extended by recycling;

(vi) Environmentally friendly, socially acceptable and affordable technologies should be developed and disseminated for efficient use of natural resources;

(vii) Full environmental and social costs or benefits foregone as a result of environmental damage or degradation should be incorporated in public and private sector planning and minimised where possible;

(viii) Social and economic incentives and disincentives should complement regulatory measures to influence people's willingness to invest in sustainable environmental management;

(ix) Priority should be given to establishing a social and economic environment which provides appropriate incentives for sustainable natural resource use and environmental management;

(x) An integrated and multi-sectoral systems approach to resource planning and environmental management should be put in place;

(xi) Regular monitoring and accurate assessment of the environment should be carried out and the information widely publicised;

(xii) Conditions and opportunities for communities and individual resource managers to sustainably manage their own natural resources and the environment should be created and facilitated;

(xiii) Effective involvement of women and youth in natural resource policy formulation, planning, decision making, management and programme implementation management is essential and should be encouraged;

(xiv) Increased awareness and understanding of environmental and natural resource issues by Government and the public should be promoted;

(xv) Social equity, particularly when allocating or alienating resource use and property rights, should be promoted; and

(xvi) Sub-regional, regional and global environmental interdependence should be recognized.

3.1.4 Cross-sectoral environmental management strategies

Many environmental issues and problems in the country are cross-sectoral in nature. For example issues concerned with the land tenure, land use and planning, biodiversity and wetlands often cut across many sectors. Consequently, creating an integrated, holistic and multi-sectoral systems approach to planning and management of resources and the environment is fundamental to sustainable socio-economic development. To accomplish this, policies are required which address broad environmental issues and establish priorities and linkages to solutions. The following below are the cross-sectoral environmental strategies which will be put in place.

3.1.4.1 Land and resource tenure

The land tenure system prevailing involves a mixture of customary tenure, private (mailo) lands , freehold and leasehold. It is complicated and fails to provide the full security of tenure of both the land and the resources on the land. In turn, this discourages improved land stewardship and sustainable utiiisation of natural resources.

Objective:

To promote improved land stewardship by rural and urban land users by better defining and strengthening land and resource tenure rights.

Strategies are to:

(i) Support recommendations of the Technical Committee on Land Tenure Reform of the Agriculture Policy Committee which relate to sustainable land use practices;

(ii) Provide mechanisms for improved and sustainable management of common property resources;

(iii) Require new leases of public lands to carry conditions which prohibit environmentally unacceptable land-use practices; and

(iv) Subject public land leases to the environmental impact assessment process.

3.1.4.2 Land use planning

Given the high rate of population growth which is exerting increasing pressure on land, rational land use planning is essential for sustainable socio-economic development. At present, there is no comprehensive national land use policy and in its absence, inappropriate land use activities have led to serious environmental degradation.

Objectives:

To provide a coordinated, national approach to sustainable land use and planning; and

To prepare national and local land-use plans to help guide land-use decisions in an environmentally sound, economically sustainable and socially acceptable way.

Strategies are to :

(i) Review the existing legislation as part of the planning process;

(ii) Develop a comprehensive national land use policy, and an enhanced land-use planning system based on appropriate technical systems, such as Geographic Information Systems (GIS);

(iii) Develop technically appropriate, socially acceptable and environmentally sound rural and urban land use plans, capability classification and guidelines for sustainable resource use;

(iv) Utilise the land use plans and the national land policy and legislation to enable the districts to develop district-level land use guidelines and bye laws; employ a combination of enforcement and incentive measures to facilitate/ensure compliance at all levels; and

(v) Provide for continuous monitoring of land use at national and district levels.

3.1.4.3 Environmental information management

In order for the environment to be managed sustainably, and to continuously anticipate new and emerging environmental changes and challenges, it is imperative that timely, up-to-date and accurate environmental information be made available. Such information is currently inadequate in the country. Moreover, there is little coordination in the collection and use of information that is available.

Objective:

To collect, analyze, store, and disseminate on a continuous basis, reliable information relating to environmental management issues including biodiversity, soil conservation, fuelwood supply and demand and pollution control.

Strategies are to:

(i) Provide clear legislation and guidelines on environmental information specifying what environmental information is freely available to users and what may be regarded as classified or proprietary;

(ii) Create a centre for information on the environment in National Environment Management Agency (NEMA) and give it the mandate and means necessary to coordinate, standardize environmental information and to act as the central depository for environmental information;

(iii) Strengthen specialized information units within sectoral institutions through training and logistical support, and formally link them to the national environmental information network to be operated by the information centre; and

(iv) Document, evaluate, store, disseminate and utilize existing indigenous knowledge and practices with regard to environment and natural resource management.

3.1.4.4 Conservation of biological diversity

The conservation of biodiversity both inside and outside the protected area system is a critical environmental issue.

Some animals such as the white rhino are now extinct and others and their habitats are severely threatened as a result of man's activity.

Objective:

To conserve and manage sustainably the country's terrestrial and aquatic biological diversity in support of national socio-economic development.

Strategies are to:

(i) Develop comprehensive and coordinated policies, strategies and actions for biodiversity conservation;

(ii) Enact and/or reactivate legislation on the management of natural resources to provide for conservation of biodiversity in its widest sense, including areas outside the PA system;

(iii) Develop a policy framework and guidelines for the identification and management of buffer zones and buffer areas in and around PAs to help reduce conflicts between multiple uses and users (e.g., livestock and wildlife);

(iv) Establish a mechanism for collaboration between Protected Area management and the neighbouring communities in order to resolve potential conflicts through the involvement of local people in the planning, management and decision making process, and ensure that a portion of benefits from the Protected Area system is offered to the local communities;

(v) Bring sectoral institutions concerned with biodiversity conservation - particularly Forestry, Game, National Parks and Fisheries - together under a common management authority to enhance coordination and eliminate duplication and conflict; incorporate all three levels of biodiversity conservation into this institution's policies and programmes;

(vi) Re-assess priorities in Protected Area management and rationalize the Protected Area system to maximize its cost effectiveness in the conservation of biological diversity;

(vii) Identify valuable areas of terrestrial biodiversity outside of protected areas, and in consultation with local communities and land owners, explore means of protecting such areas, including gazetting as protected areas, purchase of land-use rights or conservation easements;

(viii) Identify and map valuable areas and sensitive habitats of aquatic biodiversity, particularly breeding, nesting and feeding areas, and in consultation with traditional and commercial fisheries, explore means of protecting such areas, including gazetting, the purchase of fisheries use rights, or conservation easements;

(ix) Foster public support for intended biodiversity actions and encourage private investment in tree planting and wildlife conservation by placing greater emphasis on increasing public awareness on biodiversity values;

(x) Re-institute methods of adoptive management and continue the process of sustainable resource management techniques, based on research results and monitoring programmes;

(xi) Strengthen links to international biodiversity conventions, e.g., CITES, Ramsar, World Heritage Sites, etc.;

(xii) Cooperate in the conservation of shared biological resources with other countries; and

(xiii) Integrate and coordinate **in situ** and **ex situ** methods of genetic and species conservation, e.g., seed and sperm banks, botanical gardens, orphanages and captive breeding sites.

(xiv) encourage community participation in natural resource management programmes especially for those people living on land adjacent to protected areas.

3.1.4.5 Water resources

Water is a major factor in the socio-economic development of Uganda. The rapid growth in population and increased agricultural and industrial production require adequate and safe water supplies. However, the development of adequate domestic and industrial water supplies is hampered by inadequate resources, accessibility to safe water points, scattered settlements and inadequate education and awareness on hygiene.

Objective:

To sustainably manage and develop the water resources in a coordinated and integrated manner so as to provide water of acceptable quality for all social and economic needs.

Strategies are to:

(i) Expedite and finalize a national water resources policy;

(ii) Develop a National Water Action Plan and enact proper up-to-date water sector legislation which will establish an appropriate institutional and legal framework, water quality and standards and management guidelines for different users based on ecosystem structures and functions;

(iii) Develop local capacity for community management and maintenance of water resources (with particular attention to the role of women) and institute measures to prevent environment degradation around water points;

(iv) Increase the level of community awareness on the importance of water particularly with regard to hygiene;

(v) Promote an integrated approach by concerned government agencies and Non-governmental Organizations (NGO) in the implementation of water conservation and protection measures in catchment areas to control soil erosion, siltation and maintain productive soil and water environments;

(vi) Strengthen the capacity to measure and to continuously assess and monitor the quality and quantity of water resources;

(vii) Promote regional cooperation in the development, management and equitable utilization of shared water resources; and

(viii) Subject major water conservation and management projects to the Environmental Impact Assessment (EIA) process and include the costs and benefits of protecting watershed forests, wetlands and other key ecosystems in the economic analysis of such water projects;

3.1.4.6 Wetlands conservation and management

Wetlands provide special habitats for flora and fauna and have considerable socio-economic and ecological values and functions. In spite of their importance, wetlands resources are currently threatened with degradation as a result of drainage for agricultural production, brick-making and industrial expansion.

Objective:

To promote the conservation of wetlands to sustain their ecological and socio-economic functions for the present and future well-being of the people.

Strategies are to:

(i) Expedite and finalize the wetlands policy;

(ii) Carry out a full inventory of major wetlands to determine their location, status, ecological and socio-economic values, as well as their capacity to perform their various functions on a sustainable basis;

(iii) Develop wetlands management guidelines and management plans in consultation with wetlands users, and enact appropriate national legislation;

(iv) Enable districts to pass appropriate bye lays which incorporate both socio-economic and environmental concerns;

(v) Require preparation of an EIA before major alteration of wetlands are permitted; and

(vi) Establish full protection status for wetlands of significant biological diversity.

3.1.4.7 Environmental economics and macro-economic policy

Government has two kinds of macro-economic interventions to affect environmental use - targeted economic instruments and indirect economic measures. Indirect economic policy measures include monetary and fiscal policy, the exchange rate, attitude to foreign investment, regulation of the capital and labour markets, industrial strategy, trade policy, foreign debt servicing and energy pricing. All these can have both planned and unplanned effects on environmental and natural resource use.

The knowledge of these indirect macro-economic policies helps to give a broader framework within which the targeted economic instruments have to be administered. The targeted instruments are designed to use market incentives to achieve specific environmental aims or objectives. However, macro-economic policies have their own limitations in contributing to sustainable resource use. Problems associated with population pressures, unequal distribution of assets and income and poverty seriously limit the scope for economic policy interventions. They must therefore supplement or be

supplemented by other interventions of regulation or command, persuasion, creating or altering property rights and institutional reforms.

Thus, the following sections on macro-economic policy are closely interrelated. In particular, pricing policy and incentives are like different sides of the same coin. The price of a resource strongly influences the incentive to use it wisely in processing and consumption activities. The price also determines if there is an incentive for the private sector to produce and maintain the resource, or to use alternative resources.

Environmental Accounting

Environmental accounting is a tool of environmental management which makes it possible to quantify environmental costs and benefits as components of development planning. Neglecting to include these "hidden" costs of environmental degradation in development accounting will cause an understatement of true project cost, thereby imposing additional burdens on society and the economy.

Objective:

To integrate environmental costs and benefits into economic planning and development at all levels of government in order to reflect the true costs and benefits of development.

Strategies are to:

(i) Develop capacity in environmental economics in the Ministry of Finance and Economic Planning, other line ministries and institutions of higher learning, to review project proposals and resource allocation;

(ii) Incorporate the EIA process into the Ministry of Finance and Economic Planning and other government agencies as an additional criteria for reviewing and approving investment programmes;

(iii) Develop a capacity in the Ministry of Finance and Economic Planning to prepare satellite environmental accounts as part of national accounting procedures;

(iv) Initiate a pilot project on the development of national indicators and the application of environmental accounting in Uganda, within the framework of the new United Nations (or other) guidelines on national environmental accounting;

(v) Integrate environmental economics and accounting into the national development planning process; and

(vi) Structure accounting and financial management systems to facilitate analyses of benefits/achievements and costs.

Incentives in natural resource management

Economic incentives and disincentives can induce changes in behaviour of people and other economic entities more effectively than regulation. If a resource can be appropriated at little or no cost, there is no economic incentive for producers to use the resource efficiently or carefully. If the product prices are relatively low, there is little economic incentive for consumers to use the product(s) judiciously. If a natural resource can be appropriated at little cost, there is no incentive to invest in the production of that resource, e.g., trees, fish or wildlife. Or if soil and water conservation and other good husbandry practices are too costly, there is no incentive to invest in such activities.

Objective:

To ensure that individuals, groups, businesses and other economic entities have appropriate incentives and disincentives with regard to sustainable resource use and environmental protection.

Strategies are to:

(i) Develop the capacity to analyze the impact of user fees, incentives and disincentives in government agencies responsible for natural resource management, policy formulation and regulation;

(ii) Improve the capacity of the tax administration at national and local levels to effectively collect land and/or property taxes and to handle the proposed tax deductions; and

(iii) Where appropriate and feasible, offer land users a reduction on their land or property taxes for: soil and water conservation methods, agroforestry techniques, good husbandry practices, development and maintenance of tree plantations or woodlots, or use of appropriate livestock stocking rates.

Pricing policy strategies

While various causes have contributed to continued environmental degradation and loss of valuable natural resources, the failure to assess the cost of resources to reflect its real value has in a way contributed to this degradation. Many of the resources are undervalued which has led to inefficient use of such resources.

Objective:

To incorporate the cost of producing or maintaining natural resources into the costs incurred by (and benefits derived from) resource users through use of appropriate management mechanisms such as leases, management contracts, users fees, concession agreements, and similar pricing mechanisms.

Strategies are to:

(i) Build the capacity of government agencies to establish the social values of the resources for which they are responsible;

(ii) Develop policies and procedures to assess appropriate user fees or rights of access in the areas of land use, water use, sewerage use, pollution, fishing and forestry, and/or to incorporate the costs of producing and maintaining a resource into the costs and benefits of the resource users; and

(iii) Explore the possibility of using concessions or other mechanisms to grant exclusive rights to use a specific delimited natural resource as a mechanism to both assess user fees and to incorporate the costs of resource management into the costs of the user.

Financial and Economic Sustainability

The country's investment needs - especially in the area of environment - have not usually been prioritised. This has often led to investments in less urgent or even inappropriate programmes and projects. The lack of prioritisation of investment programmes in the area of the environment stems from the fact that there has been no enabling environmental policy, lack of awareness among Government planners combined a weak monitoring and evaluation system for existing investments.

Objective:

To mobilize increased private sector resources to achieve environmental conservation and management objectives.

Strategies are to:

(i) Develop a mechanism to reduce the implementation responsibilities and financial requirements of government agencies by involving local communities, NGOs and the private sector in natural resource management;

(ii) Develop criteria for prioritising requests for government funding in the area of natural resource management and environmental protection; and

(iii) Mobilize private sector resources to achieve environmental conservation and management objectives, through the use of incentives, management contracts, leases, concessions, joint-ventures, and production sharing agreements.

3.1.4.8 Environmental impact assessment (EIA)

Development activities and land use changes can have significant impacts on the environment. The purpose of environmental impact assessment is to assess the potential of a planned action to adversely affect the environment, and if such potential is found to exist, to identify alternatives that will eliminate or minimize these adverse impacts. The low cost of preventing environmental damage as opposed to the high cost of repairing such damage provides a sound economic foundation for such assessments. Although the EIA process is not an entirely new concept in Uganda, it has not been applied by the managers and users of resources.

Objective:

To provide a system of Environmental Impact Assessment (EIA) and environmental monitoring so that adverse environmental impacts can be foreseen, eliminated or mitigated.

Strategies are to:

(i) Create by law an EIA process which requires, as appropriate, environmental impact assessments, environmental impact statements and environmental audits for all private and public development projects;

(ii) Lodge the EIA oversight function in the National Environmental Management Authority but leave

implementation to the relevant line ministries and departments; and

(iii) Develop EIA capacity in sectoral ministries and departments.

3.1.4.9 Environmental standards

The laws in the country have no references to standards and yet standards are the formal means of interpreting policy principles given in legislation. Standards are not only a source of institutional authority but also a residual source of power and a technical means for practical implementation of the law.

Objective:

To develop standards and references in all the key aspects of environment and develop corresponding technical capacity for monitoring and surveillance compliance.

Strategies are to:

(i) Establish committees to develop standards in consultation with the lead agencies in every aspect of environmental management and train and equip corresponding monitoring units in the line agencies;

(ii) Review legislation to establish standards where they are missing;

(iii) Develop capacity and a coordinated mechanism for the establishment, and enforcement of environmental standards; and

(iv) Prepare and adopt, in consultation with lead agencies, criteria and procedures for the measurement of standards.

3.1.4.10 Control of pollution and management of domestic and industrial waste and hazardous materials

Economic activities - particularly industrial production, mining, agriculture, health, and transport - are all major sources of pollution. Environmental standards and laws on pollution management are still inadequate and non-existent in many areas. In addition, waste disposal facilities are inadequate throughout the country.

Objective:

To control the pollution of water, land and air from domestic, industrial and other emissions and discharges, and promote environmentally sound management of wastes and hazardous materials.

Strategies are to:

(i) Establish environmental standards for permissable levels of pollution;

(ii) Strengthen institutional and technical capacities for waste management and enhance institutional coordination;

(iii) Develop and institute specific safety and health codes of practice and guidelines based on the hazard levels of various industry types;

(iv) Encourage better understanding of the effects of hazardous materials through provision of information in a form understandable to users; provide information on the appropriate methods and technologies for the treatment and disposal of wastes;

(v) Formulate a national strategy on medical waste management and disposal and in particular carry out urgent rehabilitation of medical waste incinerators;

(vi) Establish a system for monitoring compliance with water, land and air pollution control standards and regulation;

(vii) Develop and strengthen technical capability for the monitoring and control of hazardous materials;

(viii) Develop a national emergency/disaster preparedness plan and programmes;

(ix) Promote efficient waste minimisation including the efficient recycling of wastes;

(x) Train and encourage farmers and extension workers in the safe use of agro-chemicals;

(xi) Prepare environmental guidelines/legislation for the management of hazardous installations;

(xii) Require waste generators to pretreat their effluent according to established standards before discharge;

(xiii) Establish safe limits for the location of water wells, boreholes and dams in the vicinity of major sanitary landfill sites;

(xiv) Maintain an up-to-date register of toxic, hazardous and radioactive substances;

(xv) Prescribe minimum standards of environmental safety of mining operations, including the development of mine contingency plans;

(xvi) Stipulate procedures for the reclamation and restoration of land, top soil and vegetation of mined out areas and monitor the recovery of such areas;

(xvii) Prescribe regulations for the disposal of mine tailings and dumps in approved sites; and

(xviii) Maintain regular environmental audits to ensure the adoption of environmentally sound practices.

3.1.4.11 Climate

Climate and climatic variability have a direct impact on socio-economic activities. Disastrous effects of droughts, floods and local changes in climate are continually being felt in many parts of the country. Yet there is no comprehensive mechanism or strategy to contain or mitigate the effects of climate.

Objective:

To monitor the climate and atmosphere of the country in order to better guide land-use and economic development decisions, and better manage air pollution and greenhouse gas emissions.

Strategies are to:

(i) Improve coordination and exchange of meteorological information among producers, managers and users;

(ii) Decentralize the monitoring and dissemination functions of the Department of Meteorology through the creation of regional or district meteorological communication networks, and involve resource users in the collection of climatic data;

(iii) Strengthen the existing national meteorological monitoring networks and data processing capabilities;

(iv) Where feasible, improve the flow of climatic information to the users by involving extension workers, local official communication channels, as well as traditional methods of communication;

(v) Improve awareness among potential users and decision makers of climatic and atmospheric information including establishing demonstration projects in selected areas;

(vi) Enact appropriate legislation for the management of the country's atmospheric environment, particularly with respect to climate and air pollution monitoring;

(vii) Strengthen the manpower development programme through increased training of personnel; strengthen the National Meteorological Training Centre in the short term, and in the medium to long-term, introduce climate and meteorological studies at institutions of higher learning;

(viii) Strengthen the Early Warning Information System for food security and put in place disaster preparedness response measures to extreme climatic events or accidental hazardous emissions into the atmosphere; and

(ix) Strengthen international cooperation so as to take full advantage of the global and regional climate and weather management facilities; strengthen the cooperation of the Nile Basin countries in management of hydrometeorlogical monitoring stations.

3.1.4.12 Population, health and human settlements

While the environment provides the resource base necessary for nurturing and sustaining the human development, man's activities and needs greatly influence the state of the environment. Continued high fertility rates and a high resource-dependant population require an efficient and sustainably managed environment. It is therefore, important to balance population growth, agricultural production and environmental quality.

Objective:

To manage population growth, settlements, distribution and health in such a way as to match people and resources in an economically productive, socially acceptable and environmentally sound manner.

Strategies are to:

(i) Increase access to family planning and maternal and child health care programmes, targeting both men and women, in order to balance the population growth rate with available resources and social services;

(ii) Improve access to health facilities;

(iii) Develop and promote the wider application of appropriate technologies for infrastructural development such as for building materials, energy production and use, and water supply and sanitation/hygiene facilities (e.g., prefabricated materials, recycling of solid waste, improved cook stoves, and recycling of waste waters for agricultural and industrial use);

(iv) Undertake rural and urban land use planning/urban renewal for integrated and sustainable rural and urban development and improved environmental quality;

(v) Promote income generating programmes which aim at the alleviation of poverty especially among women and lower income groups; and

(vi) Facilitate women's participation in population and environment decision making, resource ownership and management, as well as improve their access to inputs including better access to credit.

3.1.4.13 Gender integration

In general, attitudes and assumptions within the household and society are often faulty and tend to ignore the different roles and responsibilities of women and men. For example, not all households headed by a male are better managed than those headed by a female and both can have just as much impact (either positive or negative) on the environment. The exclusion of women from natural resource management activities (including training and extension) has partially contributed to the lack of behavioral change with regard to environmental degradation.

Objective:

To integrate gender concerns in environmental policy planning, decisions making and implementation at all levels to ensure sustainable social and economic development.

Strategies are to:

(i) Integrate gender concerns in existing and proposed policies and programmes;

(ii) Collect gender desegregated information related to the environment including the human factors;

(iii) Include gender roles and analysis in environmental management training programmes at all levels;

(iv) Facilitate participation of both men and women in formal and informal education, training, public awareness campaigns and decision making in environmental and natural resource management;

(v) Establish an institutional mechanism to review existing and proposed programmes to integrate gender issues; and

(vi) Carry out research on the local knowledge and use of natural resources.

3.1.4.14 Environmental education and human resource development

Proper management of the environment and its resources depends in great part on the establishment of a solid foundation in environmental awareness, research and human resource availability. However, there is no clear mechanism to coordinate issues and activities pertaining to environmental education/public awareness, research and human resource development. This has led to low levels of environmental education and public awareness, dissemination and training.

Most research in Uganda is conducted at government research stations, as academic development initiatives by existing universities, or by foreign researchers. However, Uganda has not yet worked out a definite and comprehensive national research and development policy. Policies of existing research institutions are therefore aligned to the sectoral policies of the various ministries and organizations to which they belong.

Objectives:

To increase awareness and understanding among the politicians and the public of the need for sustainable environmental management;

To develop skills needed to implement national programmes of environmental management; and

To carry out local demand-driven research needed for proper management of the nation's environmental resources.

Strategies are to:

(i) Develop a national strategy for carrying out public awareness through non-formal and informal environmental education programmes for the public and private sector, especially policy makers, politicians, administrators, bankers, industrialists, transporters, farmers and all other natural resource users;

(ii) Develop environmental teaching materials initially for primary schools and eventually for all training institutions;

(iii) Train trainers in the use of environmental educational materials for example teacher trainers;

(iv) Make environmental education mandatory in all formal education institutions;

(v) Strengthen existing higher level institutions to offer more programmes tailored to produce environmental economists, planners, trainers, lecturers, lawyers and enforcement officers;

(vi) Provide in-service training in specialized areas such as environmental planning, economics, law, information systems, impact assessment, pollution control and waste management;

(vii) Establish an environmental research fund to support research programmes in environmental management; and

(viii) Facilitate better understanding of factors affecting resource use by promoting and supporting research programmes on environmental concerns and develop appropriate technologies for sound environmental management and resource use.

3.1.4.15 Public participation

Currently, local communities do not participate in the decision making process with regard to resource use and management. They are, however,

expected to participate in the protection of these same resources often without being able to realize any benefits from them. Active participation of the people in resource management is intended not only to enlist the support of the people but also to influence changes in behaviour and attitudes and act as an incentive to sustainable use of natural resources. User-based natural resource management is the most effective means to assure long-term, sustainable use of natural resources.

Objectives:

To involve land and resource users in environmental planning, implementation, monitoring and evaluation at all levels and empower them to manage their natural resources;

To bring resource management decisions and accountability closer to the land and the land and resource users; and

To vest resource ownership rights in resource stakeholders (e.g., individuals and communities).

Strategies are to :

(i) Develop guidelines on public participation in environment/natural resource management to be applied by resource managers in their development programmes and projects;

(ii) Strengthen extension programmes in natural resource management enlisting the assistance of local NGOs wherever possible;

(iii) Design programmes that involve and benefit the most disadvantaged groups, particularly women, children and disabled;

(iv) Widen experience and opportunities for public participation in natural resource management, including co-management and benefit sharing in protected areas management;

(v) Decentralize environment management to enhance public participation; and

(vi) Bridge the information gap between the central government and the local communities/resource users by developing a two-way mechanism for information collection and dissemination.

3.1.4.16 International cooperation

Environmental issues do not respect national, shared resources regional or any boundaries. Typical examples are climate change and pollution. Government is concerned about this and will adopt a regional and global approach in bringing these issues to proper management.

Objective

To actively participate in the development and implementation of regional and global initiatives/efforts for enhancement of conservation of environmental resources to achieve sustainable socio-economic development.

Strategies are to:

(i) Participate actively in regional and international efforts towards sound management and conservation of environmental resources especially in the areas of water quality, biodiversity conservation, control of movement of hazardous materials, climate change, etc.

(ii) Ratify appropriate and relevant regional and international conventions and protocols on environment;

(iii) Enact domestic legislation to implement the above conventions and protocols on environment;

(iv) Promote awareness about regional and global environmental issues and concerns to the policy makers and the general public.

3.1.5 Sector strategies

Day-to-day implementation of environmental management activities will, for the most part, be carried out by sectoral ministries, departments and other public and private sector institutions. Each ministry/institution will operate under sectoral policies developed within the framework of the cross-sectoral policies described above.

However, as previously stated, environment planning and management in Uganda requires an integrated and multi-sectoral approach. This approach must take into account the interrelationship between the different resources and human activities, and recognize that each system influences and is influenced by other larger and smaller systems whether ecological, economic, social, cultural or political. This approach, however, has been lacking and as a result, sectoral institutions have - to a great extent - not been effective in their operations.

In this regard, Government will strengthen environmentally-related sectoral institutions to enable them to more effectively manage their portfolios and integrate and coordinate their respective activities. The following sections describe strategies to be implemented through these active sectors.

3.1.5.1 Agricultural sector

Agriculture is the back-bone of the national economy. However, high population growth rate, poor agricultural practices and past economic and social instability have acted through agriculture to degrade the environment.

Objective:

To promote farming systems and land-use practices that conserve and enhance land productivity in an environmentally sustainable way.

Strategies are to:

(i) Enhance and strengthen the environmental concerns in the agricultural extension system, including research and training for extension workers, NGOs and land-users;

(ii) Place greater emphasis on environmentally friendly means of increasing agricultural production;

(iii) Undertake a national soils survey and mapping programme and formulate a National Soils Policy;

(iv) Where appropriate and practicable, offer land users tax incentives for soil and water conservation and good husbandry practices;

(v) Support research to develop farming systems that combine optimum production with land resources conservation and which are compatible with the socio-economic conditions of the target population; and

(vi) Review the existing byelaws and where appropriate introduce new ones and ensure their enforcement.

3.1.5.2 Forest conservation and management

In 1889 forests covered 45% of the country and included nearly 100,000 sq. km of tropical high forest. Currently, about 36,000 sq. km of tropical high forest remain. Of the remaining high forests, about 150,000 sq.

km million ha are in protected areas (Kigenyi 1990). Although precise information is lacking, deforestation (mostly on private land) is currently estimated at about 5000 sq. km annually due to clearing for agriculture, pitsawing for lumber, and fuelwood harvesting.

Objectives

To manage sustainably forest resources in Protected Areas, public and private land; and.

To promote increased forest production by the private sector and communities.

Strategies are to:

(i) Develop a coordinated Protected Area system by bringing institutions concerned with biological diversity conservation and management - in particular, Forests, Parks, Fisheries and Game - under a common agency to enhance coordination and eliminate duplication, conflict and rivalry;

(ii) Revise and strengthen the Forest Act with particular regard to gazetting and degazetting, collective responsibility in management, revenue sharing and local community participation in PA management;

(iii) Improve local capacity to manage protected and gazetted forest reserves by encouraging people's participation in forest planning and management;

(iv) Address the issue of tree-tenure outside reserves and put in place adequate mechanism to clearly specify resource rights on trees and other forest products;

(v) Review financial management systems particularly with regard to the relationship between revenue and forest management costs;

(vi) Provide economic incentives and the necessary legal framework and technology to encourage and facilitate rural communities, woodfuel using industries and institutions, and the private sector to be self-sufficient in forest product requirements;

(vii) Encourage agro-forestry practices for farm communities;

(viii) Enhance adaptive research and monitoring capacity in all areas of forest management;

(ix) Develop and disseminate scientific and technical information related to more efficient utilisation of forest resources;

(x) Explore innovative methods of collecting forest user fees, particularly through annual licensing fees on concessions; include harvest rights and the integration of forest management costs and responsibilities into such concessions;

(xi) Encourage and promote production and export of value added timber products in line with the principles of sustainable use;

(xii) Subject the introduction of exotic species to the environmental impact assessment process and develop institutional capacity to carry out this process;

(xiii) Monitor and control if necessary the spread of invasive exotic vegetation;

(xiv) Encourage non-destructive use of forests such as eco-tourism;

(xv) Revise the forestry training curriculum to enhance the environmental and socio-economic aspects of forest management;

(xvi) Provide for the total protection of identified key areas of biodiversity preservation inside PAs and disseminate information to facilitate protection of those areas; and

(xvii) Enhance local community participation in the management of PAs, where feasible, through the development of Forest Management Advisory Committees, cooperative co-management agreements, and parish and sub-county workshops, and provide more direct benefits to local communities from Protected Area activities including the return of a percentage of revenue to them.

3.1.5.3 Wildlife conservation and management

Although the country is well endowed with a variety of animal species both inside and outside the protected area system, the status of wildlife has over the years been threatened as a result of poaching, inadequate coordination among sectors and ministries with responsibilities for wildlife conservation, a lack of clearly defined wildlife conservation guidelines, and no consensus on the relationship that should exist between wildlife conservation and tourism development.

Objective

To conserve and manage sustainably wildlife resources in Protected Areas, public and private lands.

Strategies are to:

(i) Develop a coordinated Protected Area system by bringing institutions concerned with biological diversity conservation and management - in particular, Forests, Parks, Fisheries and Game - under a common agency to enhance coordination and eliminate duplication, conflict and rivalry;

(ii) Merge Uganda National Parks and the Game Department into a single parastatal organization to increase coordination and maximize cost effectiveness of wildlife resources management;

(iii) Revise and strengthen the National Parks Act and the Game Act with particular regard to gazetting and degazetting, collective responsibility in management, revenue sharing and local community participation in PA management;

(iv) In consultation with district authorities and local communities, identify additional areas which could be gazetted as wildlife protected areas to ensure adequate protection of major ecosystems and key species and habitat as part of national biodiversity conservation and planning;

(v) Enhance local community participation in the management of PAs through the development of Parks Management Advisory Committees, parish and sub-county management institutions, and provide more direct benefits to local communities from Protected Area activities including the return of a percentage of revenue to them;

(vi) Access wildlife and other resources of the wildlife protected areas to identify buffer zones and appropriate peripheral areas for multiple land use by local communities;

(vii) Develop a policy framework and guidelines for the identification and management of buffer zones and buffer areas in and around PAs to help reduce conflicts between multiple uses and users (e.g., livestock and wildlife);

(viii) Reactivate the management capabilities of institutions involved in the management of protected wildlife resources through training and logistical support;

(ix) Establish concessions, management contracts, joint ventures and production sharing agreements to develop tourism where appropriate, and charge fees commensurate with the value of the resource;

(x) Revise the wildlife training curriculum to enhance the socio-economic aspects of wildlife management;

(xi) Promote the rehabilitation and establishment of appropriate infrastructure for tourism industry while ensuring that all infrastructural development relating to Protected Area system is subjected to the environmental impact assessment process;

(xii) Conduct research on and inventories of wildlife species which are of significant ecological, economic or cultural importance; add such species to the scheduled list of protected wildlife;

(xiii) Promote the sustainable use of wildlife resources through private sector activities such as game ranching, crocodile farming, etc.;

(xiv) Maintain the ban on trade in endangered species and monitor and control trade in non-endangered wildlife and wildlife products; and

(xv) Subject the introduction of exotic wildlife species to the environmental impact assessment process.

3.1.5.4 Livestock and rangelands resources

Although the livestock sector plays an important role in the socio-economic development of the country, overgrazing, poor stocking methods, inadequate disease control and socio-cultural practices, among others, have greatly contributed to the general decline of the country's rangelands.

Objective:

To manage the nation's rangeland resources within the capacity of the land to support both livestock and wildlife.

Strategies are to:

(i) Develop a comprehensive policy on livestock and range management to include pasture, compatible crop production practices, water supply, stocking, tsetse fly, tick and disease control;

(ii) Where feasible, use tax incentive for ranchers to respect appropriate stocking rates;

(iii) Improve marketing outlets in order to control stocking rates;

(iv) Strengthen livestock extension efforts to encourage efficient management of rangeland resources by all rangeland users and managers;

(v) Address the practice of communal grazing with a view to developing a definite breeding and ranching policy which is culturally and environmentally acceptable;

(vi) Educate farmers about the value of keeping fewer but more productive animals instead of large unproductive herds;

(vii) Encourage establishment and management of buffer zones and buffer areas around protected areas to help reduce land-use conflicts between livestock and wildlife; and

(viii) Study the potential for wildlife ranching as a supplement for livestock ranching.

3.1.5.5 Fisheries and other aquatic resources

Fishing is an important economic activity for sizeable communities living around Uganda's rivers and lakes, and an essential source of protein in lakeshore communities and urban areas of the country. The aquatic ecosystem has evolved biodiversity resources with specific roles to play in promoting sustainable production of the resources. However, fisheries and aquatic resources are presently threatened by over-exploitation, introduction of exotic species, and pollution.

Objectives:

To conserve and manage sustainably fisheries and other aquatic resources for sustainable production.

Strategies are to:

(i) Compile inventories of aquatic biodiversity resources, species distribution and role in aquatic systems for all waters;

(ii) Separate the roles of enforcement and extension and involve NGOs, among others, in implementation and extension;

(iii) Update and enforce the Fish and Crocodiles Act 1964 to allow for comprehensive management of fisheries resources, including provisions for fish culture, processing and marketing;

(iv) Give local communities better control over the management of fisheries resources and strengthen local management capacity;

(v) Expedite implementation of the programme on water hyacinth control and eradication;

(vii) Increase knowledge on the role of non-fish aquatic life in aquatic ecosystem dynamics and develop safeguards to ensure their protection and sustainable use;

(vii) Contain over exploitation, the destruction of habitat and control of species introduction through strengthened research efforts and better planning and monitoring;

(viii) Identify and map critical and sensitive habitats and take appropriate steps (gazetting) to minimize damage and disturbance to breeding, nesting, aestivation and feeding areas of all aquatic species;

(ix) Put in place mechanisms, including research, planning and monitoring, to encourage the revival of endangered fish species in the waters and ensure sustainable utilization;

(x) Regulate the disposal of water and wastes from fish processing areas, plants and other industries;

(xi) Increase training opportunities, develop more appropriate curricula and develop better local capacity in the fisheries manpower sector; and

(xii) Collaborate and participate with the neighbouring countries to harmonize the management and development of shared aquatic resources.

3.1.5.6 Energy sector

Most of Uganda's energy sources are currently and will in the foreseeable future be derived from natural resources, primarily fuelwood and water. There is a clear and present danger that the country's forests and woodlands may be exploited unsustainably to the detriment of the environment. The conventional energy sector (hydropower) is currently not able to meet demand nor provide alternatives to the use of fuelwood. In part,

this is due to the years of political turmoil and economic decline which was characterised by inadequate maintenance, low investment and distorted pricing mechanisms.

Objective:

To meet the national energy needs through increased use of hydropower, improved efficiency of energy use, increased use of alternative energy sources, increased production of (plantation and on-farm) trees and promotion of exploration and production of fossil fuels.

Strategies are to:

(i) Develop a comprehensive energy policy which adequately addresses issues related to shortages and inefficient use of fuelwood;

(ii) Link energy policy more closely to forestry policy; focus extension programmes on rural tree planting and reforestation;

(iii) Acquire or develop, test and disseminate appropriate alternative energy technologies as well as increase efficiency of conversion in fuelwood utilisation (e.g., improved cook stoves, charcoal kilns, brick ovens, etc.);

(iv) Improve local capacity to manage woodlands by encouraging peoples' participation in forest planning and management;

(v) Encourage the private sector to generate and distribute hydro-electricity by removing the monopoly in generating, transmitting and distributing electricity by the Uganda Electricity Board;

(vi) When feasible, provide economic incentives for private and institutional fuelwood plantations;

(vii) Encourage environmentally sound exploration, development, production, distribution and use of traditional sources of energy by both the public and private sector;

(viii) Encourage the private sector to establish institutional energy plantations and peri-urban woodlots and where feasible provide economic incentives for private and institutional fuelwood plantations;

(ix) Encourage environmentally sound exploration, development, production, distribution and use of conventional sources of energy by both the public and private sector; and

(x) Encourage industries/institutions using furnace oil to switch to hydro energy.

(xi) In order to implement the various strategies mentioned above legislative reforms focuses at each sector of concern are required in addition to institutional and technological measures.

3.2 Sectoral legislative reforms

3.2.1 Present legal status

There are over 60 pieces of legislation governing various aspects of natural resources management and the protection of the environment emanating from either the central Government or enacted as bye-laws by various local authorities and local administrations. While this diversity and multiplicity is in itself a problem, much of the legislation is outdated or outmoded and is sectoral in nature and do not provide for inter-sectoral coordination. Other shortcomings are that the majority of laws address resource utilization and not conservation, combined with the fact that they lack effective sanctions (fines and imprisonment terms) to deter infraction.

Additionally, there are many areas which are not covered or only partially covered by the law. These include: sustainable management of wetlands resources; aquatic biodiversity other than fish and crocodiles; management of waste other than sewage; conservation of biological diversity outside protected areas; maintenance and enhancement of ambient air and water quality; management of industrial chemicals; environmental standards; procedures for assessment of impacts on the environment; management of and access to genetic resources as a natural resource (including native animal breeds, primitive crop cultivars and old land races); and the working environment outside of factories.

Currently, the country's laws are organised along sectors and resources and any reforms or changes in the law has to be modelled along those sectors. However, it is now clear that environmental concerns are closely inter-related and the current legislation does not adequately take this into account. As a result, there is a need to have a framework management law for inter-sectoral legislation, legislate for certain spheres where there is no law or the law is inadequate, and provide for environment management concepts where they are not provided for in the sectoral legislation.

3.2.2 Framework for environmental legislation

Government will enact a framework environmental management legislation whose guiding principle will be to ensure sustainable development which will use resources without depleting them for the benefit of both present and future generations.

The **objectives** of the framework legislation are twofold: to provide a planning framework, set standards and coordinate for all environmental-related issues in the country; and to strengthen sectoral laws. Sectoral laws will be enacted in consultation with lead agencies to ensure coordination and effectiveness. The framework law will be in harmony with society's need to achieve better material standards, reduce poverty and achieve sustainable development.

The environmental legislation reform will provide for:

- Enactment and implementation of laws and regulations for specific sectors regarding air quality, water quality, disposal of effluent and solid wastes and conservation and utilisation of resources;

- Creation of rights and obligations for people to live in a decent and healthy environment; any individual will have a right to bring an action to prevent and/or stop activities which are likely to significantly damage the environment or seek to redress the damage caused to the environment by dangerous action/activities;

- Requirement of EIA to be mandatory for all activities likely to have a significant effect on the environment;

- Establishment and enforcement of viable environmental standards on the maintenance of air, water, soil quality and standards for noise, smell, atmospheric pollution and natural resources;

- Establishment and enforcement of viable environmental standards for sound management of municipal and hazardous wastes, chemicals and other dangerous products;

- Discontinuance of the harm, compensation of the individuals harmed, and the restoration of the environment where damage has already occurred; and

An Environment Management Statute will be enacted to take the above into account and to establish the National Environment Management Authority

to coordinate all aspects of the environment in Uganda. The new law is intended to provide for a management mechanism for coordination, consultation and cooperation with sectoral institutions. It recognises existing competencies, capacities and provides for guidelines for the proper management of particular environmental sectors. The development, issuing and enforcement of regulations will be left to the particular sectors with the Authority overseeing implementation.

3.2.3 Enforcement of environmental legislation

Enforcement of environmental-related laws in the country has waned over the years and it is expected that the situation will not improve significantly in the near future. Thus, in addition to the traditional forms of enforcement such as fines and terms of imprisonment, Government will, where possible, introduce economic devices such as incentives and disincentives to enforce compliance. These measures will include, inter alia, taxes and charges to be levied for behaviour deleterious to the environment and tax credits and/or exemptions for good environmental behaviour. Additionally, refundable performance deposit bonds will be used - particularly in the industrial sector - to ensure good environmental behaviour.

3.2.3.1 Enforcement strategies

Legislative enforcement strategies include:

- **Strengthening the criminal law by:** increasing the terms of imprisonment and fines to ensure deterrence; introduction of pollution licences for activities which will pollute above established standards; strictly prohibit the importation of hazardous wastes into the country; and create new criminal offences;

- **Environmental restoration orders.** Where damage has occurred, Government will demand that the persons who have occasioned the damage to pay for or make up for the damage caused (e.g., reafforestation after illicit tree felling, covering up pits after sand, gravel or clay extraction, etc.); and

- **Community service orders.** As an alternative to imprisonment and fines, persons committing environmental wrongs may be required to perform duties in the community such as cleaning streets, mowing parks, etc., as a reparation to the community for the wrongs done.

In order to contain the rampant and uncontrolled use and disposal of chemicals and hazardous wastes, Government will introduce the following requirements:-

- All hazardous processes, inputs, products and by-products (including wastes) shall be classified, clearly labelled and registered;
- All processes, products, in-puts and by-products which are hazardous or have the potential to significantly affect the environment be licensed;
- Analysis of products and by-products be undertaken, and an Inspectorate - to monitor the quality of these products and by-products - be instituted;
- Operators of projects to report on their performance regularly in order to ensure compliance with established standards, guidelines and criteria.

3.2.4 Proposed reforms in the sectoral laws

Sectoral laws have been inadequately enforced for several reasons. Generally, they are either out-dated, weak in content, the public is unaware of them or are subject to corruption. These problem are exacerbated by the fact that the sectoral institutions have lacked the necessary resources to enforce them. In this context, the following sectoral laws will be revised and updated and subsidiary legislation will be enacted incorporating environmental provisions.

3.2.4.1 Land management

Land and resource tenure law in the country is not being adequately enforced because it is complicated, lacks proper security of tenure for resource users and a large part of the land does not fall under the practical operation of the law. Specifically:

- **The Public Lands Act Cap.13, 1969** provides for the control and management of all land in Uganda and vests all land in the Uganda Land Commission. The Act is currently being reviewed in the areas of land tenure reforms, environmental conservation needs and sustainable use.
- **The Land Reform Decree, No.3 1975** is also being reviewed. While the decree provides for the streamlining ownership and

management of all land in Uganda by transforming all mailo and freehold tenure into leases, it has never been effectively enforced.

In the review of the above laws, environmental concerns will be incorporated. The review will further provide for land owners to restore the damage caused to land as a result of environmentally unsound activities. For leased areas, provision will be made for the controlling authority to review tenure holdings in case of excessive land degradation.

- **The Urban Authorities Act, Cap. 27 1964** provides for planning of urban areas and spells out powers of urban authorities. The Act will be reviewed to provide for good environmental practices among town officials and residents especially for waste management and other health aspects.

- **The Town and Country Planning Act, Cap. 30 1964** provides for orderly planning of urban settlements and the country side. The law is currently being reviewed and the revision will take into account environmental concerns especially EIAs for planning of urban activities, pollution management, waste management, and environmental standards.

- **The Soil Conservation (Non-African Land) Act, Cap. 245 1964** provides for the conservation of soil on land owned by or leased to non-Africans by imposing a general duty on every non-African owner to cultivate, manage, and generally to prevent erosion of the soil. It further provides for the establishment of Conservation Orders for prevention of soil erosion. However, the law covers only non -African land owners and no one else.

  The Act will be amended to cover all land and land owners in Uganda irrespective of race or tribe. Future legislation on soil will emphasize the involvement of resource users in soil conservation, policy making and extension work in addition to compulsory environmental conservation measures. All districts will have soil conservation by-laws. Government will transform the proposed national soils policy into appropriate laws.

3.2.4.2 Flora

- **The Forests Act, Cap.246 1964** provides for the creation of Forest Reserves and their proper control, management and utilization. The Act concentrated more on exploitation and less

on conservation and sustainable use in protected areas. It does not cover forests and forest production outside the protected area system.

The Act will be reviewed to place more emphasis on conservation, reafforestation and protection of forests outside protected areas. The review will also place additional emphasis on the conservation of fauna in forest reserves. Provisions for local forest reserves and village forests will be re-activated. Establishment of woodlots will be provided for as an obligation to major woodfuel consuming institutions. Stringent guidelines for forest officers on the exercise of discretionary powers will be made. Government will update the schedule of reserved species to include more valuable and vulnerable tree species.

Conservation requirements to fauna and flora in forest reserves, gazetting and degazetting, collective responsibility in management, revenue sharing and local community involvement will be provided for.

Districts will pass bye-laws on tree planting and conservation of flora and fauna.

- **The Plant Protection Act, Cap.244 1964** provides for the prevention of introduction and spread of diseases destructive to plants and regulates the importation of plants to prevent the importation of injurious pests and diseases. The Act will be updated by introducing subsidiary legislation to include current knowledge of plant quarantine measures, other protective measures, the growing of drug-related plants in the country and exportation of genetic resources.

- **The Timber (Export) Act, Cap 247 1964** provides for the control of timber and its inspection, grading, marking and handling in transit. It also provides for restrictions on quantity or type to be exported. This Act will be coordinated (by either amalgamation or consolidation) with the Forest Act so as to comply with current forestry policy. A law which is in line with the International Tropical Timber Agreement 1984 will be developed, enacted and enforced.

- **The Prohibition of Burning of Grass Decree, No.5 of 1974** provides for the unauthorised burning of grass except in accordance with the decree. Although this law is good, it will be strengthened in as far as enforcement is concerned by making bye-laws to regulate burning with detailed provision on

methods of burning, areas, etc. The management of the act will be placed under the local authorities.

3.2.4.3 Fauna

- **The Game Preservation and (Control Act), Cap. 226 1964** provides for the protection and preservation of game and wildlife in game reserves and sanctuaries and restricts and regulates hunting. This law, together with the Uganda National Parks Act, are being reviewed and will provide for the sustainable and coordinated management of game resources.

- **The National Parks Act Cap. 227 1964** provides for the establishment of National Parks for the preservation and protection of wild animals, birds, etc. Access to these protected areas is controlled for all human activities. The Act is being reviewed together with the game preservation law above with a view to harmonisation and updating.

- **The Animal Diseases Act, Cap. 218 1964** provides for the control and prevention of the spread of animal diseases. The administration of the Act is vested in the Minister responsible for veterinary services. As with the other laws, Government will strengthen the enforcement mechanism and provide for environmentally friendly chemicals and materials for the control of diseases.

- **The Cattle Grazing Act, Cap. 223 1964** provides for the control and regulation of grazing of cattle, prevention of over-stocking and over-grazing. The Act has been hampered by lack of adequate regulations to bring it into force.

  Government will increase the enforcement of the law and all districts will pass bye-laws on cattle grazing based on local conditions.

- **The Fish and Crocodiles Act, Cap.228 1964** makes provision for the control and regulation of fishing, purchasing marketing and processing of fish and crocodiles. The Act will be amended to provide for comprehensive management of fisheries resources, processing and marketing. Regulation will also be given for disposal of water and wastes from fish processing plants. Furthermore, this Act will be brought in line with CITES and sustainable harvesting methods.

District by-laws on fisheries will be made to control fishing at the district level. Fishing rules will be updated to protect immature fish species.

The sustainable conservation of other aquatic resources will also be provided for in the law.

- **The Trout Protection Act Cap. 229 1964** provides for the Protection of the trout. The law attempts to protect this rare fish of the salmon family. The law needs strengthening in terms of its enforcement mechanisms.

- **Animal (Prevention of Cruelty) Act Cap. 220 1964** provides for the prevention of cruelty to animals. The Act will be strengthened and enforced in view of the new world concern on cruelty against animals.

- **Animals (Straying) Act Cap. 221 1964** provides for the control of straying of animals. The law will be supplemented by regulations to provide for the control of the use of chemicals and pharmaceuticals and in the disposal of stray animals.

3.2.4.4 Mining and energy

- **The Mining Act, Cap. 248 1964** provides for the ownership, prospecting and mining of minerals. It reserves rights over all minerals and mineral oils in Uganda to the Government and regulates the granting of permits, licences and leases for prospecting and mining. It also provides for the use of water, soil and trees for mining purposes.

  While the Act is still under review, the review will include measures for waste disposal, requirement for EIA's, use of environmentally friendly technologies and extension to less important minerals (e.g., sand, clay and stone extraction). The review will also strengthen the enforcement mechanism.

- **The Petroleum Act Cap 97 1964** provides for regulation of the importation, transportation and storage of petroleum products. There are no provisions for the safety and control of, and minimization of impacts on the environment. The explosions, review will provide for safety measures and disaster management in case of spills, fibres, etc.

- **The Petroleum (Exploration and Production) Act, 7 1985** vests the control of petroleum resources in the state. Petroleum

exploration and production are subject to environmental conditions and pollution prevention. Government licences exploration subject to environmental conditions including good oil field practices, protection of the environment and pollution prevention.

Although it is an environmentally sound legislation, regulations to implement environmental requirements under the Act will be provided for.

- **The Electricity Act, Cap. 198 1964** establishes the UEB and spells out its functions on generation, transmission and distribution of electricity.

  The Act will be reviewed to reflect environmental concerns associated with the UEB monopoly for generation, transmission and distribution of electricity. The Act will also provide for adequate protection for consumers of electricity.

3.2.4.5 Human health

- **The Public Health Act, Cap 269 1964** provides for urban and local authorities on issues of public health, regulation of water, adequate food supplies for domestic use and standards for housing. The Act is under review, and will provide for the strengthening of environmental health aspects through the prevention of disease. The objective is to ensure that the population becomes healthy and productive and to reduce the high cost of curative services.

- **The Rabies Act, Cap. 219 1964** provides for the prevention of rabies. The act has not been adequately enforced and requires strengthening of its enforcement mechanisms in addition to providing for environmentally safe methods of animal control. Districts will pass bye-laws on rabies control and correct practices for disposal of wastes will be provided for.

- **The Tsetse Control Act, Cap.273 and the Sleeping Sickness Act, Cap. 274 1964** provide for the control and prevention against the spread of Tsetse fly and sleeping sickness respectively.

  Government will update, consolidate and bring the two laws into conformity with current policy on tsetse control concerns for the proper handling of pesticides will be incorporated. Bye-laws to effectively implement the Act will be made by the

districts. Additionally, these two laws will be harmonised with the Uganda Trypanosomiasis Control Statute, 16 1992 on matters of environmental management.

- **The Factories Act, Cap. 198 1964** provides for the health and safety of persons at work particularly in factories but is also mindful of other working environments other than factories. Although the Act is currently under review, there is need to incorporate the relevant international provisions concerning environment in the workplace. It should also provide measures for protection of the general environment - under the direct influence of the establishment - from industrial pollution and technological disasters. It should further require the conducting of EIAs/EIS's before licensing of factories.

- **The Control of Agricultural Chemicals Statute, No.8 1989** provides for the regulation of the quality and importation, licensing and distribution of agricultural chemicals. Regulations to supplement the statute have been published. These cover uses of pesticides other than for crop protection, storage and disposal of pesticides. Subsidiary regulations will be made to provide for standards, safe use and protection of the environment and for EIAs for pesticide use.

- **National Bureau of Standards Statute No.1, 1983** establishes the National Bureau of Standards (NBS) and empowers it to make standards in general. However, the statute does not specifically mention environmental standards. The NBS will, in conjunction with the Authority and other sectoral institutions, develop the required standards on environmental protection and sustainable use of natural resources and more specially on pollution.

3.2.4.6 Cultural

- **The Historical Monuments Act, Cap. 22 1967** provides for the preservation and protection of historical monuments and objects of archaeological, paleontological, ethnographical and traditional interest. The act has not been adequately enforced. It will be revised to conform with the Convention on World Natural and Cultural Heritage of which Uganda is a party.

3.2.4.7 Water resources

All the laws related to the water sector are under review.

- **The Water Works Act, Cap. 137 1964** provides for the supply of water to the public by water authorities and the prohibition of water pollution.

- **The Rivers Act Cap. 347 1964** provides for the licensing of stream vessels on rivers and the dredging of rivers.

- **National Water and Sewerage Corporation Decree 34 1972** creates a corporation charged with supplying water to and disposing of sewerage in urban centres.

The review has come up with a proposal for the enactment of a Water Resources Statute and a Water Supply and Sewerage Statute. The proposed laws are adequate in as far as water resources management and environmental issues are concerned. Detailed regulations is, however required to be enacted.

3.2.5 International conventions and treaties

Government recognises her obligations to translate international conventions and treaties into national policy and law. Government will, where those conventions and treaties are appropriate, enact domestic laws to reflect this obligation. Government will also subscribe to those international treaties and conventions to which she is not a member but which are relevant to her environmental needs. Section 3.2.5.1 below lists those conventions and treaties to which Uganda is a party and which will be brought under domestic law. These conventions and treaties will be reviewed and where necessary domestic law will be enacted. Section 3.2.5.2 lists international conventions and treaties which Uganda will review.

3.2.5.1 Treaties and Conventions in the field of environment to which Uganda is a party

- Convention on the Continental Shelf- (1958)

- Convention on Fishing and Conservation of the Living Resources the High seas (1958).

- Convention on the High Seas. - (1958).

- Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and Under Water. (1963).

- Treaty on Principle Governing the Activities of States in the Exploration and Use of Outer Space Including the Moon and Other Celestial Bodies. (1967).

- African Convention on the Conservation of Nature and Natural Resources. (1968).

- Convention on Wetlands of International Importance especially as Waterfowl Habitat. (1971).

- Convention Concerning the Protection of the World Cultural and Natural Heritage. (1972).

- Convention on International Trade in Endangered Species of Wild Fauna and Flora. (1973).

- Vienna Convention for the Protection of the Ozone Layer. (1985).

- Montreal Protocol on Substances That Deplete the Ozone Layer. (1987).

- Convention Concerning Safety in the Use of Asbestos. (1986).

- Convention on Biological Diversity, Rio de Janeiro. (1992).

- Framework Convention on Climate Change, Rio de Janeiro. (1992).

3.2.5.2 Treaties and conventions which Uganda will review

- Treaty on the Prohibition of the Emplacement of Nuclear Weapons and other Weapons of Mass-Destruction on the Sea-bed and the Ocean Floor and in the Sub-soil Thereof. Washington, 1971.
(Depositaries: Russia, U.K and U.S.A).

- Convention Concerning Protection Against Hazards of Poisoning Arising from Benzene, Geneva(1971). (Depositaries - I.L.O).

- Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxic Weapons and on Their Destruction. Moscow (1972).
(Depositaries - Russia, U.K. and U.S.A.)

- Convention on the Prohibition of Military or Any Other Hostile use of Environmental Modification Techniques, New York, 1976. (Depositary - United Nations)

- Convention Concerning Prevention and Control of occupational Hazardous caused by Carcinogenic Substances and Agents, Geneva, 1974. (Depositary - I.L.O)

- Convention Concerning the Protection of Workers Against Occupational Hazards in the Working Environment Due to Air Pollution, Noise and Vibration, Geneva. (1977) (Depositary - I.L.O).

- Convention on the Conservation of Migratory Species of Wild Animals. Bonn (1979) (Depositary - Federal Republic of Germany).

- Convention concerning occupation Safety and Health and The Working Environment, Geneva (1981) (Depositary - International Labour Office).

- United Nations Convention on the Law of the Sea, Montego Bay, (1982)(Depositary - United nations).

- International Tropical Timber Agreement, Geneva. (1983) (Depositary - United Nations).

- Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, London. 1990 (Depositary - United Nations).

- Convention Concerning Occupational Health Services, Geneva. (1985) (Depositary - I.L.O.).

- Convention on Early Notification of a Nuclear Accident, Vienna, (1986). (Depositary - Agency - IAEA).

- Convention on Assistance in the case of a Nuclear Accident or Radiological Emergency, Vienna. (1986). (Depositary - IAEA).

- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, Basel. (1989). (Depositary -Secretary -General of the United Nations).

- International Plant Protection Convention Rome, (1951) (Depositary - FAO).

- Convention on Occupational Safety and Health in Construction Industry, Geneva, 1988.
  (Depositary - I.L.O.).

- Convention on Safety in the Use of Chemicals at work, Geneva 1990. (Depositary - I.L.O.).

- The Bamako Convention - 1991 (Depositary - O.A.U). 37,1973

3.3 Environmental institutional reforms

Institutional reforms are needed in order to have effective implementation of this Plan.

In developing and establishing the desired institution the following principles are essential. The institution should:

- have a powerful voice to ensure cross sectoral coordination and management;

- have political support to be effective at national, district and community levels;

- avoid implementing those activities that can be implemented by sectoral institutions;

- develop close collaborative and cooperative links with line ministries, public institutions, NGOs and private sector;

- have technical and professional competence with which to guide Government, the business community and the public on the wise management of the environment;

- be decision oriented, practical and operational on the ground country-wide so that it is able to respond decisively and quickly to any environmental circumstance;

- have no direct exploitive interest in any of the resources to be managed so that it does not succumb to economic, business and political conflicts of interest;

- have the mandate to guide the development and enforcement of national environmental policies, laws and standards.

In line with the above Government will create the National Environment Management Authority as a semi-autonomous institution with the mandate for coordination of environmental management.

Government, in creating this institution, will abolish the present Department of Environment Protection presently under the Ministry of Natural Resources and absorb those relevant responsibilities into the the Authority.

3.3.1 Establishment of a National Environment Management Authority

The **National Environment Management Authority** (hereinafter called the Authority) will be the principal agency responsible for management of the environment in Uganda and will co-ordinate, monitor and supervise all activities in the field of the environment. The Authority will be under the general supervision of the Minister of Natural Resources. The functions of the Authority are to:

- co-ordinate the implementation of Government policy and the decision of the Policy Committee;
- ensure the integration of environmental concerns in overall national planning through co-ordination with the relevant ministries, departments and agencies of Government;
- liaise with the private sector, intergovernmental organizations, non-governmental agencies and governmental agencies of other states on issues relating to the environment;
- propose environmental policies and strategies to the Policy Committee;
- initiate legislative proposals, standards and guidelines on the environment in accordance with this Statute;
- review and approve environmental impact assessments and environmental impact statements submitted in accordance with this Statute or any other law;
- promote public awareness through formal and non-formal education about environmental issues;
- undertake such studies and submit such reports and recommendations with respect to the environment as the Government or the Policy Committee may consider necessary;

- ensure observance of proper safeguards in the planning and execution of all development projects, including those already in existence that have or are likely to have significant impact on the environment;

- undertake research and disseminate information about the environment;

- prepare and disseminate a state of the environment report once in every two years;

- mobilize, expedite and monitor resources for environmental management.

3.3.1.1 Policy committee on the environment

In order for the Authority to operate at the highest level of government, attain high visibility and ensure that checks and balances in the management of the environment are attained, government has established a Policy Committee on the Environment. This committee is composed of Ministers relevant to environment management under the chairmanship of the Prime Minister. The composition of the Policy Committee is:-

- the Prime Minister who shall be the Chairman;

- the Minister responsible for natural resources;

- the Minister responsible for agriculture, animal industry and fisheries;

- the Minister responsible for finance and economic planning;

- the Minister responsible for education and sports;

- the Minister responsible for health;

- the Minister responsible for land,housing and urban development;

- the Minister responsible for local government;

- the Minister responsible for Gender and Community Development; and

- the Minister responsible for tourism, wildlife and antiquities.

- the Minister responsible for trade and industry.

The Policy Committee on the Environment has responsibility for the review of major environmental policies and legislation before submission to Cabinet and Parliament. Other duties and responsibilities of the Policy Committee will be:

- to provide policy guidelines, formulate and coordinate environmental policies;
- liaise with the Cabinet on issues affecting the environment;
- identify obstacles to the implementation of environmental policy and programmes and ensure implementation of those policies and programmes;
- to perform any other function that may be assigned to it by the Government;

3.3.1.2 The Board of Directors

A Board of Directors has been established to fulfill the operational, financial, and personnel oversight functions of the Authority. The Board is composed of distinguished Ugandan citizens of high technical ability, recognized as authorities in their areas of specialization, with established records in relevant areas such as environmental policy, natural resources management, public sector administration, financial management and others as may be recommended. The Board consist of:

- a representative of the Ministry of Natural Resources;
- a representative of the Ministry of Agriculture, Animal Industry and Fisheries;
- a representative of the Ministry responsible for economic planning;
- two representatives of academic and research institutions;
- two representatives of local non-governmental organizations; and
- two representatives of the private sector;

The Board is granted direct responsibility for assuring the effective and efficient accomplishment of objectives of the Authority. The specific functions of the Board will be to:

- to oversee the implementation and successful operation of the policy of the Authority .
- to review the policy and strategic plan of the Authority.
- to provide guidance to the Executive Director and staff;
- to approve the annual budget and plans of the Authority;
- to monitor and evaluate the performance of the Authority against budgets and plans;
- to establish and approve rules and procedures for the appointment, discipline, termination and terms and conditions of service of staff, administrative matters and financial matters;
- any other duties assigned to it by the National Environment Statute.

The Executive Director is an *ex-officio* member of the Board for purposes of information and representation.

3.3.1.3 Relationship to Government

The Management Board will provide direct oversight and supervision to the Authority. Its authority does not extend to any body other than the Authority and its subordinate parts. The Board will maintain complete and accurate records of all meetings and decisions and will provide regular reports of minutes and other pertinent information to the Policy Committee. The Board will respond in a timely manner to all requests for information and documentation that lies within its competence at the instruction of the Policy Committee on the Environment.

3.3.1.4 Technical committees (TC)

The Board shall, on the advice of the Executive Director, appoint as many technical committees as it considers necessary to give advice on such subjects relating to the environment. The technical committees will advise Authority on the environment and on technical matters related to environment management. Initially four permanent technical committees are established by law:

- "a Technical Committee on Soil Conservation;"
- "a Technical Committee on the Licensing of Pollution;"
- "a Technical Committee on biodiversity conservation;" and
- "a Technical Committee on Environmental Impact Assessment".

3.3.1.5 Staff of the Authority

The day to day activities of the Authority will be carried out by the technical staff with their support staff. Both will be report to the ED and the DED.

A Executive Director and Deputy Executive Director

There will be an Executive Director and a Deputy Executive Director appointed by the Minister on the reccommendation of the Board and with the approval of the Policy Committee. They will each serve for a period of five years and be eligible for re-appointment.

i) Functions of the Executive Director or Deputy Executive Director

The Executive Director will be the chief executive of the Authority and will be responsible for the day to day operations of the Authority.

The Executive Director will:

- be responsible for the management of funds, property and business of the Authority and for the administration, organisation and control of the staff of the Authority.

- from time to time, keep the Board, the Policy Committee and the Minister informed of the progress and activities of the Authority.

The Deputy Executive Director shall assist the Executive Director in the performance of his functions.

The Executive Director and the Deputy Executive Director will be responsible to the Board. He will also have independent access to the PCE by virtue of his ex-officio membership and to the Minister.

ii) The office of the Executive Director

The office of the Executive Director is be composed of the Executive Director, a Deputy Executive Director, a District Support Coordinator and support staff.

It is be responsible for overall development and supervision of the Authority's activities and will be particularly concerned with coordination of the country's environmental programmes at national and district levels.

In keeping with the government's decentralization policy, codified in the Local Governments (Resistance Councils) statute, 1993, many of the Authority's activities will operate at the district and sub-district levels.

A variety of technical and material assistance programs and training activities are planned for the decentralized technical and popular bodies. The effective development and implementation of these assistance activities will requires careful planning, coordination and monitoring. The district coordination function will therefore be a key responsibility of the Executive Director.

Consequently a **District Coordination Unit** will be established under the office of the Executive Director. This unit will be staffed with a District Support Coordinator. The other members of the District Coordination Unit will be drawn from the full-time members of existing division staff.

The function of the Unit will be to:-

- develop, in association with the Authority's technical divisions, the implementation program and schedule of assistance and support activities to district and sub-district technical and popular bodies,

- integrate workplans and schedules for field-level activities in support of decentralized bodies, and

- assure appropriate and timely response to requests for assistance from districts and line agencies.

B Other staff of the Authority

There will be other officers and employees of the Authority appointed by the Board, on the advice of the Executive Director.

These will be organised into four divisions as follows:

- Policy, Planning and Legal Division

- Information and Monitoring Division

- Education, Awareness and Training Division

- Administration and Finance Division.

Each division will have distinct responsibilities and priority areas of action, however, the effective accomplishment of the Authority's objectives will require a high degree of interdependence and collaboration among all its staff and program areas. Therefore, it is also anticipated that some of the Authority's priority activities will involve the formation of task groups. It is important that flexibility be incorporated at the outset in the organization's style of operation so as to avoid the inefficiencies of bureaucratic practice that has plagued most public sector agencies.

i) Planning, Policy and Legal Division

The purpose of this division is to ensure that environmental planning, policy development and the legal and advisory function required in good environmental management are provided.

Objective

To integrate environmental concerns into the planning process, policy, and law at relevant levels of activities that affect the environment.

ii) Information and Monitoring Division

The purpose of this Division is to assure adequate surveillance and control of the environment and those areas of interest to it, collect and analyse data, and disseminate information on the state of the environment.

Objectives

The general objective of this division is to measure the stressors encountered in the environment, evaluate their overall impact on the system, inform the concerned parties and institute control measures.

Specific Objectives :-

- to gain information about present levels of degradation by harmful processes and agents so as to judge whether the abatement policies are succeeding.
- to identify activities that are harmful or beneficial to the environment and so fulfil the principle of sustainable use of natural resources.
- to identify environmental risks and impacts not previously known so that they can be brought under control.
- to follow the advance of harmful processes and agents through the environment into living creatures and man himself.

iii) Education, Awareness and Training Division

The purpose of this division is to promote the development of adequate environmental knowledge, skills and awareness to ensure sustainable utilisation of the country's environment and natural resources.

Objectives

The following are the objectives of this division :-

- to promote the development of environmental education in the formal education system.
- to increase public awareness and understanding of the linkage between environment and development and promote the

development of conservation culture in all sectors of the society.

- to develop environmental management skills in the line institution, private sectors and the community.

iv) Administration and Finance Division

The purpose of this division is to ensure support and administration of the Authority, including personnel, logistics, and equipment procurement, operation and maintenance. It will also assure the regular accounting and management of budgetary and real property resources.

3.3.1.6 Linkage with line ministries

While the Authority is with monitoring, planning and coordination of environment/natural resource matters, implementation will be the responsibility of the relevant line Ministries. Thus, the development of strong links between these Ministries and the Authority is critical if effective coordination is to be achieved.

A small Environmental Liaison Unit (ELU) will be established in each line Ministry concerned with environmental activities. The unit will initially consist of at least three people recruited, as appropriate, from existing personnel in the line Ministries.

While the ELU personnel will initially be paid an incentive allowance from the Authority resources, it is expected that each Ministry will eventually assume the costs of maintaining the unit.

The eventual expansion of the unit in terms of staff and discipline would be based on demonstrated need.

Objective of the ELU:

General Objective:

To integrate environmental concerns into the internal planning process, policy, law and implementation activities within the mandate of the ministry.

Specific Objectives are to:-

- Ensure adequate access of the ministry and the public under its jurisdiction to environmental information and programmes at the national level;

- Develop and increase the internal capacity and potential of the sector to effectively contribute in good environmental management;

- Ensure effective monitoring of environment and enforcement of legislation within the jurisdiction of the ministry;

Functions of the ELU:

Functions are to:-

- Integrate environmental concerns into the planning process, policy, law and activities at all levels of concern in the ministry;

- Coordinate environmental activities between the different departments in the ministry? and between the ministry and the Authority;

- Monitor all activities within their jurisdiction to ensure that such activities do not have any significant impact on the environment;

- Identify areas of priority environmental concerns within the ministry and develop internal programmes to address them;

- Identify and mobilise personnel and local resources to effectively participate in environmental planning and other environmental activities;

- Ensure (by organising them) that the authorised officers in the ministry are equipped with skills and facilities in order to effectively participate in enforcement of the environment management law;

- Ensure that in so far as their mandate is concerned the enforcement of the environmental law as related to the sector is carried out by the officers of the ministry;

- Ensure proper flow of information to and fro and both horizontally and vertically within the departments of the ministry;

- Prepare environmental information available in the ministry for dissemination;

- Promote awareness and knowledge within the ministry personnel and communities accessible to them on environmental issues;

3.3.1.7 Linkages at the district level

The development of strong links between resource users and the Authority is considered crucial for effective implementation of the NEAP. In this context, the Authority's strategy vis-a-vis the districts will be to enlist the support and participation of local people by: (i) building local government environmental planning capacity to enable them to sustainably manage their own environment and natural resources; and (ii) assisting local governments to develop their own environmental action plans, policies and bye-laws.

The districts themselves will have ultimate responsibility for:

- ensuring that the environmental concerns are integrated at the district and local level's planning processes;

- collecting and disseminating environmental information;

- taking actions for environmental catastrophes;

- ensuring that the local people, non governmental organizations and the private sector participate in environmental planning decision making and implementation of environmentally related activities;

- mobilizing people and resources to solve environmental problems; and

- ensuring that national environmental polices are implemented at the local level.

Thus, to increase the scope of NEAP and ensure local participation and support, Authority will assist the district in incorporating environmental concerns into District Development Plans through the District Technical Planning Committee. As a first step, the Authority will assist each district to establish District Environment Committees (DEC's) as a sub-committee of the District Resistance Council (DRC's). Generally, working through the DECs, The Authority's role in the districts will be to:

- ensure that national environmental policies and legislation are adhered to and translated into action;

- assist in formulating local polices and bye-laws based on national policies and legislation;
- monitor and evaluate environmental and natural resource policies for impact;
- provide technical advice;
- set standard guidelines, where appropriate, for environmental management;
- coordinate and assist in environmental data collection and monitoring; and
- assist in district cross-boundary environmental management.

The DEC will be composed of RCV Councillors as decided by the DRC. Relevant heads of government departments (depending on the environmental problems in the district), representatives of non governmental organizations, women's and youth groups representatives, and the private sector will be ex-officio members. However, the composition will specifically be determined by the districts themselves.

The functions of the District Environment Committee are to:-

- to develop a district environment action plan to be revised every five years;
- to co-ordinate the activities of the District Council relating to the management of the environment and natural resources;
- to ensure that environmental concerns are integrated in all plans and projects approved by the District Resistance Council;
- to assist in the development and formulation of bye-laws relating to the management of the environment;
- to promote the dissemination of information about the environment through education and outreach programmes;
- to coordinate with the Authority on all issues relating to environment management;
- to co-ordinate the activities of Local Environment Committees in the management of the environment;

- to receive reports from the Local Environment Committees and advise the Local Environment Committees; and

- to prepare a district state of the environment report once in every two years.

In conformity with the decentralization process, Local Environment Committees (LECs) may be established at appropriate local levels, i.e., the sub-county and in urban authorities. The LECs will be sub-committees of the Resistance Councils in their respective areas and will follow the same model as the district committees. The LECs will, among other activities, prepare Local Environment Work Plans, assist in the formulation of sub-county development plans, carry out public environmental awareness campaigns, mobilize the people through self-help to conserve and sustainably manage natural resources, initiate programmes to restore the degraded environment where possible, and monitor all activities which may have impacts on the environment. The DEC will have the responsibility of coordinating the activities of these local environment committees.

Finally, strong links between resource users and the Authority are needed for effective implementation of the NEAP. In this regard, each district will appoint an Environmental Officer (EO), working under the DES, to act as the coordinating officer for environmental affairs at the district level and serve as a link to the Authority.

3.3.1.8 Sustainability of the Authority

As a semi-autonomous body, the Authority will have to be financially viable and sustainable in its operations. However, due to the complexity of its mandate, the Authority will have to attract highly qualified experts and specialists from both the public and private sector; salaries will need to be at a level which is both competitive and encourages staff to contribute productively. This implies that the Authority's personnel will have to be remunerated considerably above what the public service scale is able to pay under present economic circumstances.

Potential sources of revenue to cover the Authority's programmes will include government contributions, self-generated revenues and donor support grants, loans, gifts and other voluntary contributions.

Government's financial contribution in the short-term will be small, between 10% and 20% of costs (or the current equivalent Government contribution to the Department of Environment). However, it is expected that Government's contribution will increase to a more substantial level as Uganda's economy improves.

Concurrently, as an independent institution, the Authority will be able to generate some of its own resources by: charging projects and the private sector for technical data and environmental information; taxes on industry and on resource users; fines for polluting or exceeding environmental standards; charging fees related to the EIA/EIS process; charging for internship programmes; and interest on investments made under the Environmental Trust Fund.

CHAPTER IV

THE ACTION PLAN

4.0 Overview

As described above, the backbone of Uganda's economy is its natural resources. Vital in the livelihoods of millions of Ugandans are agricultural lands, water, fish and wildlife, pastures, woodfuel, hydropower, construction materials of wood and earth, and minerals. As the country strives for economic and social progress, management of these resources assumes increasing importance. Because of constraints on financial and managerial skills, it is impossible to satisfy all the national demands from the resource base. Scarcity of finance and other inputs implies that some activities are implemented at the expense of others. The framework is one of systematically identifying and evaluating alternative investments, both in natural resource sectors and in relation to all other productive uses of capital.

Drawing on the previous chapters, this Chapter provides the basis for this framework in the form of an action plan consisting of a prioritized investment programme, an implementation strategy for the programme, and a system for monitoring and evaluation to determine both policy and programme impacts.

4.1 The investment programme

4.1.1 Introduction

As previously stated, the natural resource base contributes 54% of GDP, about 100% of the country's exports and 90% of direct employment. However, estimates indicate that losses imposed on the economy as a consequence of environmental degradation are in the order of 1.4%-12% of GDP per annum (Converey 1992, Slade and Weitz 1992). While these estimates may be crude, they do suggest that Uganda's rate of socio-economic growth would be much lower if environment or natural resource degradation or losses were taken into account. Moreover, if environmental assets are destroyed (or are not renewed) they can no longer fulfil their part in the development process. Thus, the prospects for sustainable economic growth will become seriously undermined. Investing in better environmental management, ensures that there will always be a balance between socio-economic growth and use of natural resources and the environment. This investment programme for environment provides such sustainable socio-economic development.

4.1.2 Objectives of environmental investment programme

The overall goal of the Environment Investment Programme (EIP) is to attain efficient use of resources. The EIP's objectives are to:

- halt and reverse environmental degradation so as to enhance productivity of the environment and natural resource base for sustainable economic growth and improved human welfare;
- build and strengthen human capital and institutional capacities in environmental management so that they can continually respond to problems, challenges and demands; and
- hold open future options for resource conservation and development by formulating and implementing good policies and inculcating positive conservation culture and attitudes.

4.1.3 Justification for the Environmental Investment Programme

Sustainable economic growth for the present and future generations is not feasible unless there is corresponding sound use and management of the environment and resources. This requires that society fully understands the full range of social and economic benefits accruing from the environment.

Presently, the losses incurred because of environmental degradation are not accurately known. While more accurate studies need to be made to quantify and value these losses, the message is clear that these losses could be transformed into benefits if the country reduces environmental degradation. Efforts must be directed towards investment in environment management in its own right so that there is no loss of some or all of its natural resources on which it greatly depends for economic development. It will be extremely expensive and/or impossible to replace them once they are depleted. Specific benefits will accrue through:

- increased earnings at macro and micro levels due to improved productivity of biotic resource;
- avoiding losses of future income (e.g.,by controlling the impact of water hyacinth on fisheries);
- avoiding future costs (e.g. correct siting of harzadous industries, preventing loss of soil nutrients, emphasising preventive medicine rather than expensive curative medical care etc..);
- a healthy and productive labour force; and

- professional and confident human resources in environmental management.

The value of increased output is in the improved national economy resulting from both direct and indirect benefits. These types of benefits are challenging to define and even more challenging (usually impossible) to quantify but are nevertheless extremely important. Most are public goods, truly intangible, and often exhibiting externalities which spill beyond the borders of Uganda. Examples include:

- nation building (e.g., cross-sectoral and communications fostered by the establishment of the the Authority);

- confidence, pride, and optimism (e.g., of women in self-help projects; of farmers who utilize trees they have planted; of teachers who master a curriculum plan in environmental education; of all Ugandans who perceive that the country is moving forward on environmental issues);

- existence values (e.g., appreciation of Uganda's mountain gorillas by persons who will never see them);

- option and quasi-option values (e.g., of maintaining an inventory of indigenous knowledge and practices in natural resources management in Uganda; of maintaining the ecological integrity of key wetlands before they are drained); and

- aesthetic, spiritual, and cultural values (e.g., of protecting the crested crane, Uganda's national symbol; of protecting Mt. Rwenzori as the identity of the Bakonjo people).

Unfortunately, investment intended to tap these indirect socio-economic benefits or multipliers do not easily win favour when funds are limited, the need to fight poverty and provide social services is urgent, and when short-term profit motive dictates most investment decisions. Because of these limitations, deliberate efforts must be made to invest public funds in environment management as well as systematically influence and encourage private sector investment. This helps to ensure an equal balance between short-term development goals and long-term ecological productivity.

4.1.4 The investment plan

4.1.4.1 Criteria for choice of programme and projects

Many environmental issues and problems were identified during the NEAP process and corresponding recommendations proposed so as to address them and promote sustainable environmental management. Given the present state of the national economy and existing institutional infrastructure and personnel, it is evident that all the issues and problems cannot be addressed at the same time or as a single package. Priorities must be set in order to optimize the allocation of scarce resources, and develop an investment programme which is cost effective and efficient, responds to both societal and individual concerns, and leads to sustainable social and economic development. The following guidelines were used in prioritizing environmental problems and subsequently in the selection of priority programmes and projects to be included in the investment programme. It should be pointed out at the onset that implementation of the investment programme will be done in phases and will be carried out by the line institutions and departments both in government and outside government.

Seriousness of the problem:

The seriousness of the problem was evaluated from the viewpoints of both members of society affected by a particular problem and society as a whole, taking the following into consideration:

- the distribution of the impact in terms of geographical area and affected population;
- the degree of threat to human health and life support systems;
- the possibility of the present problem resulting into other problems;
- the potential for irreversible damage;
- the linkages of the problem with other problems; and
- the eventual economic and/or social cost of not taking action now.

Contributions to the economy and social well-being:

Resolution of some problems will contribute more to the economy and community welfare than the resolution of others. The following parameters were used to determine the level of contribution of a given activity:

- the extent to which the activity makes the best use of limited resources (land labour and capital);

- the anticipated financial returns and other incentives to the target group;
- the activity's potential risk with respect to the security of the target groups' production and income;
- the anticipated economic returns, including social and economic equity and multiplier effects; and
- the extent to which local resources are available to meet the requirements of the activity.

Potential for solving the problem:

Each investment activity was evaluated in terms of the activity's potential for: (i) solving the problem; (ii) gaining target group acceptance of the solution; and (iii) ease of implementation. Criteria used included:

- the perception and appreciation of the problem at the individual, community, district, national and international levels;
- the identification and definition of the underlying causes of and the extent to which the intervention addresses the underlying problems;
- the opportunities offered by the bio-physical conditions in the target area;
- the social-cultural aspects of the possible solution with respect to the beneficiaries; and
- the level of technological and financial resource requirements in view of the existing socio-economic status.

4.1.4.2 Key programme areas for investment

Government departments, university departments, the private sector, and conservation NGOs were asked to submit profiles of programmes and projects to be considered within the NEAP process. Project ideas were evaluated in light of the above criteria as well as the strategic NEAP framework for environmental management in Uganda. This resulted in the development of five programmes, namely and in order of priority:

(i) Capacity Building in Environmental Management;

(ii) Enhancing Resource (land and water) Productivity;

(iii) Conservation and Use of Biodiversity Resources;

(iv) Environmental Education and Public Awareness; and

(v) Environmental Health and Pollution Management.

Each of the projects within these five programmes includes one or more of the following objectives:

- to improve economic efficiency by increasing aggregate benefits from limited inputs (land, labour, management, and finance);
- to enhance professional, political, and grassroot capacity to define develop and implement strategies for managing natural resources (i.e., build "human capital");
- to consolidate government efforts and thus reduce public spending by sharing information sources, data collection efforts, and other public infrastructure for natural resource management;
- to increase social and political stability (as an end in itself and as a precondition for economic growth);
- to improve conditions for poorer or disadvantaged members of society (i.e., address issues of social welfare); and
- to hold open future options for resource conservation and development by avoiding irreversible actions.

It should be noted that while the priority program areas will be valid at least for the short term, the projects listed under each programme area do not constitute a finalized investment program. Projects were submitted by various line ministries, NGOs and the private sector and were prioritzed according to the criteria presented above. However, there are addtional projects currently being developed and submitted some of which appear to have considerable merit and are currently being reviewed for possible inclusion. Moreover, the projects listed and any new projects will need to be evaluated in the context of the strategies defined in the National Environment Management Policy.

Additionally, while the investment program provides a first cut at implementation responsibilties, many of the implementation details vis-a-vis the role of Government, the private sector and non-governmental organizations

need to be worked out. While Government will take a lead role in many of the projects, the private sector and other collaborating agencies, including NGOs, will be facilitated to participate both directly and indirectly through a range of strategies, including but not restricted to macro-economic policies, incentives and disincentives, re-definition of property rights and management contracts.

The five programmes, comprised of ranked priority and reserve projects and including Government, private sector and non-governmental implementation responsibilties, are described below.

4.1.4.2.1 Programme 1: Capacity building in environmental management

Implementation of the investment programme will pose new challenges in terms of cross-sectoral coordination, information sharing and the development of innovative and cost-effective methodologies . It will also entail venturing into new areas such as green accounting, environmental impact assessments, audits, and holistic and integrated development planning in both the public and private sector. However, the present institutional arrangements for environmental management are inadequate for the implementation of the investment programme. The present institutions are weak and their management systems are not conducive to a multi-sectoral and interdisciplinary approach to environment and natural resource management. Other problems exacerbate the situation: environmental policies and laws are sector-based and weak thus making cross-sectoral coordination more difficult; people's participation in the management of the environment and natural resources has been difficult to achieve; and data and information on the environment and natural resources are insufficient.

In this context, the first category of projects consists of interventions to strengthen environmental policy review, the resource information bases, and institutions organization. Efforts to build organization, planning, policy, and information is seen as a pre-investment strategy. The objective is to enable the country to conserve and manage her environment and natural resources sustainably, but this cannot occur without strong institutions. Individually or collectively, programmes and projects under this theme are intended to build Uganda's institutional capacity in environmental management. Specific objectives are to:

(i) create and establish a coordinated and efficient institutional mechanism that will promote and ensure that environmental considerations are integrated into the overall national socio-economic planning and development process;

(ii) provide coherent and consistent policy and legal guidelines that will enhance environment management capability;

(iii) empower the local resource users especially at the grassroots to manage their own resources through decentralisation of natural resources management;

(iv) develop comprehensive environment information system to improve decision making in the management of all aspects of environment; and

(v) strengthen the sectoral institutions for the implementation of the national environment management programme.

Ranked priority and reserve projects to be included under this programme and in the Rehabilitation and Development Plan (RDP) are presented in Table 4.1.

Table 4.1: Programme 1: Capacity building in environment management

A: PRIORITY PROJECTS		IMPLEMENTATION RESPONSIBILTIES[1]			IN RDP?
		GOV	P.S.	NGO	
1.	Establishment of the National Environment Management Authority	P	S	S	New Project
2.	The National Environment Information Centre	P	S	S	In RDP. No funds
3.	Capacity Building in Environmental Economic Analysis	P	P	P	New Project
4.	Support for the Decentralisation of Natural Resource Management	P	S	P	New Project
5.	Environmental Management Training Support Project	P	P	P	New Project
B:	**RESERVE PROJECTS**				
1.	Policy and Legal Review	P	S	S	New Project
2.	Development of Guidelines and Standards for Environment Protection	P	P	S	New Project
3.	Capacity Building in Climate Monitoring	P	S	S	New Project
4.	Strengthening of Institutional Capacity for Health and Safety in the Working Environment	P	P	S	New Project

4.1.4.2.2 Programme 2: Enhancing resource (land and water) productivity

Along with the resourcefulness of its people and its favourable macroeconomic position in recent years, Uganda's other comparative advantage is its natural endowments. Because agriculture (industry and mining) plays the dominant role in the country's socio-economic development higher productivity in its primary sectors. is essential. However, the uncontrolled and inappropriate use of these resources has been the major cause of degradation and declines in productivity. A number of the country's essential resources therefore require strategies and field projects for efficient use, fact finding and active management.

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[1]Denotes who will have primary (P) or secondary (S) implementation responsibilties, Government (GOV), the private sector (P.S.) or non-governmental organizations (NGO).

Consequently this programme contains projects which are interventions to enhance resource productivity. Some of the projects aim to rehabilitate already degraded sites; others propose activities to lessen future losses; others have explicit gender awakening objectives (e.g., women in development, community management); and still others engage in problem diagnosis to enable future management strategies to be defined. The programme focuses on improved techniques and systems which will ensure increased productivity of the resources, prevent degradation and promote sustainable use. The implementation strategy emphasises cross-sectoral and multi-disciplinary approach as well as encouraging resource users' participation.

Specific objectives are to:

(i) develop a comprehensive national land use policy and legislation;

(ii) develop in phases a national land use plan beginning with priority areas of major land degradation;

(iii) undertake in phases a comprehensive soils survey including wetlands throughout the country;

(iv) undertake detailed studies of environmental and natural resources degradation in the country;

(v) develop community focused programmes to improve natural resource management and enhance resource productivity; and

(vi) develop the Fisheries Master Plan and strengthening the fisheries extension services.

Ranked priority and reserve projects to be included under this programme and in the Rehabilitation and Development Plan (RDP) are presented in Table 4.2.

Table 4.2: Programme 2: Enhancement of resource (land and water) productivity

A.	PRIORITY PROJECTS	IMPLEMENTATION RESPONSIBILTIES[2]			IN RDP?
		GOV	P.S.	NGO	
1.	National Forest Action Plan	P	P	P	In RDP No funds
2.	Environmental and Natural Resource Degradation Studies	P	S	S	New Project
3.	Uganda National Soils Survey	P	S	S	New Project
4.	Formulation of the Uganda National Landuse Plan	P	S	S	New Project
5.	Enhancing Soil Productivity through Improved Farming Systems	P	P	P	New Project
6.	Rehabilitation of Water Resources Monitoring and Assessment Services	P	P	P	New Project
7.	Fisheries Master Plan	P	P	S	New Project
B.	**RESERVE PROJECTS**				
1.	Community Forestry Initiatives	P	P	P	New Project
2.	Improved Dryland Farming Systems	P	S	P	New Project
3.	Pilot Wildlife/Livestock Ranching Scheme	P	P	S	New Project
4.	National Energy Supply and Efficient Utilization	P	P	S	New Project

4.1.4.2.3 Programme 3: Biodiversity conservation and use

As described above (Chapter 2) although Uganda is a relatively small country, it has an immense variety of biological resources due to the climatic and altitudinal variations. Biodiversity forms the backbone of Uganda's economy and the well-being of the population but this biodiversity is under threat.

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[2]Denotes who will have primary (P) or secondary (S) implementation responsibilties, Government (GOV), the private sector (P.S.) or non-governmental organizations (NGO).

Consequently this programme aims at addressing the threats and conserve this resource.

Thus, the principal focus of Programme 3 is to examine the population biology, habitat requirements, and other conservation parameters for the nations's biodiversity resources. Specific objectives under the biodiversity management programme are to:

(i) Maintain essential ecological processes and life-support systems on which human survival and development depends;

(ii) Preserve genetic diversity on which the functioning of many of the above processes depend; and

(iii) Ensure living resource conservation for sustainable development and rational utilization of species and natural ecosystems to support rural communities and industries.

The implementation strategy for investment in biodiversity conservation emphasises a cross-sectoral approach and community participation. Ranked priority and reserve projects to be included under this programme and in the Rehabilitation and Development Plan (RDP) are presented in Table 4.3.

Table 4.3: Programme 3: Biodiversity conservation and use

A. PRIORITY PROJECTS		IMPLEMENTATION RESPONSIBILITIES[3]			IN RDP?
		GOV	P.S.	NGO	
1.	Community participation in wildlife conservation	P	S	P	New Project
2.	Biodiversity Assessment	P	P	P	New Project
3.	Conservation of the Shores of Lake Victoria (within Uganda)	P	P	P	New Project
B.	**RESERVE PROJECTS**				
1.	Inventory Assessment and conservation of Medicinal Plants	P	P	P	New Project

[3]Denotes who will have primary (P) or secondary (S) implementation responsibilties, Government (GOV), the private sector (P.S.) or non-governmental organizations (NGO).

4.1.4.2.4 Programme 4: Environmental education and public awareness

Environmental education is a process of continuous learning by an individual, community or organization in order to develop knowledge, skills and attitudes necessary for the proper management of environmental resources. It can be achieved through formal, non-formal and informal educational measures. These latter two are considered to be in the realm of "public awareness".

Environmental education is relatively new in Uganda. It does not exist as a distinct curriculum at the primary or secondary school levels. In tertiary institutions, environmental education is provided for in various subjects while co-curriculum activities include public awareness programmes. In the non-formal and informal education sector, public awareness programmes have been developed by various sectors within and outside government. However, the majority of them have yet to realize maximum impact as they are not yet focused on the grassroots resource users.

Environmental education and public awareness are important elements for proper management of natural resources. If resource users and policy makers do not understand and are not able to appreciate environmental issues, then environmental concerns cannot be adequately taken into account in the decision making process. The need to have a positive change in resources users' attitudes and behaviour is equally important considering that the vast majority of the population depends directly on products and services derived from natural resources. The overall impact of lack or inadequate environmental education is the continued degradation of the natural resource base.

The objectives of investing in environmental education and public awareness are: to provide information and education to help individuals, communities and organizations understand environmental implications of their actions; and to develop human resources for sustainable management of the environment and natural resources. Investments under this theme will adapt an inter-sectoral approach for the development of a comprehensive environmental education and public awareness programme.

Ranked priority and reserve projects to be included under this programme and in the Rehabilitation and Development Plan (RDP) are presented in Table 4.4.

Table 4.4: Programme 4: Environmental education and public awareness

A:	PRIORITY PROJECTS	IMPLEMENTATION RESPONSIBILTIES[4]			IN RDP?
		GOV	P.S.	NGO	
1.	Primary School Environmental Education Development Project	P	S	P	New Project
B:	**RESERVE PROJECTS**				
2.	Secondary School Environmental Education Development Project	P	S	P	New Project
3.	Environmental Media Network	P	P	P	New Project
4.	Environmental Education Project for Rural Out-of-School Youths in Uganda.	P	S	P	New Project

4.1.4.2.5 Programme 5: Environmental health and pollution management

Poor nutrition and poor health in the country are related directly and indirectly to rapid population growth and environmental problems like unsafe drinking water and inadequate sanitation. Diarrhoea and other preventable environmental related diseases are major killers. As said above, the country's population growth rate of 2.5 percent will double the population in 28 years, adding considerably to the challenge of providing health care. The imbalance between population and economic growth has put a strain on the environment and natural resource base to meet the increased demand for products.

Additionally, although the industrial sector is presently small, it is expanding rapidly. The release of industrial effluent, and solid wastes is essentially uncontrolled and un-monitored. Moreover, medical wastes from clinics and hospitals have been accumulating, and the country has no facility to incinerate them. Pesticides and herbicides for agriculture and disease control are one of Uganda's fastest-growing imports, yet a system to register and regulate them does not exist. Also lacking are environmental standards for mines and quarries (i.e., to control tailings and discharges), guidelines for siting hazardous installations, and guidelines for disaster preparedness. Government currently lacks adequate information systems, qualified personnel, and authority to conduct Environmental Impact Assessments (EIA).

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[4]Denotes who will have primary (P) or secondary (S) implementation responsibilties, Government (GOV), the private sector (P.S.) or non-governmental organizations (NGO).

All these factors allow for the pollution of our living and working environment.

The objectives of the Environmental Health and Pollution Management Programme's are: to improve the productivity of the population by improving its health through the provision of a safe environment; and to control the rapid population growth. Specifically, the programme focuses on the reduction of the incidence of environmentally related diseases by improving sanitation, nutrition, housing quality, working environment, public awareness and family planning services. Benefits from the programme are both health-related (i.e., reduced morbidity and mortality) and economic (i.e., reduction in medical care expenses and increased productivity of each individual). Also to be recognised are the moral, psychological and cultural dimensions of saving lives and/or improving the human living condition.

Ranked priority and reserve projects to be included under this programme and in the Rehabilitation and Development Plan (RDP) are presented in Table 4.5.

Table 4.5: Programme 5: Environmental health and pollution management

A:	PRIORITY PROJECTS	IMPLEMENTATION RESPONSIBILITIES[5]			IN RDP?
		GOV	P.S.	NGO	
1.	Medical Waste Management	P	P	P	New Project
2.	Assessment of Industrial Pollution and its Impact on Environment	P	P	S	New Project
3.	Chemical Safety	P	P	P	New Project
B:	NO RESERVE PROJECTS				

4.2 Implementation strategy

The policy, legislative and institutional reform described Chapter III are the first steps in the NEAP process. The second steps, described in Section 4.1, are the setting of priorities, the identification of activities to be carried out over the short, medium and long terms, and an investment plan to finance

[5]Denotes who will have primary (P) or secondary (S) implementation responsibilties, Government (GOV), the private sector (P.S.) or non-governmental organizations (NGO).

implementation. However, implementation - the third key step - must follow the others or the NEAP process will become meaningless. Implementation consists of several components. These include ensuring that necessary implementation conditions are met, the development and dissemination of information and education programmes to inform the public and the government about the new policies and legislation, and the assignment of implementation responsibilities among various components of society (government, government ministries, local administration, the private sector, NGOs and the local institutions and local peoples). Strategies for this third step are discussed below.

4.2.1 Necessary conditions

There are certain conditions outside the control of the NEAP policy, organisational, legislative, and technological reforms conditions are vital for NEAP implementation. These conditions must be met in order for implementation to succeed.

4.2.1.1 Enabling political climate and support

The main difficulties in proper environmental management are often not technical but political, economic, and social. Among these latter, the political aspect is the most significant. In this context:

- The NEAP must at all times have a high level of political support, both inside and outside Government, based on a clear understanding of its content and expected results;
- The political system at any given time must be conducive to the participation of the people, have a decentralized decision making process and allow freedom of speech and confidence in creative and critical thinking;
- The political decision making process must be transparent particularly in terms of accountability, information access and publicity;
- A reasonable level of peace needs to be maintained and political unrest avoided;
- There are different roles for politicians and technicians which are complementary but not-interchangeable whether public or private. Policy formulation is the role of the politicians and policy implementation the role of the technocrats. Both need to be recognised and respected.

4.2.1.2 Financial resources

As described in Section 1.4 above, the economy is only beginning to recover from devastation caused by years of civil strife. Expenditures on the Rehabilitation and Development Plan (RDP) far exceed the resources available to the government from domestic sources and the budget is running a significant deficit. The value of imports and annual debt obligations is much larger than the value of exports. Foreign grants as well as borrowing from both foreign and domestic sources support the balance of payments deficit and the government budget deficit. The economy alone cannot support the present level of expenditure, with regard to the government budget or the balance of payments. This situation is not sustainable in the long-run. With large expenditures on rehabilitation, the availability of funds for many other aspects of the budget is very constrained. This situation demands that serious consideration be given to the financial resources required by, and the economic implications of, any natural resource management and environmental programmes proposed. As a result:

- Continued donor support is essential, but donor-driven activities which fall outside the NEAP investment programme as well as those activities which use expensive and unsustainable imported technologies will be avoided;

- Investments must, as far as possible, be non-political both at the local and international donor levels;

- Environmental operations must be based on a combination of both "bankable" projects but also on those with typically social benefits. For projects which produce marketable commodities (e.g., market agriculture, plantation timber, tourism, fishing, etc.), investments should be evaluated against returns on good private investments, or rates thought to be about 10-20 percent. For public projects which produce typical public goods, projects should have a rate of return of at least 1-5 percent to contribute positively to the servicing of Uganda's considerable debt. At the lower bounds, a social discount rate of zero may be acceptable for certain projects striving to avoid environmental irreversibilities;

- Investment seek to develop strong complementarities by combining projects by location, strategy and sector;

- Principles of proper accounting and transparency in the use of resources must be maintained at all times; whenever possible, programmes proposed must be, or become, self-financing;

- Line agencies must move towards becoming supervisory and regulatory agencies which set policy, prices and contract conditions, rather than be the implementing agencies for resource management activities;

- The responsibility for resource management must be integrated into contracts, leases and concessions which regulate resource use by the private sector; and

- Implementation strategies must focus more on establishing an appropriate economic environment to promote sustainable natural resource use, and less on classic government-run development projects.

4.2.1.3 Human and institutional capacity

Uganda's ability to plan, implement, and evaluate activities in environment and natural resources is weak. Forestry, national parks, game, and fisheries are separate government entities. This virtually assures confusion, rivalry, and waste. Databases on resource conditions are few, outdated, scattered, and incomplete. National data on the use and disposal of hazardous materials and industrial and medical wastes are sketchy and incomplete. Many elements of basic physical infrastructure in the resource and health agencies are absent or badly deteriorated after years of neglect, e.g., buildings, information centres, and equipment for sampling and measurement.

Additionally, Uganda's ability to effectively price and collect revenues from its natural resources is inadequate, even though improved revenue assessment and collection is a national priority at the highest levels. Skills in the design and evaluation of programmes and projects are very narrowly distributed. Therefore, while the country attracts substantial inflows of foreign grants and loans for projects in environment, health, and natural resources, her capacity to effectively assimilate these funds is an open question.

Thus the third necessary condition for implementation of the NEAP - that of building organizational, planning, policy, information and technical skills - should be seen as a pre-investment strategy. The objective is to position the country to be able to protect and manage her environment and natural resources , but this cannot occur without improved institutions and trained human resources. In this context and pending funding and implementation of "Programme Area No.1: Capacity Building in Environmental Management" under the Investment Programme:

- a core of senior resource professionals will be maintained in the Authority, in the sectoral institutions and outside government (NGO's and the private sector) who are committed to NEAP

implementation, and who also have direct influence in executive and legislative deliberations. Under the Authority, these professional and technical cadres will be backed by strengthened information sources (i.e., a National Environmental Information Centre), an increased capacity for monitoring and standard setting (i.e., for EIA), and improved capacity for outreach (i.e., for public education); and

- nationals will be used as much as possible in all donor-funded environment/natural resource activities, and where necessary, donors will be asked to reallocate or provide new funds in current activities to include a local capacity building/training component.

4.2.1.4 Education and awareness

The success of the NEAP will, to a great extent, rely on the cooperation of all sectors of the population. This cooperation will be based primarily on a good understanding and awareness of NEAP's components (policy, legislative and institutional reforms and the Environmental Investment Programme). Thus, one of the first tasks of the Authority pending funding and implementation of Environmental Education and Public Awareness programme (Theme 5), will be to publish and disseminate information on all NEAP components. This will be accomplished in a variety of ways from providing District Environmental Officers with information packets, through workshops and seminars to articles in the NEAP newsletter *Focus on Environment.*

4.2.2 Implementing institutions

4.2.2.1 The role of the Authority

The National Environment Management Authority will be the overall coordinating body to ensure timely and appropriate implementation of national environmental strategies. The Authority will be linked to sectoral institutions such as line ministries, the districts, NGOs, the private sector and academic institutions all of which will play vital roles in implementation. The Authority's major duties and responsibilities have been described in Section 3.3.1.3 above.

4.2.2.2 The role of sectoral agencies and institutions

The bulk of NEAP's implementation responsibilities will be carried out by the various mandated government ministries, departments and agencies. Leading ministries and their roles are detailed below.

4.2.2.2.1 Prime Ministers office

This office is the head of Government business and receives information from and reviews and evaluates the performance of all Government Ministries in terms of social and economic development.

4.2.2.2.2 Ministry responsible for Natural Resources

The role of the Ministry is to assess, maintain and safeguard natural resources and the environment, and to develop, promote and coordinate the optimum and efficient use of natural resources in the fields of water, minerals, energy, forests, weather and climate, so as to promote sustained socio-economic activities and development in a healthy and safe environment. The Departments under the Ministry and their roles and responsibilities are as follows:

a. Directorate of Water Development

At the national level

- finalisation and implementation of the Water Action Plan (WAP);
- review of water sector legislation and regulations and development of water quality standards;
- formulation of national priorities for water resources;
- decentralisation of water resources management; and
- policy formulation for international waters and water use conflicts.

At the district level

- plan water resources utilisation in conformity with national priorities and plans (WAP, the Authority etc.); and
- monitor adherence to plans, regulations, standards and permits, and undertake necessary enforcement actions.

At the local level

- facilitate the development of community/water user organisations for water supply and sanitation management, maintenance, water use regulations and monitoring of catchments, including wetlands.

b. Directorate of Environmental Protection

Forestry Department

The major functions of this department are to: conserve and manage forest land to ensure that there is adequate supply of timber and fuelwood on a sustainable basis; and to ensure the protection of soils and water supplies and the conservation of plants, animals and other biological species in their ecosystems. The Forestry Department is also responsible for educating the public about the value of forests and trees both for current and future generations.

The role of the Department in environmental management will be as stipulated below:

Forestry Resources Department (Management and Planning Unit)

- review, assess and modify existing forest policy as necessary;
- conduct research on appropriate techniques for sustainable utilisation of forest resources;
- conduct inventories of important species;
- embark upon the conservation of medical plant/endangered tree species through ex situ conservation;
- coordinate the implementation of the tree planting agenda;
- increase the scope of the peri-urban plantation to better meet urban needs; and
- evolve a forest development programme.

Nyabyeya Forestry College

- integrate environment matters into the forestry syllabus at their level.

Meteorological Department

- revive the National Climate Committee to guide the department on climate matters;
- design and implement a monitoring network for the elements of climate; and
- develop legislation on the use and management of the atmosphere, formulate atmospheric standards and monitor atmospheric pollution levels.

c. Directorate of Minerals and Energy

Energy Department

- review, assess and modify if necessary the existing energy policy.

Department of New and Renewable Energy

- promote more efficient woodfuel utilisation; and
- spearhead the use of alternative sources of energy.

Department of Petroleum

- develop and institute a disaster preparedness plan;
- improve holding capacity of petroleum stores and cater for more effective handling and transport facilities; and
- develop and initiate regulations on the handling of petroleum products.

Department of Hydro-electricity

- encourage and facilitate private sector participation in the rural electrification strategy;

4.2.2.2.3 Ministry responsible for Agriculture, Animal Industry and

Fisheries

The role of this Ministry is to support, promote and guide all crop, livestock and fisheries production. This is to be achieved by ensuring that all farmers, producers and fishers are assisted in raising the quantity and quality of their produce so as to both sustain Uganda's self sufficiency in food, and help in the country's economic and social development through increased exports.

In terms of environmental management, all Directorates in the Ministry will be involved in:

- reviewing the agricultural policy with view of integrating environment matters;
- coordinating the finalization of the soils policy in conjunction with relevant institutions;
- carrying out a nationwide survey to establish the status and extent of soil degradation; and
- embark upon, in collaboration with other institutions, an effective control and eradication programme for water hyacinth.

The duties and responsibilities of the specific Directorates in the Ministry are as follows.

a. Directorate of Crop Resources

- increase food production through improved and environmentally friendly methods; and
- formulate a comprehensive policy on livestock/rangeland management, develop an inventory of rangelands and in collaboration with Uganda National Parks and the Game department, develop a wildlife ranching programme.

b. Directorate of Agriculture Extension

- incorporate environmental concerns in the unified extension services programme; and
- develop a comprehensive food security strategy in collaboration with other relevant institutions; and

- identify a better system of providing technical advice to farmers through a unified extension service permeating to the parish level.

District Farm Institutes (DFIs)

- provide a better linkage between research and extension in terms of demonstrating improved agricultural practices and natural resource management practices.

c. Tertiary Institutions e.g Bukalasa Agricultural College, Arapai Agricultural College, Fisheries Institute Entebbe.

- Integrate environment matters into their syllabi.

4.2.2.2.4 Ministry responsible for Finance and Economic Planning

This Ministry has the responsibility for formulating financial and monetary policies. It is also charged with managing the economic activities of Uganda - through fiscal and monetary policies - to achieve sustainable economic growth. On the planning side, it is responsible for: planning for the economic and social development of Uganda; planning for effective and efficient utilization of resources; coordinating national planning activities; allocating national resources for economic and social development; and scrutinizing and coordinating offers of external economic and technical assistance.

a. Expenditure Department

- integrate environmental issues in macro-economic planning; and

- support institutions dealing with natural resources.

b. Aid Coordination Department

- establish monitoring and evaluation techniques in respect of the investment programme; and

- prioritise environment investment programmes.

c. **Economic Planning Department**

- incorporate environmental concerns into the national socio-economic planning process; and
- facilitate training of environmental/natural resource economists.

d. **Population Secretariat**

- integrate environmental concerns in the Population Policy and Strategy.

e. **Parastatals under Ministry of Finance and Economic Planning; Uganda Investment Authority**

- liaise with all institutions to ensure the EIA process is integrated in all proposed investments.

National Council of Science and Technology

- coordinate, promote, prioritize and direct research in environmentally related areas; and
- compile a directory of Researchers in the field of environment management.

Uganda Revenue Authority

- liaise with other sectoral institutions on the control of the export of endangered and reserved species; and
- liaise with other sectoral institutions in the control of hazardous material and chemicals.

4.2.2.2.5 Ministry responsible for Trade and Industry

The role of this Ministry is to: promote, expand and diversify all trade; promote ecologically sustainable industrialisation and the advancement of appropriate technology; facilitate the growth and proper functioning of the cooperative movement; and ensure effective marketing, quality products and consumer protection. The roles of the various departments with regard to environmental management will be as follows:

a. Department of Industry

- integrate environmental matters in the new Industrial Licensing Policy;
- ensure that industries do not carry out activities which are hazardous to the environment;
- encourage sound and environmentally friendly technology in industry; and
- monitor compliance with regard to regulations on the prohibition on importation of hazardous materials and technology.

b. National Bureau of Standards

- liaise with other institutions in the development of environmental standards where they do not exist and integrate environmental aspects in already developed standards; and
- monitor pesticide residues and related substances.

4.2.2.2.6 Ministry responsible for Education and Sports

This Ministry is mandated to deal with: development of education; initiation and promulgation of regulations concerning education; and controlling and managing schools. In consideration of this mandate, the Ministry's role in environmental management will be as follows:

a. National Curriculum Development Centre

- develop a curriculum for all schools on environment education; and
- develop environment teaching materials.

b. Schools and Colleges Department

- encourage schools and institutions to engage in environmental education programmes; and

- develop an environment education policy to include environmental subjects in their syllabi.

c. Teacher Training Colleges

- embark upon nationwide training of trainers in environmental education.

d. Manpower Planning Department and Schools/Colleges

- enable the schools to have in-service training for specialised environment/natural resource skills; and
- integrate environment matters into their syllabi.

e. Medical School and Institute of Public Health

- train students in control, treatment and eradication of environment-related diseases.

4.2.2.2.7 Ministry responsible for Foreign Affairs

The major role of this Ministry is to fulfil the obligations and duties conferred on Uganda by the bilateral and multilateral conventions, treaties, laws, charters and agreements.

a. Africa Region Department

- spearhead regional and international cooperation particularly concerning shared resource and transboundary issues.

b. Consular, legal human rights, research and information department

- liaise with line departments in the development of international treaties, conventions and their implementation.

4.2.2.2.8 Ministry responsible for Health

This Ministry is the watchdog over the health of the population. Its responsibilities include: formulating national health goals and policies; training personnel for government health services; and developing and running all government hospitals and health training institutions. In consideration of this critical mandate, the Ministry will play the following roles in environmental health.

a. Health inspectorate, public health department

- embark on environmental heath awareness campaigns; and
- implement Government policies on sanitation.

b. Urban/local authorities department

- promote environment health;
- establish systems to manage waste disposal; and
- rehabilitate and/or establish medical incinerators.

4.2.2.2.9 Ministry responsible for Information and Broadcasting

The major responsibility of this ministry is to inform the public on the policies and functioning of Government and to provide information to the general public on a variety of matters in order to make them more knowledgeable. With regard to environmental management, the roles and responsibilities of the various Departments in the Ministry will be as follows.

a. Directorate of Educational Broadcasting and UTC, Radio Uganda

- enhance dissemination of environmental information; and
- develop and disseminate awareness programmes.

4.2.2.2.10 Ministry responsible for Land, Housing and Urban Development

This Ministry's role is to encourage the population to build their own houses and in collaboration with the private sector, increase the housing stock and improve housing conditions in general. It is also mandated to promote progressive and productive use of land both in urban and rural areas. With

regard to environmental management, the roles and responsibilities of the various Departments in the Ministry will be as follows.

a. Land Administration Department

- ensure that environmental concerns are incorporated in the Land Tenure Bill;
- in collaboration with other relevant institutions, formulate and implement a National Land Use Policy and Plan which integrates environmental concerns.

b. Physical Planning Department

- initiate the formulation of comprehensive land use regulations; and
- institute monitoring of land use both at the national and district levels.

c. Directorate of Housing Building Research and Materials Development Section

- implement the National Shelter strategy; and
- promote the usage of environment friendly building materials.

4.2.2.2.11 Ministry responsible for Local Government

The ministry is mandated, inter alia, to do the following:

- overall co-ordination of local government policy and supervision of local authorities;
- establish efficient democratic local institutions to serve as the main instruments of political, social and economic development;
- promote and maintain active people's participation in the development and management of their areas;
- coordinate government policies which affect development of production or services in local areas; and

- resettle people from densely populated areas to less densely populated areas and take a lead in the resettlement of refugees.

The Ministry and its various Departments will assist the districts in carrying out the following roles and responsibilities as regards environment management.

a. RCs at all levels

- review policy to integrate environment aspects;
- integration of environment components in decentralised planning;
- engage in environment information dissemination and environment awareness campaigns;
- restore excavated/degraded sites after use; and
- provide land fills for dumping of wastes.

b. RC. Department; Administration and Establishment Department

- review by-laws to include environmental consideration and ensure their enforcement and compliance;

c. Community development, rural and urban, health services, planning, refugees. Rehabilitation, relief, administration and establishment departments.

- encourage Districts to develop and implement Land Use Plans.

d. Community development department; administration and establishment department; urban affairs department.

- develop improved rural social services.

e. City council, municipalities, towns

- include environmental concerns in the building standards;
- liaise with districts on environmental issues; and

- promote community participation in environmental management.

4.2.2.2.12 Ministry responsible for Works, Transport and Communications

The major responsibilities of this Ministry are to plan, design, construct, improve and maintain trunk roads, railways, aerodromes and water ways. It is also responsible for developing and regulating the operation of transport and communications services.

a. Directorate of Engineering

- ensure that EIAs are carried out before road construction;
- embark upon tree planting programmes along road reserves in order to protect road reserves; and
- evolve a Road Policy to cater for vehicular standards and ensure their compliance through incentives and disincentives.

b. Classified Road Network Department

- establish and oversee the enforcement of pollution standards connected with vehicles, railways, air and marine traffic;
- ensure that transport policy includes provision for pollution and waste management for railways, air and marine traffic and the road transport sector; and
- develop and institute disaster preparedness programmes for roads, air, water and rail traffic.

4.2.2.2.13 Ministry responsible for Women in Development

The primary role of this Ministry is to ensure the integration of women in development by increasing women's access to income-generating activities in order to achieve self reliance and equality. The Ministry is also responsible for ensuring that women fully participates in all aspects of development and that women's issues and concerns are incorporated into and addressed by all ministries and departments.

The Ministry will carry out the following functions with regard to environmental management.

a. WID Department (research and planning division)

- integrate gender concerns in all policies and enable women and youth to participate in the environment/natural resources decision making process;
- specifically target women and youth in environment awareness and education campaigns; and
- facilitate the networking of women's groups and NGOs addressing environmental issues.

4.2.2.2.14 Ministry responsible for Tourism, Wildlife and Antiquities

The mandate of this Ministry is to develop and promote tourism in Uganda and carry out conservation, protection and management of wildlife in its natural habitat. To be able to fulfil these objectives, the Ministry and its various Departments will have the following responsibilities in the context of the NEAP.

a. Department of Tourism

- Incorporate environmental concerns in the Tourism Master Plan;
- identify and gazette sites/areas of special natural attraction;
- in collaboration with Ugandan and other tour operators, promote eco-tourism development and tourism in general; and
- ensure that EIAs are conducted in all tourism ventures.

b. Game Department

- carry out inventories of endangered and threatened species and recommend protection measures;
- develop a long-term wildlife conservation strategy; and
- ensure that trade in endangered species is controlled.

c. **Uganda National Parks**

- integrate community participation in the management of wildlife resources;
- develop applied research and training in ecology and conservation of natural resources; and
- manage the nation's natural assets conserved in the national park system.

4.2.2.2.14 Ministry responsible for Labour and Social Affairs

The mandate of this Ministry is to ensure the welfare of, and justice for workers in their places of employment through provision of good working conditions, health and safety standards and security of earnings. The Ministry and its Departments will carry out the following functions with regard to environmental management.

a. **Occupational Health Department**

- develop/formulate and implement anti-pollution policies and laws in the working environment;
- conduct research into the causes of occupational diseases;
- establish and oversee arrangements for emergency repairs resulting from technological disaster; and
- monitor compliance with established guidelines and standards for occupational health.

b. **Relief Services Department**

- improve emergency preparedness services, particularly with regard to health-care and resettlements.

c. **Factories Inspectorate**

- develop guidelines for and ensure protection from industrial technological disasters.

4.2.2.2.15 Ministry responsible for Internal Affairs

This Ministry is primarily responsible for internal security but also houses and controls the Government Analytical Laboratory. The main function of this department is to protect public health by ensuring the use of clean and safe foods, drinks and drugs. The Lab also examines forensic cases. The following roles will be undertaken by this department as regards environmental management.

- Implement the monitoring of residues of toxic chemicals in the environment; and
- Facilitate the training of judges and magistrates in environmental aspects in liaison with sectoral institutions.

4.2.2.2.16 President's office/Karamoja affairs

This Ministry was established to enable Government to pay particular attention to Karamoja area and will play the following roles as regards this region.

- embark upon the formulation of the drought preparedness strategy;
- integrate environmental concerns into the Karamoja Development Plan;
- undertake socio-economic studies with regard to the impact of current land use and range management practices in the region;
- develop a land use plan for the Karamoja area;
- embark on massive environment awareness and education campaigns; and
- undertake a review of on-going and proposed projects to ensure the incorporation of environmental concerns.

4.2.2.2.17 The role of academic institutions

Graduate and undergraduate programmes in certain departments of academic institutions will me modified to better reflect environmental concerns and better respond to national manpower needs in the environment

and natural resource management. Makerere University will be the leading academic institution particularly the Departments below.

a. Makerere University Institute of Environment and Natural Resources (MUIENR)

- develop graduate training and research programmes on environmental information systems, geographical information systems, land use planning, and environment/natural resource economics; and
- develop and implement training programs for professionals on the above topics.

b. Makerere University Institute of Social Research (MISR)

- develop graduate training and research programmes on the social aspects of environmental management including the application and use of indigenous knowledge;

c. Department of Applied Statistics and Applied Economics.

- develop undergraduate programmes in environment/natural resource economics and energy planning.

d. Faculty of Law

- develop an environmental law programme.

e. Faculty of Agriculture and Forestry

- develop inter-disciplinary natural resource management programme which encompasses both biophysical and socio-economic components;

f. Institute of Adult Education

- develop adult environmental education training of trainers programmes.

4.2.2.2.18 The role of research institutions

It is envisaged that under the NEAP, various research institutions will conduct research on environment and natural resource matters directly related to the Action Plan and the Investment Programme. It is also expected that much of this research will be of regional interest. As stated above, the National Council for Science and Technology will coordinate all environment and natural resource research of the following organizations.

a. National Agricultural Research Organization (NARO)

In addition to maintaining and strengthening its traditional agricultural research programme, NARO would also:

- conduct research on land management issues including land and soil degradation; and
- collaborate with other research institutions on terrestrial biodiversity issues.
- conduct research on the effect of pesticide residues in food; and
- conduct research on the impact of pesticides on non-target organisms.

b. Uganda Fresh Fish Research Organization (UFFRO)

- undertake inventories and research on aquatic ecosystems;

c. Uganda Trypanosomiasis Research Organization (UTRO); (Animal Research Control Centre)

- research into the effective tsetse fly control methods; and
- research on improved animal disease control methods.

d. Nakawa Research Centre

- conduct additional research on little utilized indigenous tree species to ascertain relevant uses; and
- revive woodlots laboratories.

e. Mbarara Institute of Tropical Forestry

- conduct research on conservation of wildlife resources (biodiversity).

f. Uganda Institute of Ecology (research division of UNP)

- research on conservation of wildlife

4.2.2.3 The role of the non-governmental organisation (NGOs)

The contribution of NGOs towards the implementation of environmental management policies and actions is crucial, from both a technical assistance point of view, and as a means of facilitating people's participation at the local level. Indigenous community-based NGOs are important instigators of local community projects, and valuable teachers and trainers in support of government programmes at the grass roots level.

At the national level, a few selected NGOs will act as advisors to the Authority in their areas of specialisation. At the grassroots level, activities will be linked through NGOs to broader activities and policies at the district and national levels. NGOs will also provide a convenient and effective way of administering community targeted incentives, and facilitate mobilization for environmental education and awareness programmes.

In this context:

- sectoral ministries and local authorities will be encouraged to utilize the capabilities of local NGOs in the implementation of environmental activities, taking into account the capabilities of the particular NGO and the specific situation;
- Particular attention will be directed to those NGOs which provide support and opportunities to the more disadvantaged groups, such as women, the aging and the youth; and

- NGOs will be fully informed and involved in the NEAP process, especially in the decentralization of NEAP implementation. Qualified NGOs will be used as partners in bringing the NEAP message to the land-users.

4.2.2.4 The role of private sector

As stated above, the country's economy is only beginning to recover from the economic devastation caused by years of civil strife. While the government is rapidly moving the economy from a command economy to a market-based, mixed economy, many government agencies have not yet reassessed and reoriented their role in this transformation. There is still a

tendency among many line agencies to rely on Government (with the help of donors) to fund the natural resource management and environmental protection activities which are proposed in the investment programme. Given the financial and economic constraints which the country faces, many of the environmental objectives are unlikely to be achieved. This is particularly true if funding remains dependent on official government development resources. Thus, the Action Plan's strategy is to pass much of the actual implementation of natural resource management to the private sector (including NGOs), while government agencies take on the role of supervising and regulating natural resource use to meet societal needs.

In this context:

- sectoral ministries will be encouraged to reduce their implementation responsibilities and government financial requirements and increase their supervisory and regulatory by involving the private sector in natural resource management;

- private sector resources will be mobilized to achieve environmental objectives, through the use of contracts, leases and concessions and other arrangements; and

- sectoral implementation strategies will be encouraged to focus more on establishing an appropriate economic environment to promote sustainable natural resource use, and less on classic government-run development projects.

Finally, the private sector will also play a major role in developing and implementing environmental standards; carrying out Environmental Impact Assessment and effecting them where they are concerned; and in developing and implementing environmental awareness campaigns in their particular areas of interest.

4.3 Monitoring and evaluation

The Authority's monitoring and evaluation programme is composed of two components; an environmental monitoring programme and an internal system to monitor the Authority's policy and programme impact.

4.3.1 Monitoring the environment

The goal of NEAP is to ensure sustainable use of natural resources upon which the welfare of the present and future population depends. In order to achieve this goal, it is necessary to:

i) identity all the agents of environmental degradation; whether known or suspected;

ii) evaluate their impacts, particularly on resources of major socio-economic values; and

iii) provide effective measures to minimize the impacts of these agents especially on vulnerable resources.

Monitoring plays a crucial role in all these activities. It generates information which enables corrective managerial decisions to be made in order to achieve desired goals and adhere to established standards.

The definition of monitoring used in this section excludes research. But it is evident that the boundary between the two is not very distinct. Moreover, research is important in determining the right choice of indicators to measure and in what circumstances. Furthermore it is important in the development of better methods of monitoring. Therefore there must be an effective dialogue between those responsible for monitoring and those responsible for research such as Makerere University Kampala and the agricultural and forestry research stations. For this reason the Authority must liaise with both the monitoring institutions and the research institutions where these are different.

4.3.1.1 Environmental monitoring objectives

The general objective of monitoring is to establish the status of the environment and to evaluate the impacts of various activities on the environment in general and natural resources in particular.

The specific objectives are:

- to understand the present levels of degradation by various agents so as to judge whether the abatement policies, programmes and projects are succeeding;
- to identify environmental risks and impacts not previously known so that they can be brought under control;
- to follow the movement of harmful agents through the environment into living creatures and man himself; and
- to identify activities that are beneficial to the environment and ensure sustainable use of natural resources.

Monitoring is therefore a system which can be used for reconnaissance, surveillance and investigative purposes.

4.3.1.2 The present monitoring programme

Owing to political instability experienced in the 1970s and mid 1980s, inadequate manpower and equipment, poor organisational infrastructure and lack of funding, there has been no coherent monitoring programme in Uganda since the 1960s. However, some isolated monitoring activities have survived over the difficult years, although they are sectoral in nature. Actual programmes and measurements have been carried out by sectoral establishments such as Makerere University, Kawanda, Namulonge and the Government departments such as Forestry, Meteorology etc.

Sectoral monitoring is desirable since monitoring requires a network of sampling stations covering all active sectors. However it also poses certain problems. First, monitoring activities are not coordinated; some areas of environmental concern are not covered at all while others might be covered by several departments resulting in considerable redundancy. Second, monitoring activities were designed primarily to serve sectoral interests; each institution uses its own methods without due regard for standardisation of procedures. Even the methods used to monitor the same agent often vary from institution to institution and from laboratory to laboratory. The resulting data from these measurements are therefore not comparable and applicable to a wider situation. Moreover, most data and available information are kept in the sectoral institutions, are not published, and are therefore not available for use by others. Finally, there has been no agency or body in the country given the mandate to compile all the data and information and evaluate the overall national status of environmental/natural resources.

As a result of the above, the status of the environment at the national level is less known compared to what is known at the sectoral level. A monitoring programme that corrects the above problems is therefore required.

4.3.1.3 The desired monitoring programme

The NEAP environmental monitoring programme will be sector based but will cover the country at both national and local levels and will be overseen and coordinated by the Authority. Methods of measurement will be standardised in order to ensure accuracy and uniformity of results. It will attend to interconnecting areas by defining the scope for each sector in order to avoid overlap and redundancy; it will also fill-in current critical gaps in the information base.

Implementation and coordination of the programme will be the responsibility of the Authority's Monitoring and Evaluation division in collaboration with the National Environment Information Centre. These two central units will be responsible for the overall strategy for monitoring and information exchange, respectively. In particular they will:

- advise local authorities and sectoral institutions on how to set up their own monitoring networks so that duplication is avoided;

- review all sectoral environmentally related monitoring programmes and develop new ones to fill gaps or newly emerging areas of concern when necessary. In particular carry out special monitoring programmes nationwide to generate basic information that is currently lacking;

- establish guidelines on methods and equipment to be used and statistical treatment of both sampling and handling of results;

- control quality and compatibility of results. To do this, the central unit will ensure that the patterns of monitoring in different areas will be designed such that the resulting data are of comparable accuracy;

- ensure proper information flow and guidance so that the monitoring system is responsive to the required needs both of local and national level;

- prepare information for publication without duplicating or replacing more detailed reports from sectoral institutions. To do this the centralised unit will publish mainly trends revealed by the detailed reports and discuss their significance;

- participate in international monitoring efforts e.g. "global monitoring," and "nature watch"; and

- ensure a participatory approach.

4.3.1.4 The scope and strategy of environmental monitoring

Monitoring is expensive and consequently the decision to monitor, what to monitor, and how often to monitor demands careful consideration. Owing to limited resources, the NEAP monitoring process aims at acquiring and maintaining a minimum critical data and information sets. The main areas to be covered will include: deforestation; soil degradation; loss of

biodiversity; wetland degradation; pollution; and climate. The strategy with regard to these areas will be to:

- develop a minimum critical set of indicators for each area;
- establish inventories of sources of stressors and policies that control them;
- establish baseline data on the most significant indicators;
- measure at source and follow through pathways to targets;
- measure target responses; and finally; and
- collate data, interpret and disseminate information.

This approach will be used for all environmental aspects to be monitored. Priority areas of concern will be addressed first followed by other areas of lesser concern as capacity improves. The monitoring instruments themselves will be monitored and reviewed regularly. Details of the monitoring programme for the first five key areas are provided below:

4.3.1.4.1 Monitoring forest and vegetation cover

Monitoring of both natural and man-made forests is essential for evaluating the forest condition and planning for their survival as living systems. Similarly, monitoring is important for vegetation cover throughout the country.

Forests in particular - as living resources - are subject to a number of influences that either cause their regression, impoverishment in terms of species of both fauna and flora, or promote their vitality.

Most influences are caused either by man's direct activities (i.e., logging, clearing for agriculture, fuelwood harvesting) or as a result of man's indirect activities which affect tree growth, including climatic change, air and terrestrial pollution or an increase in the number of some aggressive species. Even forests that are left untouched collapse over a given period of time due to various causes, especially mortality due to old age and inability to be recolonised.

In man-made forests, second and successive rotations usually show declines in performance. This often is a result of depressed site conditions especially reduction in soil fertility. In other cases, pathogenic or insect attacks may be destructive agents, particularly in monoculture.

a. Monitoring activities for natural forests

The monitoring programme for natural forests will focus initially on improving baseline data collection for key species, their relative abundance and distribution as well as general ecosystem status for all of the major forest types. This information will be updated at key intervals of 2-5 years depending on the status and forest type. The main indicators include:

canopy cover;
openness;
frequency and density of fire tolerant species;
humidity and soil moisture;
change in regeneration of common species;
insect build up;
pathogenic outbreaks; and
demand for forest products.

In forests where logging is taking place, or which are subjected to significant pressure for other uses, the monitoring programme will be more detailed in order to determine the effect of such activities on the forest. Depending on levels and nature of such activities, they may either degrade the forest or promote diversity due to changed food webs that might favour some species to the detriment of others.

More detailed monitoring may be directed to the effects of large animal populations especially elephants to forest ecosystems. Their increased numbers usually degrade forests and there is a critical need to determine the optimum population in a given size and type of forest.

Standard methods will be used in monitoring forest lands. These will include:

- remote sensing (use of satellite imagery and aerial photography);
- periodic inventories of forest areas, measurements, and assessments/re-opening of old permanent sample plots and the establishment of new ones;
- field inspections of forest areas;
- field reports from forest personnel and local administrators and communities; and
- review of administrative files.

b. Monitoring activities for man-made forests

Plantation forestry started in Uganda in the 1940s. Most plantations have been harvested and some are over mature. The second rotation is due to start as replanting occurs. However, as experienced in other tropical countries, there are usually growth problems in second rotations as a result of depletion of soil nutrients by the first crop or alteration of acidity levels. This often results in poor second crop establishment and survival rates leading invariably to reduced yields or even complete failure. Thus, monitoring of site conditions especially in areas where second and successive rotations are envisaged, is particularly important.

As with the natural forests, the main indicators are:

canopy cover;
openness;
frequency and density of fire tolerant species;
humidity and soil moisture;
change in regeneration of common species;
insect build up;
pathogenic outbreaks; and
demand for forest products.

Monitoring methods will be similar to those of natural forests. The Forestry Department will play the leading role in providing guidelines and monitoring both natural and man-made forests.

c. Monitoring activities for savanna and rangeland ecosystems

The country's savannas and rangelands play a critical role in socio-economic development and will also be the subject of a monitoring programme. Using similar methods as for monitoring forest cover, but with a more inter-sectoral approach the following indicators will be monitored:

Savanna

density/frequency/cover of annual species;
canopy cover of wood species;
frequency and density of fire resistant species;
decrease of overall cover; and
frequency and density of indicator species.

Rangelands

frequency and density of palatable species; and
frequency and density of toxic species.

d. Invasive and exotic species

In general invasive species are usually exotic which can establish themselves, particularly in higher rainfall areas, and tend to take over territory, usually reducing both the diversity and the actual numbers of many indigenous species. This is already happening in the Mabira, Budongo and Semliki forests due to the widespread intrusion of the exotic *Cassia siamea*. Monitoring is therefore required not only to control the spread of such species, but to assess their impact on natural ecosystems.

4.3.1.4.2 Monitoring soil degradation

Soil degradation refers to the decline in organic matter content accompanied by a deterioration of soil structure and lowering of soil fertility. In general, soil degradation is caused by a combination of soil erosion and over-cultivation (which are themselves inter-related) but which inevitably lead to loss of soil organic matter and nutrients, and destruction of the soil physical structure.

In Uganda, where application of fertilizers is limited, an important influence of yield decline is the physical conditions of soil. These result from complex interacting properties including structure, aggregate stability, porosity, bulk density, infiltration capacity and available water capacity. While these properties are partly determined by the basic conditions of texture and iron minerals present, soil organic matter is an important factor of influence.

Thus, monitoring soil degradation will focus on these physical, chemical and biological changes and their key indicators, as well as their proxy indicators, biomass productivity or crop yields; changes will be directly linked to their causal activities.

The lead agency in this exercise will be the Ministry of Agriculture, Animal Industry and Fisheries particularly NARO, and in collaboration with Makerere University. Degradation indicators are listed below.

a. Physical degradation and its indicators

Soil erosion is one of the most important contributors to soil degradation, and is mainly associated with inappropriate agricultural practices. Hence monitoring of soil degradation should place strong emphasis on this phenomenon. However, the degree of monitoring will depend, in part on both

soil type (e.g., texture, structure, etc.) and other variables including rainfall intensity, slope, wind speed and cultivation or use practices. For example, the dominantly red sandy clay ferralsols and acrisols of the humid plateau have reasonable resistance to erosion, but the sandier and loam varieties are very vulnerable to rainfall. In the mountain and highland districts, the situation is largely dictated by the steep slopes, most of which are long enough to generate high runoff and erosion thereby neutralizing the advantage of the relatively less aggressive rainstorms in this environment. The severe erosion on the semi-arid-plateau area is more attributable to removal of vegetation cover by humans rather than by natural elements (either storm erosivity or slope gradient) of which there is little human control.

Important indicators of soil physical degradation include, changes in the depth of top soil. Increased soil erosion leads to losses in top soil and consequently decreases in soil depths. Physical degraded soils are also characterised by high bulk densities and temperatures, low infiltration rates and low total porosity. Regular measurements and analysis of these parameters will provide information on the extent of physical degradation. Other important indicators include: the development of rill, sheet and gully erosion and increased yield or silt levels in the neighbouring rivers or streams; and development of surface crusts, soil slips, slumps and land slides.

b. Chemical degradation and its indicators

Indicators of chemical degradation are the changes in soil organic matter content and nutrient levels. Organic carbon losses resulting from soil erosion and other processes are often extremely high since most of the organic matter is in the top soil. Consequently, organic matter content of a degraded soil is very low. Similarly, exchangeable calcium, magnesium, Potassium, nitrogen, and phosphorous are extremely low in eroded and over-cultivated soils; measurements of eroded sediments and run off water would show typically high values of exchangeable calcium, magnesium, potassium, nitrogen, and phosphorous indicating that the surrounding areas are losing considerable amounts of these nutrients.

Changes in acidity and exchangeable manganese are also important indicators of soil chemical degradation. Decreases in soil acidity are usually associated with losses in nutrients and organic carbon and as a result of decreased rates of nutrient recycling and increased leaching. High concentrations and long- term use of chemical fertilizers may also give rise to soil acidification. Degraded soils therefore typically are acidic, have high levels of total acidity and exchangeable Mn and are low in effective cation exchange capacity.

c. Biological degradation and its indicators

As a result of changes in the soil physical and chemical properties, the population of soil micro-organisms may also change. In general, the population of the beneficial macro and micro flora and fauna generally decrease (e.g., earthworms and rhizobium) and harmful soil flora and fauna increase (e.g., pathogens). Chemically and biological degraded soils would therefore have low populations of beneficial macro and micro fauna and flora and relatively high populations of harmful species.

d. Biomass productivity

The most important proxy indicator of soil degradation is the overall productivity of the system. Monitoring and evaluation should ensure some understanding of the long-term changes in the productivity and sustainability of a given soil system. The economic productivity of a given soil system can be defined as the ratio of the total value of the output produced by the system to the total value of the inputs used by the system over one cycle. Consequently, sustainability of a system is a measure of the ability of the system to maintain or increase productivity over a long period of time in relation to that at the beginning of the cycle.

Degraded soils are usually characterised by low productivity largely because much of the soil potential has been eroded. Consequently, there is a need to measure potential biomass productivity of a soils system in order to estimate the level of soil degradation that has already occurred. This can be accomplished by measuring the additional inputs required to achieve similar crop yields as those of newly cleared neighbouring fields. Finally, nutrient deficiency symptoms in field crops would also serve to indicate to what extent nutrients have been lost in a given soil system.

e. Other sources of soil degradation

There are two additional soil-related activities which will be monitored. These include:

- unplanned mining and quarrying, especially of clay, sand and murram, as well as construction of socio-economic utilities. These activities are increasingly becoming a threat to soils. In many cases they take place on prime agricultural land and yet the same services could be obtained on less productive land; and

- excessive leaching of nutrients and salinization due to poor irrigation practices. This also contributes to soil degradation but at present, degradation due to irrigation is very limited in Uganda.

4.3.1.4.3 Monitoring wetlands

Wetlands contain organisms and ecological systems that have become adapted to temporary or permanent flooding. Thus, wetlands constitute an ecological entity that differs from open waters and dry lands in character and functions. The threats which wetlands are experiencing at the moment requires that a monitoring programme be instituted in order to guide their management. This management shall be at the district level with the relevant departments providing sectoral inputs and advice. Implementation of the monitoring programme will be primarily the responsibility of the Authority's Wetlands Management Unit in collaboration with relevant line Ministries district authorities and local communities.

A variety of indicators are available for monitoring wetlands. The main ones to be used include:

water levels;
inflow/outflow rates;
sediment transport;
pH;
transparency;
colour;
conductivity;
dissolved oxygen;
biochemical oxygen demand;
algae;
macrophytes;
invertebrates; and
fish, bird and animal life.

4.3.1.4.4 Monitoring pollution

Pollution arises from a variety of activities such as industry, mining, agriculture and the use of hazardous materials in the service sectors such as hospitals, schools and research centres. Consequently there is a variety of pollutants released to the environment. NEAP's pollution monitoring programme, detailed below, will focus on water, land and air pollution

a. Water pollution

Water quality

Water resources include surface water (lakes, rivers, streams and ponds) and underground water (boreholes and springs). These water bodies form the main part of life support systems for both animals and plants and are a vital economic asset. However, their productivity is currently threatened by pollution; the quality of water resources therefore must be monitored.

The monitoring programme will "follow" pollutants at several points on their pathway through the environment to water bodies including:

- at source - individual discharges to the sewage system;
- individual discharges to water bodies;
- effluent from treatment plants to water bodies;
- at points where water is taken for public water supply;
- in the tissues of fish and fish eating animals; and
- at points remote from pollution sources.

Monitoring discharges to sewers

There are massive discharges of hazardous and toxic wastes into public sewers countrywide. These discharges comes from a variety of sources including factories, garages, stores, hospitals and schools. most of which are located close to water bodies. Monitoring at discharge points will ensure that these sources treat their waste to acceptable levels before release to the sewers. This is important for three reasons. First, it will ensure that the final effluent to the water bodies meets environmental standards. Second, it will protect the fabric of the sewage works particularly the treatment process which can be poisoned by toxic chemicals from discharges. Finally, it will protect the workers of sewerage treatment plants from harmful materials in the discharge. The discharger, the enforcement authority and the receiver of the waste all have interest in the monitoring process and each will have the responsibility of ensuring that the monitoring programme is properly carried out.

The department of Occupational Health and Hygiene will be the government authority responsible for monitoring compliance by all factories and other registered workplaces. The National Water and Sewerage

Corporation (NWSC) - or other water and sewerage authorities as appropriate - will monitor strategic points of the sewerage system in collaboration with major water consumers. The discharger will have the responsibility of monitoring the composition and volume of his discharge on a daily basis.

Monitoring individual discharges to water bodies

A number of dischargers - not connected to municipal sewerage systems -discharge their wastes directly into water bodies. Typical examples are Nytil, Nile Breweries and others industries along the River Nile. Others like Kakira and Lugazi Sugar factories are in rural areas and discharge directly into rivers closest to them. These industries will also be required to monitor their discharges.

Another group of industries/factories discharge their wastes into storm water channels (e.g. the Nakivubo Channel in Kampala). This waste flows directly into the water body (e.g. Murchison Bay in Kampala). The authorities interested in this discharge include the municipalities, the water authorities (DWD, NWSC, Fisheries Department - FD) and the Department of Occupational Health and Hygiene. DWD is the authority responsible for processing of wastewater discharge permits and thus in charge of this monitoring component. However, relevant regulations may delegate the actual work of the regularly performed wastewater discahrge sampling and analysis to the directly interested parties.

Monitoring the condition of rivers and lakes

The vast majority of air and surface pollution eventually ends up in the water bodies. Monitoring is needed to follow the conditions of these lakes and rivers at pollution entry points and at the bulk area of the body. The objective is to collect information on the capacity of the water to support life and avail this information to the public. Specific indicators include sediment load, volume flow and chemical pollutants. The main authority responsible for surface waters is the Directorate of Water Development (DWD) who is mandated to take charge of monitoring this component. The Fisheries Department (FD) will collaborate with biologists (water ecologists) to monitor flora and fauna and the balance of natural life in water bodies as a further indication of pollution.

Monitoring domestic water supply

The objective of this monitoring programme - under the responsibility of the DWD - is to ensure pure and safe water supply. Water will be regularly sampled at intake points and from consumer taps and monitoring will involve

both chemical and bacteriological examination. Monitoring will be carried out by public health inspectors and medical officers of the municipal authorities in collaboration with among others, the Department of Public Health, the National Bureau of Standards (NBS), and the Laboratory of the Government Chemist.

Monitoring for Residues in Aquatic Life

Many pollutants end up in aquatic fauna and flora. Residue monitoring is therefore essential to protect consumers in both local and export markets. The FD and UFFRO will have major responsibility for this component will collaborate with the Laboratory of the Government Chemist (LGC.) and the National Bureau of Standards (NBS).

Special Studies

There are currently a number of water systems which are experiencing major pollution problems and increased levels of public concern. These include the Murchison Bay area, the Jinja-Njeru-River Nile area and the Kyabakuza - Masaka area. Special collaborative studies involving the Authority, DWD, NWSC, and FD (UFFRO) will be carried out in these areas to establish the current pollution levels and status.

Underground water has also been polluted especially through leaching from urban dumping. The lead agency for groundwater management is the DWD. This institution, among others, will assess the extent of pollution and regularly monitor the quality and quantity of groundwater.

Springs are a source of drinking water for a large portion of the population. A significant proportion of these springs are polluted mainly by faecal waste. A study to determine the pollution status of springs will also be undertaken by the DWD, the Public Health Sections in local administrations, etc.

Water quality indicators

The range of substances to be measured to indicate water quality varies with purpose or use of the water. The major ones are summarized below in Table 4.6. Group A are the more common water quality indicators while Group B indicators are for more rigorous water quality analysis.

Table 4.6: Water quality indicators

Group A	Group B
temperature	
acidity (pH)	fluoride
conductivity	sulphate
dissolved oxygen	non carbonate hardness metals
ammoniacal nitrogen	(Cd, Mg, Na, K, Fe, Ni, Pb,
(as, total oxidised nitrogen)	Zn, Cu, Hg, Cr)
suspended solids	cyanide, (uncomplexed)
chloride	phenols
orthophosphate	polychlorinated biphenyl
total phosphate	organohalogens
chemical oxygen demand	polyaromatic hydrocarbons
biochemical oxygen demand	silica
light transmission	
chlorophyll	
anionic detergent	
microbiols	

b. Land pollution

Land pollution is usually localised to areas of human activities such as waste disposal sites, industrial sites (including sites no longer used), mine spoil heaps and land adjoining operative factories. Application of persistent organic pesticides to farm land also creates pollution but of a general kind. Land can also be polluted from the fallout of substances from the air, the deposition of materials from storm wash and floods and the deliberate dumping of solid wastes and sledges. Accidents involving hazardous goods in transit by road or rail can also lead to land pollution.

Land pollution is of concern because it lowers the productivity of soil and can increase groundwater contamination through percolation. More importantly, harmful substances can enter the food chain of man and animals through land pollution causing severe health problems. It may also damage terrestrial ecosystems or wildlife species with consequent loss of biodiversity. In this context, the objective of monitoring this component is to minimize health and ecosystem damage and ensure that land productivity is not impaired.

The strategy for monitoring land pollution is:

- establish an inventory of acreage and location of land affected;

- measure the levels of hazardous substances on it; and
- measure the levels of such substances in plant and animal tissues, foodstuffs and in man.

Inventory of polluted land

An inventory of polluted land will be conducted in the context of land use plans developed at the District and lower levels. This will be the responsibility of the Department of Lands and Surveys (DLS) and local authorities in liaison with other sectoral departments such as the Factories Inspectorate (FI) and Mines and Geological Surveys (MGS).

General monitoring of land

The institution having the largest interest in land and its productivity is the Ministry of Agriculture, Animal Industries and Fisheries (MAAIF). Thus the MAAIF will be responsible for monitoring the condition of the soil, and of background levels of substances not in association of any particular source of pollution.

In practice, the measurement of toxic levels of pollutants in plants and the animals they support serves as a proxy indicator for general soil pollution monitoring. The MAAIF will therefore focus on pollutant levels on crops and livestock. However, specialist capabilities of the Laboratory of the Government Chemist will be indispensable in this exercise.

Monitoring close to sources of pollution

This involves more specific and localised monitoring around known sources of pollution. These include factories generating airborne pollutants, factory waste dumps, tips of soil wastes and sledges mainly from urban domestic and commercial refuse, and from large waste storage or disposal sites, including those from mining activities. The first step in monitoring these sources is to construct an inventory of hazardous materials involved in pollution and their location. This will indicate what contaminant to look for in the surrounding land.

The authorities responsible for the proper operations of the above activities include the Factories Inspectorate (FI) the OHHD, the Mines Inspectorate (MI) and local authorities. The roles of these bodies should be extended to monitoring the land under the influence of these activities. Hence the FI will monitor around factories, the OHHD around any other workplace including stores, the MI to monitor around mines, drilling sites and quarries.

The municipalities will be responsible for monitoring around garbage tips and the MAAIF will monitor agricultural chemicals distribution centres upcountry. All these authorities will collaborate in undertaking the above inventory, which when finalized will
be centrally available at the Authority as a useful part of the national picture.

Monitoring of pollutants in foodstuffs, wildlife and man

This is the ultimate indicator of how close pollution has come to man, i.e., to what extent is the food chain actually affected. As already stated above, an inventory of what pollutants are used and where will indicate what contaminants to look for in each sample. Those pollutants which are widely used and are known to be toxic to man through the food chain - particularly pesticides and heavy metals - will be closely monitored.

The agricultural use of pesticides is controlled primarily by the Agricultural Chemicals Statute 1989 enforced by the MAAIF. Consequently the MAAIF will take the lead for monitoring pesticide residues in foodstuffs in addition to monitoring the impact of pesticides on soil system dynamics. This will be done in collaboration with the Laboratory of the Government Chemist (LGC) and NBS. Monitoring for pesticide residues in wildlife will be carried out by the MAAIF in collaboration with the LGC and the Game Department. Monitoring of levels in man will be done primarily by the Ministry of Health's Institute of Public Health.

c. Air pollution

Air pollution is a very vast and complex subject. However, concerns about air pollution in the country are increasing due mainly to the recent industrial renaissance. Major emissions to the air arise from industry and present several dangers including:

- certain air pollutants when inhaled by man or animals attack the respiratory system and the skin and can cause ill-health and often death;
- certain air pollutants can damage plant life thus reducing crop yields and forest productivity;
- certain air borne particle pollutants which settle out on soils and vegetation often cause damage or contamination of human or animal foodstuffs;.

- air pollution can screen out sunlight, corrode structures and be a nuisance simply in terms of smell or dust accumulation; and

- air pollution is also the prime culprit in more global issues such as climatic change or global warming and ozone layer depletion.

The strategy of monitoring air pollution will be to:

- monitor at site (particularly industries) individual emissions to the air;

- monitor at varying distances from source or targets that may be affected through a sampling network arranged to follow the movement of a particular pollutant; and

- monitor particles trapped as they settle out on vegetation or the ground at varying distances from the source.

Monitoring individual emissions at source

This monitoring programme will be similar to that for land pollution. Invariably the emitters are factories and mines. Sectoral institutions/departments such as FI, OHHD, MI which are mandated to oversee matters inside the relevant establishments will be responsible for executing the monitoring programme under their areas of jurisdiction.

These same authorities are currently responsible for monitoring of air pollution in the working environments of industrial establishments. However, this monitoring is significantly different from that of the general environment. There are substance and agents present inside the workplaces at dangerous quantities that form serious pollution problems there, but in the general environment are diluted to the extent that they usually pose no significant problems. Therefore, the sensitivities of the methods used for each case will be different and medical surveillance will be necessary to identify the corresponding biological response.

Another air pollution problem is vehicular emissions, mainly in urban centres. Concern about this problem has reached significant levels now that the number of motor vehicles in the country has rapidly increased. Pollutants of major concern are lead and carbon monoxide and these need to be monitored. Responsibility for monitoring vehicular emissions will involve collaborative effort between the Department of Meteorology (DOM), the Kampala City Council (KCC) and the Authority among others.

The programme will begin initially in the major urban centres and move outwards as capacity increases.

4.3.1.4.5 Monitoring climate and the general atmospheric condition

It is now a known fact that some pollutants affect atmospheric processes with subsequent impacts on weather and climate. These operate chiefly by influencing cloud structures, precipitation and radiation balance between the sun and the earth. It is therefore important to monitor both climatic factors and the chemical content of the atmosphere and its turbidity. The chief chemical of concern is carbon dioxide - the major causer of the "green house effect". Measurements for atmospheric pollutants including carbon dioxide have to be made in sites remote from emission sources - (i.e., urban and industrial centres) in order to identify the condition at the "bulk" of the atmosphere. These sites are also therefore ideally placed to record background levels of pollution. The department of Meteorology in collaborating with the Authority will be responsible for coordinating this monitoring programme.

The following are the main indicators to be used for climatic monitoring:

temperature;
rainfall;
humidity;
soil temperature;
evaporation;
radiation; and
sunshine hours.

4.3.1.5 International collaboration

Uganda is not an isolated island as far as environmental issues are concerned, particularly with regard to the pollution of the atmosphere and shared water resources. Thus, domestic networks for air and water resources monitoring need to be harmonised and linked with those countries with which natural resources are shared. Uganda will also participate in global environmental monitoring programmes.

4.3.2 The Authority's internal monitoring and evaluation system

The above environmental monitoring programme emphasizes indicators directly related to the condition of the environment and natural resources. However, a monitoring and evaluation (M&E) system is also fundamental to the efficient and effective operation of a goal and time-bound-

directed organisation such as the Authority. A M&E system provides information needed for planning and design, feedback for tracking progress towards goals and objectives, and for the assessment of impacts. It also identifies gaps which may hinder progress before they become problematic.

M&E systems are information-driven and form the backbone of an institution's management information system (MIS). A MIS which is equipped with a M&E component is able to account for inputs (expenditures, person-hours, etc.) and compare them to impacts. This gives decision-makers and planners the capability to assess performance and cost-effectiveness of projects or programmes. Ultimately, it also provides the information needed to gauge the progress and overall effectiveness of the institution itself.

The Authority's internal M&E system will be responsible for:

- tracking and assessing the effectiveness of the institution in carrying out its functions; and
- measuring the impact of those functions.

This will lead into improvements on management and identification of needs, gaps or problems.

The Authority's internal monitoring system is basic to progress and accountability. It will be used constructively and scientifically and not as a policing function. When employed effectively, internal monitoring keeps programmes on track and signals the need for course corrections or modifications before they become costly and counter-productive. Its utility as a management tool, especially in situations where finances are in short supply, is clear.

Initially, given the Authority's mandate, its internal M&E system will focus on eight key areas: policy and investment programme impact, environmental information, legislation, environmental standards, environmental assessment and oversight, environmental education and human resources development, operational linkages with line ministries, and operational linkages with district-level institutions. Rationale and indicators for each of these key areas are discussed below.

4.3.2.1 Policy and investment programme impact

The NEAP's first product is policy. The policy-making process is central to the NEAP and will continue as an advisory function to government in the Authority. New policy needs will arise and existing policies may require fine tuning or modifications in response to changing circumstances in the future. The NEAP's work began with policy formulation, its passage to, and its approval by cabinet and government. However, the process which

produces should be examined to ascertain the extent to which they reflect opinions and concerns of all parties involved in policy-making. Moreover, the actual policies themselves need to be monitored in order to determine if they are having the desired impact.

Another major product of NEAP is the preparation of an investment programme which contains plans for the solution of environmental problems. Ultimately the Authority, government and donors will need to know the impact of the policy reforms and the investment programme on the environment, the economy, and the population. Furthermore, the Authority, government, donors and the general public will require measures of progress and effectiveness by which to evaluate investment in the Authority.

This aspect of monitoring examines the Authority's diverse range of outputs or products which will be carried out through divisional programmes which are tied to annual targets on a multi-year operational plan. These plans (which will be developed in co-ordination with the Authority), are in turn directed to attaining goals, such as: optimal district level resource management; locally-managed sustainable resource use; greater public awareness; compliance with environmental standards, and the like.

Means of gauging the degree of attainment of these goals will include: (i) investment plans (identified, designed, financed, and implemented); (ii) assessment of their impacts on the environment and on the standard of living of participants through the use of shared and agreed indicators; and/or (iii) progress in public awareness and education programmes.

Monitoring at the policy, programme and impact levels is closely bound to annual targets on a multi-year operational plan. The overall purpose of monitoring at the programme level is to measure progress and effectiveness of each institutional component or division. Monitoring impacts is needed to analyse costs and benefits which can be translated into measures of programme effectiveness and efficiency.

4.3.2.2 Monitoring the Authority's information system.

The Authority stands at arm's length from implementation. Operating as a national brain trust, an advisory and co-ordinating institution, it must effectively access and coherently manage information from the policy level down to activities at the grass-roots. Accordingly, the Authority's mandate involves a high degree of co-ordination and co-operation with line ministries, a diverse group of implementors, and institutions at the district level and below. The effectiveness of the Authority as an institution will largely hinge on the co-ordination and the effective and efficient use of information.

Maintenance and improvement of the information system is a primary function of the Internal Monitoring System (IMS). the Authority's information system interconnects it with line ministries through liaison officers and with district level government through district environmental officers (DEOs). The implementation of investment projects may also involve NGOs or grass-roots organisations, donors, or others. In order for the Authority to be fully involved in planning, it must be situated in the reporting loop. Management of the information flow thus centres on the role of environmental officers and liaison officers who are located at key points in the system.

Liaison officers will play an important role in information flow through line ministries and this link can be monitored from above by the IMU. They are an important link in the larger information circuit connecting the Authority, line ministries, and the districts.

Environmental officers are key points in the Authority's information system. They are situated at the strategic junction linking the Authority with the districts and the districts with local communities. Operating through the district administration, they are the Authority's chief linkage with the grass-roots. They also serve to monitor impacts and interaction with field-level personnel from line ministries and implementing organisations. Their multiplex role in the Authority's information system is critical. It is essential that the linkage between the Authority and the DEOs is interactive and operates in both directions, both up to the Authority and down to the district. DEOs will not merely be used as up-links for data, but will be fully involved in the down-flow of information to the districts.

Another crucial aspect at the field level is the link between districts (RC-V) and subordinate units (down to RC-I). Ultimately, most changes in environmental management will take place because of activities well below the district level and the DEOs' role in this aspect is critical as well. Initial indicators include:

- enabling legislation passed which will allow NEIC to collect data not collected by sectoral institutions and to analyse, store and disseminate environmental information;

- a comprehensive topic paper which reviews existing sources of environmental data and databases now in use which may share information with NEIC;

- technical capability in MIS sufficient to support analyses needed for district planning and monitoring aspects of investment project implementation;

- MIS system implemented; data flow established with an initial group of 6 pilot districts; and

- indicators associated with Sections 4.2.3.7 and 4.2.3.8 below, i.e., establishment of Environmental Liaison Units and posting/recruitment of District Environmental Officers.

4.3.2.3 Legislation

The NEAP process developed and established the capability to draft laws and statutes for submission to government and the process will carry over into the Authority. Legislation at the national level may be roughly divided into two types. The first may be described as environmental legislation, chiefly in the form of sectoral laws, undertaken through line ministries. Much of the effort here will be concerned with reviewing existing laws and statutes in order to remove ambiguities, and revise and streamline the current portfolio. The second type may be called enabling legislation; that is, legislation which enables the Authority to effectively fulfil its mandate. At a more detailed level, specific regulations will be needed to permit the Authority to effectively implement its mandate of co-ordination, oversight, and monitoring. More specific instances of enabling legislation are provided as indicators for monitoring specific NEAP products. In this context, legislative indicators will include: demonstrated effective co-ordination and production of draft environmental legislation through line ministries; and production of draft enabling legislation which enables the Authority to fulfil its mandate.

4.3.2.4 Environmental standards

Established environmental standards will be basic to the Authority's oversight of environmental quality. As with legislation, the establishment of standards is done through successful co-ordination and the co-operation with line ministries, district, the private sector, and the eventual involvement of the National Bureau of Standards. Indicators include:

- a prioritised agenda for setting sectoral and cross-sectoral standards under the Authority;
- demonstrated effective collaboration through line ministries; and
- production of draft standards for submission to government in line with Agenda 21.

4.3.2.5 Environmental assessment and oversight

In order for the Authority to carry out this responsibility, general guidelines and enabling legislation for EIA and an appropriate EIA review

process have been put in place. However, monitoring compliance and cooperation of the private sector, government, NGOs and others involved in projects or interventions with potential impacts on the environment will be necessary. The primary indicator will be the number of EIAs, submitted, reviewed, executed or resolved.

4.3.2.6 Education and human resource development

One of the Authority's major products is increased public environmental awareness and education. This includes both raising general public level awareness as well as specific training for people employed in environmental management. There is scope for revenue earning by co-ordinating the development and production of schools' curricula and learning materials needed to reinforce progress made by NGOs and other implementors. Indicators include:

- a comprehensive training needs assessment for the Authority;
- an initial agenda of activities to support training for environment-related jobs at the Authority, ministry, and field levels is put in the the Authority multi-year operational plan (MYOP);
- a development plan for curricula and training materials development and teacher training (in co-operation with the Ministry of Education and Sports) is included in the first Authority MYOP;
- a public awareness plan is given for the Authority following on activities initiated through the NEAP.

4.3.2.7 Operational linkages with line ministries

In order for the NEAP process to be successful, it is essential that well defined and effective lines of co-operation and information flow are established between the Authority and line ministries which will be involved in implementation of investment plans and collection of data at the field level. Monitoring indicators include:

- draft enabling legislation/regulations to assure information flow and clarify roles and responsibilities of the Authority and line ministry personnel;
- initial review of data collection instruments and methods in line ministries to assure the supply of appropriate data;

- presence of functional liaison officers in line ministries;
- job descriptions of liaison officers; and
- training needs assessed for liaison officers.

4.2.3.8 Operational linkages with district institutions

Linkages with the districts complete the information circuit needed by the Authority for the oversight of environmental policy and coordination of actions. Effective links with the district level and below will assure local input and participation in the identification, design, and implementation of investment projects and provide data or information needed to fulfil the co-ordination function. Equally important is the up-flow of data on resource use needed for the national database, analysis and planning. Monitoring indicators include:

- District Environmental Officers (DEO) recruited and in the field;
- clearly defined position of DEOs in local administrative system, in relation to line ministry field staff, and reporting channels to the Authority;
- District Environmental Committees (DEC) established in 6 pilot districts; and
- training needs assessed for DECs in 6 pilot districts.

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