STATE OF ENVIRONMENT REPORT FOR UGANDA 2004/05

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ACKNOWLEDGEMENTS

The National Environment Management Authority (NEMA) is honoured to present this sixth edition of the State of the Environment Report for Uganda. While it fulfils our obligations under the National Environment Act Cap 153, Section 87 (2) which requires NEMA to prepare and publish the National State of Environment Report biannually, the report contributes to the development of Uganda by providing information on the status and dynamics surrounding the use of environmental resources, particularly natural resources and the linkages with poverty and sustainable development.

This edition benefited from inputs and suggestions from various individuals and organizations. NEMA would like to extend special thanks to the World Bank who through the Environment Management and Capacity Building Project II supported the preparation and publication of the report. I also acknowledge UNEP as a regional partener for providing technical back stopping on this process.

Special recognition is due to out parterners in line ministries, districts, NGO's, CBO's and the private sector who provided data and commented on earlier drafts of the report. Their input contributed immensely to the report. I am also grateful to M/S Ema Consult who compiled the report.

Last but not least, I would like to appreciate and recognize NEMA staff for their substantial and technical contribution to this report.

I look forward ro receiving your positive critique and suggestions on the report. I wish you good reading.

Aryamanya- Mugisha, Henry (Ph.D)
EXECUTIVE DIRECTOR

FOREWORD

The commitment of the Government of Uganda in promoting sustainable environment management is in part, seen in the development of policies, institutional frameworks and targeted programs to ensure sustainable utilization of natural resources. This is more evident, especially in the legislative and institutional arrangement that were made between 1992 and 2002. After the 1992 Earth Summit, Uganda committed itself to the principles of sustainable development and formulated the National Environment Management Policy in 1994. This policy was translated into the National Environment Act Cap 153 (1995). The Act mandates the National Environment Management Authority (NEMA) to prepare and disseminate a State of the Environment Report once every two years. To date, Uganda has published five State of Environment Reports the first having been released in 1994. In all these reports sustainable development is seen to entail integration of economic, social and environmental objectives.

The 1994 report mainly took stock of the environmental goods and services of the country and hence gave a baseline data on the country's natural resources at that time. The 1996 report addressed issues with regard to causes, the state of the environment resources and the responses. The 1998 report focused on the stress on natural resources as manifested by environmental problems such as loss of agricultural productivity, loss of forest cover, water pollution, over harvesting of fish, enchroachment wildlife areas and wetlands to mention but a few. The 2000 report addressed the environmental implications of key Government programs such as Vision 2025, the Poverty Eradication Action Plan (PEAP II) and the Plan for Modernization of Agriculture (PMA). The 2002 report on the other hand focused on the principles of sustainable development and the relationship between the environment and poverty. This edition gave the countries future outlook and outcomes of different scenarios and paths taken to acheive sustainable development.

This report for 2004/05 looks at the drivers of environmental change, the ensuing pressures, the state of the environment, the impacts caused and the responses adopted. New evidence emerging from this report suggests that Uganda's current pattern of development is unsustainable. Economic growth is being achieved by mining the country's natural resource capital, particularly soil erosion caused largely by inappropriate crop husbandry, deforestation and livestock management practices. Futher, still this report attempts to put Uganda on the international scene by comparing its perfomance based on certain indices such as genuine savings, living planet and water scarcity. These indices as reported upon in various sections of the report reflect that Uganda performance is still acceptable on international standards. This report also recommends for urgent policy responses in order to have more effective environmental management.

I wish to commend NEMA for producing the report as required by law and I believe this report will contribute effectively in providing useful information that will guide well informed decisions at all levels of management in Government and outside Government.

Further, I extend my appreciation to the World Bank for the financial support to the Government of Uganda through the Environment Management and Capacity Building Project II. This assistance enabled the smooth preparation of the report.

I wish to express my thanks and gratitude to all institutions and individuals who contributed immensely towards this report and I hope this report will be put to good use by policy and decision makers in Uganda.

Hon. Major General Kahinda Otafiire
MINISTER OF WATER, LANDS AND ENVIRONMENT

EXECUTIVE SUMMARY

This publication is the sixth report of the State of Environment for Uganda. These reports are prepared biennially aimed at, among others, creating environmental awareness, informing the public, showing key trends in environmental attributes as social and economic development pressures mount on the environment and natural resources, and acting as a resource material for a diverse range of stakeholders. This State of Environment Report for Uganda 2004/05 is intended to meet the aforementioned goals.

The report uses the driving forces-pressure-state-impact-response format, all reported in an integrated way. That is, the report looks at the drivers of environmental change, the ensuing pressures, the state of the environment, the impacts caused, and the responses adopted if any. Furthermore, the report informs of emerging issues such as attempts to rank countries according to various indices including: biodiversity, adjusted net savings and water scarcity, the latter from both hydrological and social aspects.

The report is divided into three main parts containing nine chapters. Part I of the report deals with the introduction and country overview. Part II is a description of the state of the environment for Uganda for 2004/05 and includes chapters on: atmospheric, terrestrial, aquatic and cross-sectoral resources representing the biophysical component of the environment, and the socioeconomic and cultural environment. Part III contains chapters devoted to management systems and tools including innovative financing approaches, and conclusions and recommendations.

Country Overview

Uganda is a land-locked country sitting astride the Equator, characterised by a number of major transboundary natural resources (lakes, rivers and mountains). The latter call for greater cooperation with neighbouring countries.

From the 39 districts which were in existence in 1994, there are now 70 confirmed, with others proposed but not implemented as of 2005. While the increase in the number of districts will mean greater devolvement of central government functions including that of environment and natural resources management, the move will increase the cost of administration. The new districts will need to appoint environment and natural resources management officers (lands, forestry, environment and wetlands) as defined in the new structures recommended by the Public Service. The new districts will also be candidates for the environment action plan process.

The extensive habitat variations as a result of the intersection of phytochoria, the location on the Equator, and the wide range of altitudinal variations, extensive drainage systems and relatively fertile soils give the country a mosaic of vegetation, modified climates and extensive wetlands. When climate is considered with agriculture and altitude, one can identify two highland agricultural zones and seven zones with different agroclimatic potentials and environmental impacts associated with production.

Ugandans are a hospitable people consisting of at least 46 indigenous tribes with varying production and consumption patterns and hence varying influences on the environment. The population is growing rapidly at a national average of 3.4% per annum. This growth rate masks differences among the districts, ranging from over 9% for Kotido District to less than 1% for Kabale. The national population is relatively young. Those below 18 years of age make up 56% of the total population. There is also a high dependency ratio with a significant number of orphans. The mean household size is 4.8 persons - 4.2 persons in urban areas and 4.9 in rural settings.

Governance in Uganda is linked to the progressive devolution - as opposed to deconcentration - of power from the centre to the local governments through the process of decentralisation.

Since 1994, the economy of Uganda has registered an impressive growth rate. Over the period 1994 to 2005, growth of the economy measured by increases in the gross domestic product has averaged over 5% per annum. Headcount poverty levels decreased from 56% of the total population in 1992 to 35% by 2000 and then rose to 38% by 2004. The northern region is the most disadvantaged region of Uganda with headcount poverty of about 70% as a result of nearly 20-years of civil war and cattle rustling. Furthermore, while the growth of the economy is impressive, there are worries of inequitable sharing of the benefits. There are indications that the gap between the poor and the rich is now wider. In terms of structure, the share of the non-monetary segment of gross domestic product has continued to decline from 1994 and in the fiscal year 2003/4 it accounted for 20.4% of the total compared to the monetary component at 79.6%, an indication of a modernising economy.

Apart from the worry with the distributive aspects of the growth of the economy, considerations of sustainability suggest there should be additional concerns. One useful measure of sustainable development is adjusted net savings. Using this measure, Uganda's economic growth is unsustainable, contributed largely by soil nutrient loss. Put another way, the country's natural capital is being 'mined' without sufficient compensatory formation of physical and human capital.

Since 1991, growth in industrial output has averaged over 10% per annum. Most of the industrial activity is based on agricultural commodities and natural resources products. The growth in industrial production is accompanied by increased levels of air, water and soil pollution. The pollution effects are being mitigated somewhat using the environmental assessment process and cleaner production procedures.

Since 1991, the burden of transportation has eased somewhat. There are now more cars on Ugandan roads while air transport is becoming easier with more frequent international flights. On the other hand, rail and water transport are insufficiently developed. The road network is improving and the environmental effects of road construction and maintenance are mitigated using the EIA guidelines for the Roads Sub-Sector and several guidelines to address other cross-cutting concerns.

Communications have improved significantly compared to 1994 whether one uses the efficiency of postal services, fixed line and cellphone telephone services, radios or TVs. The most dramatic increase has been in the number of cellphone owners from almost none in 1994 to close to 900 000 by 2004. By 2003, there were over 7 000 internet subscribers from almost none in 1994. While communications will facilitate the transmission of environmental messages, the growth in cellphone use comes with a significant environmental problem, namely, the indiscriminate disposal of the non-biodegradable plastic air time cards and indiscriminate disposal of scrap phones and their parts.

Finally, employment in Uganda is still largely agriculture-based. However, as other sectors of the economy grow, agriculture’s share of total employment is expected to decline.

ATMOSPHERIC RESOURCES

Climate is an important resource. Of concern to Ugandans are issues of climate change and climate variability, both imposing adverse impacts on livelihoods, especially of the rural poor. Global research indicates that biodiversity is particularly sensitive to climate change. The country is a net sink for greenhouse gases. But atmospheric gases know no national boundaries, hence Uganda is also impacted adversely by increases and fluctuations in the earth’s temperature. Increased frequencies of floods and droughts are manifestations of climate change. The erratic onset and cessation of rains as a result of climate variability makes it difficult for farmers to plan when to plant crops. There have been instances of frequent crop failures of late. Hence, to reduce vulnerability to the deleterious effects of climate change and climate variability, adaptation plans including early warning systems need to be put in place.

TERRESTRIAL RESOURCES

Land resources and agriculture

Land is a limiting factor of production. Access to land is increasingly becoming difficult, especially for the poorer segments of society. Land degradation, especially through soil erosion is the single largest contributor to the annual cost of environmental degradation. Loss of soil nutrients is the reason the country’s adjusted net savings are negative, in the absence of other compensatory factors.

With respect to agriculture, the country’s dominant development pathways are: expansion of cereals production; expansion of banana-coffee production; non-farm development; expansion of horticulture; expansion of cotton; and stable coffee production. Each of these development pathways has implications for the environment which will have to be addressed whichever pathways are followed.

Forestry resources

Except for some recent policy failures, the loss of forest cover in the gazetted areas has been reducing and total cover is stabilising. Unfortunately, forests in protected areas make up only 30% of the national forest cover. The remaining 70% are on private and customary lands where deforestation rates are high as a result of conversion of forest areas and bushland into agricultural and pastoral land. Furthermore, the country's harvestible timber resources are almost exhausted. Hence, to increase forest cover and ensure increased supply of timber, the Sawlog Production Grant Scheme and other licensing measures including charging economic rents for timber are in place. Furthermore, to ensure that rural communities living adjacent to forest reserves receive equitable benefits, collaborative forest management is being promoted. In recognition of the scarcity of land and goods and services provided by trees, agroforestry systems are also being promoted as integral aspects of farming practices.

Rangeland resources and livestock production

Rangelands, mostly found in the *'cattle corridor'* occupy 107 000 km^2 or 44% of the country's land area. In some places, the conditions of the rangelands are deplorable - over-grazed, and through wind and soil erosion, bare. The rangelands are also located in arid and semi-arid areas, themselves fragile ecosystems. In the extreme, pasture and water scarcities are contributing to frequent conflicts between cultivators and pastoralists in the first place, and among pastoralists themselves.

The number of cattle, goats and sheep is on the increase and hence there is need to pay attention to the carrying capacities of Uganda's rangelands. There is anecdotal evidence that in some locales the carrying capacities of the rangelands are being exceeded. Unfortunately, nobody knows for sure. Quantitative studies of rangeland conditions are sorely lacking and ought to be addressed. Carrying capacities of various rangelands have also not been established.

On the other hand, piggery and poultry are intensive operations. Large-scale piggery and poultry operations can generate significant pollution problems. From 1999 to 2003, the numbers of pigs and birds have reduced somewhat for a variety of reasons.

Wildlife resources

Conservation or resistance to it, are the driving forces influencing Uganda's wildlife resources. Wildlife constitutes an important resource base for the country – as a source of food and material, recreation, tourism, nature study and scientific research. Wildlife resources occur in protected and un-protected areas. By 1994, wildlife populations whether inside or outside protected areas represented a small fraction of what they were in the 1960s, with some species such as both the black and the white rhino becoming extinct. By 2004, the populations of wildlife in protected areas had stabilised, and some even increased, although marginally so. Outside protected areas, the decline in wildlife populations continues almost unabated as a result of increased off-take, the blocking of migratory routes and habitat conversions, among others. The Uganda Wildlife Authority is piloting the conservation of wildlife populations outside protected areas through measures such as the operationalisation of the different classes of Wildlife Use Rights provided for in the Wildlife Act. Also, communities adjacent to wildlife protected areas are being encouraged to appreciate the prescence of wildlife through benefit (including revenue) sharing.

Mineral resources

Reading from geological formations, there is a significant mineral potential in the country. However, the exact locations of commercially-exploitable deposits in most cases are unknown. Of the ones that are known, on a base case scenario, the value of mineral production is expected to rise from the 2003 figure of $12 million to over $100 million/year; while on a best case scenario basis the value is expected to increase to over $200 million/year. However, the realisation of these projections is contingent upon availing sufficient capital to the mining sector.

When increased mineral production is realised, it will bring with it higher levels of pollution which will have to be mitigated, through among others, the use of the *EIA Guidelines for the Mining Sector* and regular supervision of mining operations.

AQUATIC RESOURCES

Wetlands

Wetlands cover about 13% of the area of Uganda and provide a number of direct and non-direct values to the people of the country. Up to late 1980s, wetlands were generally considered ‘wastelands’ to be reclaimed for agriculture in rural areas, and ‘drained’ as an anti-malarial measure in urban settings. By 1994, the need for conservation was realised and the process of formulating an appropriate policy of wetlands.

By 2001, wetlands came to be regarded as ‘granaries of water’. From being a project in 1994, wetlands had by 2005 obtained an institutional home within government structure. Wetlands are now better known and better characterised with detailed information up to the district level. The 56 districts existing by 2004 all had District Wetland Action Plans. Some communities in a few districts have gone ahead and prepared Community Wetlands Action Plans. The management of wetlands is governed by a 10-year Wetlands Sector Strategic Plan which qualified for funding under the Poverty Action Fund. Despite such an impressive achievement, the implementation of the various action plans is constrained by lack of resources.

Furthermore, despite a wide array of achievements, wetlands degradation is still evident – some for basic survival needs of the poor, others as a saving measure where land purchase prices are high, and yet others are the result of ignorance about ownership and legal boundaries of wetlands. Perhaps the most important reason for continued wetland degradation is weak enforcement of the applicable environmental laws and fairly low levels of awareness among policy makers and rural communities.

Water

Water is life, and Uganda has significant quantities of the resource. From both hydrological and social water scarcity considerations, at the moment Uganda is not water stressed. However, by 2025, indications are that there will be reason to worry as a result of increasing demands for human, livestock, wildlife, irrigation and industrial water. Uganda is ranked in a group of countries that must plan and secure more than twice the amount of water they used as of 1998 inorder to meet reasonable future requirements.

The quality of the water from available sources is another area of concern principally as a result of pollution – residential, industrial and agricultural land discharges into the open waterbodies. To some extent the buffering capacity of wetlands is making a contribution towards reductions in pollution, but this will continue only if the integrity of the wetlands can be sustained.

Fisheries

The fisheries resource of Uganda has been an important source of high quality solid animal protein. On average Ugandans were consuming about 13kg/person/year by 1994. As of 2005, this consumption was estimated to have declined to about 10kg/person/year, mainly as a result of increasing scarcity and cost. Exports of fish and fish products are also on the increase. The twin effect of increases in domestic consumption as a result of population growth and higher levels of export demand has pushed capture fisheries close to its long-run sustainable supply and is threatening to exceed it. There is evidence of localised over-fishing in certain waterbodies. Two lakes (Victoria and Kyoga) and two species (Nile Perch and Tilapia) account for over 80% of annual harvest, implying a high level of selectivity. On the other hand, the Nile Perch, a carnivore, is having a devastating effect on the fish biodiversity of lakes Victoria and Kyoga.

A new fisheries policy is in place and seeks to address among others enhanced aquaculture development by adding 100 000 tonnes per year to the one of capture fisheries of about 330 000 tonnes so as to raise the combined long-run sustainable supply to 430 000 tonnes at least. The development of aquaculture at this magnitude will call for a combination of commercial and artisanal productions. Both modes of production have the potential to generate significant adverse environmental impacts which need to be mitigated. Due to the uniqueness of acquaculture, specific environmental impact assessment guidelines may have to be developed for this activity.

CROSS-SECTORAL RESOURCES

Energy

The dominant source of energy in Uganda is biomass and this is expected to remain so in the foreseeable future inspite of plans to increase hydropower energy production. However, the share of clean energy in total consumption is gradually increasing, in part as a result of programmes like the Energy for Rural Transformation. Production of energy has also been liberalised, attracting an increasing interest among private investors. The adverse environmental effects of clean energy production are mitigated through the *EIA Guidelines for Uganda 1997* and the *EIA Guidelines for the Energy Sector*.

Biomass energy will continue to be an important source of energy, especially for the rural poor, who constitute the majority of Ugandans. In some districts, the scarcity of biomass is already beginning to have impacts on the quality of food prepared. Households are opting for easy to cook but often less nutritious foods. There is need to encourage agroforestry practices so that households can raise their own biomass energy requirements in conjunction with farming practices.

There are some efforts to diversify clean energy sources through the promotion of new renewable energy such as solar and biogas. Unfortunately, the investments required are still at levels which the rural poor cannot afford. Geothermal energy on the other hand, has potential for increased electricity production. There are at least two promising sites awaiting development.

Biodiversity

Uganda is endowed with a very rich and varied biodiversity due to its biogeographical setting, varied altitudinal range and extensive drainage systems. This biodiversity is a national asset supporting rural livelihoods and contributing to commercial economic activities. The contribution of Uganda's biodiversity resources, organisms or parts thereof, populations or other biotic component of ecosystems with actual or potential value for humanity has been estimated at $1000 million per year, balanced against economic costs of $ 202 million plus losses to other economic activities of about $49 million per year.

While Uganda continues to lose some of its rich biodiversity, the rate of loss has been reduced somewhat. Reflected in terms of Living Uganda Index, the country out-performs planet Earth as a whole when the Living Planet Index is considered. The loss of biodiversity in protected areas has to a great extent been stopped and the trend reversed between 1990 and 2005. Outside protected areas biodiversity loss was still continuing as of 2005. The loss of biodiversity is largely the result of habitat conversion and introduction of alien species.

Tourism

The rich biodiversity is one of the reasons tourists come to Uganda. The projections of tourist arrivals from a base of 68 000 in 1993 was about 140 000 by 2002. In retrospect this projection turned out to be conservative because by 2002, actual tourist arrivals reached an impressive number of 254 000; and by 2004, this number had increased to over 500 000 tourists who generated gross foreign exchange earnings of $316 million. Still more tourist revenues are needed if protected areas are to move towards higher levels of financial self-sufficiency instead of depending on government subventions and development-partner assistance.

Increased levels of tourist arrivals have several implications for the environment. First, there are potential adverse impacts as a result of the interaction of different cultures. Second, continued growth in tourist numbers may move towards and gradually beyond the carrying capacity of tourist attractions. Third, the development of infrastructure such as roads and lodges also come with potential adverse impacts which have to be mitigated.

While the growth in tourist numbers and earnings in the aggregate is welcome, it also raises equity issues. For example, rural communities are currently receiving minimal benefits from tourism; and their participation in tourism ventures is limited.

THE SOCIOECONOMIC AND CULTURAL ENVIRONMENT

Human settlements, housing and urbanisation

In general, and particularly in rural areas, settlement patterns are wasteful of land and increase the cost of providing services to the areas. The settlements are also largely unplanned; and where plans exist, they are often not adhered to.

The quality of housing Ugandans live in has improved over the years. When compared to the situation in 1991 where over 85% of the houses in both urban and rural areas had rammed earth for floor, by 2002 only 29% urban and 77% rural houses had the same. The use of mud and pole for walls has also declined relieving the pressure somewhat on natural forests and woodland areas, but this change may also mean more clay mining for bricks and stone quarrying both of which have adverse impacts on the environment unless mitigated.

Although Uganda is one of the least urbanised countries in the world in absolute terms, the urban population is growing. Beginning from about 635 000 in 1969, the urban population increased to 938 000 in 1980, 1 890 000 in 1991 and 2 922 000 in 2002. The urban population is also growing faster (3.7%) than the national average (3.4%). The growth in the urban population means that pollution issues such as solid waste management, and the provision of adequate safe water and acceptable levels of sanitation coverage will have to be addressed.

Safe water and sanitation

Access to safe water and sanitation in both urban and rural areas has increased compared to the situation 10 years ago. For example in 1991, only 11 towns had the services of the National Water and Sewerage Corporation. Now, the Corporation covers 19 towns. By 2004, rural access to safe drinking water had increased to 57% while the urban one was at 65%. If current trends continue, and incremental investment funds are procured, Uganda should meet its Millenium Development Goal on water supply.

While safe water access *per se* has improved, functionality of water points is another key issue. Also, the cost of water in urban areas and the distance traveled to and queuing at water points in rural areas can easily undermine accessibility.

As far as sanitation is concerned, latrine coverage, the broad indicator (as a measure) of environmental health has improved from 41.7% in 1999 to 56% in 2002.

Pollution

As Uganda's urban areas increase in number and the urban population grows, pollution, whether air, noise, water or solid waste, is emerging as a significant issue in environmental management. Standards have been established for noise and air pollution and effluent discharge, enforcement of the standards notwithstanding. However, while guidelines have been developed for solid waste management, a stronger law is required and the pre-requisite is a national policy on solid waste management.

The Uganda Cleaner Production Centre is assisting several companies to reduce on waste generation, by conserving raw materials, substituting toxic and dangerous materials, and recovering, recycling and re-using by-products, among others.

Poverty

Headcount poverty has declined from 56% of the national population in 1992 to 38% by 2004. On the other hand, the gap between the rich and the poor is widening. For the poor, natural resources constitute important 'gifts of nature' and social safety nets on which their livelihoods depend all the time or at certain critical periods such as droughts.

The poor are agents of environmental degradation because they have limited livelihood alternatives. They are also at the same time victims of environmental degradation because their coping abilities are limited.

Environmental health

Over 80% of all diseases in Uganda can be ascribed to poor environmental conditions. Malaria is the number one killer disease because mosquitoes have fertile breeding grounds. Waterborne diseases are a result of poor sanitation. Respiratory diseases are encouraged by poorly ventilated houses and dusty environments as well as congestion in such dwellings.

The sick cannot be counted on to invest in environmental management, such as proper soil and water conservation measures. The sick are also unable to be productive and look for opportunities elsewhere, hence resulting in a heavy dependency on the available natural resources in the immediate vicinity.

Treatment costs mean the diversion of a greater share of household incomes to purchase drugs and to consult with medical personnel, leaving little else for other expenditures, including purchase of food items. It is no wonder then that malnutrition is one of the important health problems among infants and young children in Uganda.

Cultural heritage

Cultural heritage is part of humanity's relationship with the world and past achievements and discoveries. The National Environment Act provides for the protection of the country's cultural heritage. Approximately 187 cultural, historical and para-archeological sites have been identified and their specific locations recorded.

Unfortunately, Uganda's cultural heritage has not featured prominently among the country's tourist attractions. Yet, the promotion of cultural heritage as a tourist attraction could enhance community participation and even bring districts on board with respect to tourism. Some 15 tourist attractions in 10 districts have been highlighted in this report.

MANAGEMENT SYSTEMS AND TOOLS

Policies, laws and institutions

The broad policy, legal and institutional framework for environmental management is in place, having begun with almost none ten years ago. However, the need for additional sector or issue-specific policies (e.g. solid waste management) still remains. The same is true for laws and regulations. Institutionally, the structure at local government level is still evolving. There is a new structure for environment and natural resources at the district level. One key area that needs addressing is the need for better and de-personalised institutional co-ordination. Local governments also need effective institutional structures for vermin control, conservation of biodiversity outside protected areas, and management of cultural heritage.

Environmental standards, assessments and audits

Standards for air quality, water quality, discharge of effluents into water, control of noxious smells, control of noise and vibration pollution, and soil quality are now in place. However, standards for sub-sonic vibrations, minimisation of radiation and others have yet to be put in place.

There is in place EIA Guidelines, EIA Regulations, and EIA Practitioners Code of Conduct. In addition, some sector-specific EIA guidelines have been developed, and others in the process of developing. Guidelines for environmental audits are in place together with a Practitioners' Code of Conduct. Hence the tools for ensuring the mitigation of adverse environmental impacts and the enhancement of positive ones exist. The framework for regular audits is also there.

Environmental planning

Several tools and techniques of environmental planning have been developed since 1994. These include: district environment action plans, right up to the sub-county and parish levels; mechanisms for mainstreaming of the environment into development plans; adoption of the sector wide approach to planning; and integrated assessment and planning.

Ecosystems approach to management

An ecosystem approach to the management of fragile ecosystems (wetlands, riverbanks, lakeshores, and mountainous and hilly areas) is being implemented in selected districts. If proved successful, opportunities for scaling up to cover other districts would have been created.

Environmental enforcement

While the existence of a wide range of polices and laws should in theory simplify and make environmental management easier, the evidence on the ground is one of continued violations. The main reason being the low level of enforcement which in part is due to weak institutional structures. Environmental Inspectors have been gazetted and trained to improve on enforcement. The police and judiciary are also being made aware of their roles in environmental management, particularly the enforcement of environmental laws.

Environmental education and public awareness

An environmental education strategy for the formal sector was developed and incorporated in the curricula of education institutions. The strategy for the non-formal sector was also developed. Hence environmental education and public awareness have, by and large, been enhanced. A new focus now is on education for sustainable development.

Environmental research

Environmental research is scattered among various institutions. In general, the institutions all invariably suffer from insufficient human resources and inadequate equipment and other facilities. There are at least two pertinent challenges. The first is the need to develop a strategic plan for environmental research, highlighting the priorities to be addressed through, among others, inter-institutional collaboration. The second is to ensure that research results are disseminated widely.

Environment information

By 1991, environmental information was scattered and sectoral in nature. After the formulation and adoption of the National Environment Management Policy, some improvements have been registered. For one, the Environment Information Network was formed and is operational. Beginning with 6 members, there are now 22 active sectoral members excluding NEMA. To some extent, the latter acts as a metadatabase, meaning that even if the institution does not hold the actual data it knows where the data resides.

Second, the Office of the Prime Minister launched the National Integrated Monitoring and Evaluation Strategy in March of 2004. Third, there is the Land Information System. Fourth, Makerere University Institute of Environment and Natural Resources houses the National Biodiversity Data Bank. Finally, Uganda is also an active member of the evolving African

Environment Information Network.

Environmental monitoring

While in general monitoring is an expensive undertaking, there is some attempt at low-cost monitoring. Within NEMA, there is inter-departmental co-ordination team to facilitate environmental monitoring. Attempts have also been made to define appropriate environmental indicators for purposes of monitoring. However, results in this last regard are not yet conclusive and additional work is required.

Environmental reporting

The sources of information on the environment in Uganda are now more diversified than was the case in 1994. They include, among others: the state of environment reports at national and district levels; the district environment action plans; environment profiles; the participatory poverty assessment process; country environment profiles of the development partners; the poverty eradication action plan; sectoral annual reports; country reports on the Millenium Development Goals; the state of Uganda's biodiversity; various civil society publications on the environment; environmental impact statements of various development projects; and the national human development reports.

Innovating towards financial sustainability

In recognition of the fact that financial resources for environmental management are limiting and largely come from support by development partners hence having doubtful sustainability, different domestic sources are being assessed. One option is to make ecotourism pay an increasingly larger share of protected area management costs. The second option is to encourage payment for professional services. The third option involves the popularisation of payment for ecosystem services (carbon, watershed, etc.). Fourth, where funds can be accessed, a surer way to financial sustainability is through the establishment of an endowment fund through, among others, the operationalisation of the National Environment Fund provided for in the National Environment Act. Finally, environment agencies may look at generating revenues through property transactions.

POLICY RESPONSES

The State of Environment Report for Uganda 2004/2005 has demonstrated with supporting data that the investments the country, its development partners and civil society have made since 1994 have registered significant progress in the way the environment is managed compared to the baseline situation of 1991 to 1994. However many challenges still remain and some are emerging, thus calling for a number of policy responses. Some of the key policy responses required are the following.

1. Increase levels of enforcement, especially at the local government levels.

2. Formulate a national solid waste management policy to facilitate the development of appropriate laws to govern the management of solid waste.

3. Create awareness among policymakers that environmental management can complement national economic development in fulfillment of the objectives of sustainable development.

4. Prepare a manual to guide local governments on how to mainstream environment into district development plans so that the practice becomes routine.

5. Create appropriate incentives and disincentives to encourage the more active participation of local communities and the private sector in environmental management, and discourage wrong doers.

6. Encourage the Plan for Modernisation of Agriculture and the National Agricultural Advisory Delivery Services secretariats to increase interventions addressing soil erosion as a matter of priority since it is the main cause of soil nutrient loss and the largest share of the annual cost of environmental degradation which has led to negative adjusted net savings.

7. Complete the formulation and the subsequent adoption of the Land Policy and the Landuse Policy so as to facilitate the preparation of land use plans.

8. Seek international assistance in the compilation of more current inventory data (forests, wildlife, fisheries, land use changes, rangeland conditions, etc.) to allow for more informed decisionmaking in environmental and natural resources management.

9. Encourage different sectors to prepare annual reports as this will provide a rich source of information which can be used to prepare other reports including the state of environment reports.

10. Revise both the National Environment Management Policy and the National Environment Action Plan to accommodate emerging issues such as greater levels of investment in aquaculture, solid waste management and payment for environmental services.

11. Encourage Government ministries and agencies, civil society organisations and the private sector to identify innovative financing mechanisms for environmental management including creating markets for Uganda's ecosystem services.

LIST OF ACRONYMS AND ABBREVIATIONS

AEIN	African Environment Information Network
ANS	Adjusted Net Savings
BMU	Beach Management Unit
BoU	Bank of Uganda
CAA	Civil Aviation Authority
CBA	Community-Based Association
CBD	Convention on Biological Diversity
CBO	Community-Based Organisation
CC	Carrying Capacity
CDF	Comprehensive Development Framework
CDM	Clean Development Mechanism
CFM	Collaborative Forest Management
CFR	Central Forest Reserve
COP	Conference of the Parties
CSO	Civil Society Organisation
CWA	Community Wildlife Area
DAM	Department of Museums and Antiquities
DC	Domestic Consumption
DDP	District Development Plan
DEAP	District Environment Action Plan
DPSIR	Driving Forces-Pressure-State-Impact-Response
DRC	Democratic Republic of Congo
DSOER	District State of Environment Report
DWAP	District Wetland Action Plan
EIA	Environmental Impact Assessment
EIN	Environment Information Network
EIR	Environmental Impact Review
EMCBP	Environmental Management Capacity Building Project
ENR	Environment and Natural Resources

ERET	Environment Regulations and Enforcement Team
ERP	Economic Recovery Program
ERT	Energy for Rural Transformation
ESD	Education for Sustainable Development
FACE	Forests for Absorbing Carbon Emissions
FEWSNET	Famine Early Warning Systems Network
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHGs	Greenhouse Gases
GIS	Geographical Information System
GoU	Government of Uganda
GPS	Global Positioning System
HDI	Human Development Index
HIPC	Heavily Indebted Poor Country
HIV/AIDS	Human Immune Virus / Acquired Immune Deficiency Syndrome
IAP	Integrated Assessment and Planning
IFPRI	International Food Policy Research Institute
IPC	Inter-Ministerial Policy Committee
IPSR	Issue-Pressure-State-Response
ITCZ	Inter-Tropical Convergence Zone
JPOI	Johannesburg Plan of Implementation
LC	Local Council
LFR	Local Forest Reserve
LGDP	Local Government Development Programme
LPG	Liquid Petroleum Gas
LRSY	Long-Run Sustainable Yield
LSSP	Land Sector Strategic Plan
LVEMP	Lake Victoria Environment Management Programme
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
MBIFCT	Mgahinga Bwindi Impenetrable Forest Conservation Trust
MCP	Malaria Control Programme

MDG	Millenium Development Goal
MFPED	Ministry of Finance Planning and Economic Development
MoWHC	Ministry of Works Housing and Communications
MTTI	Ministry of Tourism, Trade and Industry
MW	Mega Watt
MWLE	Ministry of Water Lands and Environment
NBI	Nile Basin Initiative
NBS	National Biomass Study Project
NEAP	National Environment Action Plan
NEMA	National Environment Management Authority
NGO	Non-Governmental Organisation
NIMES	National Integrated Monitoring and Evaluation Strategy
NMVOCs	Non-Methane Volatile Organic Compounds
NP	National Park
NRM	National Resistance Movement
NSSD	National Strategy for Sustainable Development
NWIS	National Wetlands Information System
PA	Protected Area
PAH	Polyaromatic Hydrocarbon
PDD	Project Design Document
PEAP	Poverty Eradication Action Plan
PES	Payment for Environmental Services
PET	Potential Evapotranspiration
PFE	Permanent Forest Estate
PIN	Project Idea Note
PMA	Plan for Modernisation of Agriculture
PPPUE	Public Private Partnership for Urban Environment
PRSP	Poverty Reduction Strategy Paper
ROU	Rest of Uganda
SCDP	Sub-County Development Plan
SEAP	Sub-County Environment Action Plan

SOE	State of Environment
SOER	State of Environment Report
SPGS	Sawlog Production Grant Scheme
SSA	Sub-Saharan Africa
SWAP	Sector Wide Approach to Planning
SWC	Soil and Water Conservation
SWH	Southwestern Highlands
THF	Tropical High Forest
TLU	Tropical Livestock Unit
TOE	Tonnes of Oil Equivalent
UBOS	Uganda Bureau of Statistics
UCPC	Uganda Cleaner Production Centre
UDHS	Uganda Demographic and Health Survey
UN	United Nations
UNCHS	United Nations Conference on Human Settlements
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNHS	Uganda National Household Survey
UPE	Universal Primary Education
UPHC	Uganda Population and Housing Census
UPPAP	Uganda Participatory Poverty Assessment Project
UPPRE	Uganda Photovoltaic Pilot Project for Rural Electrification
UWA	Uganda Wildlife Authority
WCWQ	World Commission on Water Quality
WSSD	World Summit on Sustainable Development
WSSP	Wetlands Sector Strategic Plan
WTO	World Trade Organisation
WURA	Wildlife Use Rights Area

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INTRODUCTION AND OVERVIEW

- **Introduction**
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1.0 INTRODUCTION

1.1 Background

Principle 10 of the Rio Declaration on the Environment and Development urges States to, at the national level, ensure that each 'individual has appropriate access to information concerning the environment that is held by public authorities' (UN 1993). The State of Environment Reports (SOERs) for Uganda are published biennually to meet the need for up-to-date and timely information on the national environment; and this information is freely available to the public.

In response to the agreements reached at the United Nations Conference on Environment and Development (UNCED) dubbed the *Earth Summit* held in 1992, Uganda formulated the National Environment Management Policy in 1994 which among others, calls for regular reporting on the state of the country's environment (MNR 1994). This policy declaration was further translated into the National Environment Act. Clause 6 Section 1(k) of the Act mandates the National Environment Management Authority (NEMA) to 'prepare and disseminate a state of the environment report once in every two years' (GoU 1995). Similarly, Clause 14 Section 2(h) mandates a District Environment Committee 'to prepare a district state of the environment report every year' (GoU 1995).

The overall goal of the SOERs is to provide information for sound environmental planning in the context of sustainable development. The main reasons behind the preparation of the SOERs are:

- to provide the vital information needed to create environmental awareness and enhance timely collection and analysis of information and data in order to identify areas of the environment that require immediate intervention or action;

- to inform the public on the *State of Environment* (SOE) in the country and, more specifically, how natural resources are of value to society;

- to indicate key trends, as social and economic development pressures mount on the ENRs, and identify areas that need intervention and improvement; and

- the SOER is a useful document for natural resource specialists and those interested in the protection of environment.

1.2 Evolution of Reporting

Since the inception of the preparation of SOERs, Uganda has had five reports. This report will be the sixth. The first report on the state of environment was published in 1994. It evaluated environmental performance pointing out major constraints and weaknesses and their implications in the then existing environmental management system. The report was prepared by the National Environment Information Centre (NEIC) before the NEMA came into existence. At that time, no single institution was responsible for overall environmental management in Uganda.

However, in 1995, a new Constitution was put in place and decentralisation policy was later adopted. The Constitution provided for a healthy environment as a fundamental right. The adoption of the policy paved the way for the decentralisation of environmental and natural resources management. In the 1994 SOER, the effects of a growing and expanding economy were stated. The 1996 SOER differed in content and organisation from the 1994 report. In regard to organisation, the 1996 report used an Issue-Pressure-State-Response (IPSR) format instead of the sector approach used in the preparation of the 1994 report. The IPSR framework is a global approach whose application was recommended by the United Nations Environment Programme (UNEP).

By 1998, it was noted that Uganda's population and the economy were growing rapidly and these were putting massive pressures and stresses on the country's environmental resources. The impacts of the two scenarios could easily be seen from the scale of environmental degradation whose evidence included, among others, a decline in agricultural productivity, falling wildlife populations due to poaching, biodiversity loss as a result of habitat conversion, deforestation following conversion of forest land for other uses, wetland degradation due to encroachment, poor solid waste management characterised by indiscriminate dumping, and pollution caused by unsafe discharge of industrial wastes. This kind of situation called for an up-to-date and continuous monitoring of the environment while keeping in mind the overall goal of sustainable development. One possible way to do this was through an up-to-date assessment of the country's state of the environment, using the IPSR model.

By the end of 2000, the Government of Uganda (GoU) had compiled three important policy documents, namely: Vision 2025 (MFPED 1999a); a revised Poverty Eradication Action Plan (PEAP) an update of the previous one of 1997 (MFPED 1999b); and the Plan for Modernisation of Agriculture (MFPED/MAAIF 2000). Hence the SOERs for 2000/01 and 2002 placed greater emphasis on the linkages between poverty and environment, and environmental health.

This SOER for 2004/05 is quite similar to the past three reports of 1998, 2000/01 and 2002 in that it acknowledges the principles of sustainable development, putting more emphasis on the relationship between environment and poverty. This relationship is further justified by the fact that the PEAP is Uganda's Comprehensive Development Framework (CDF), as well as the country's Poverty Reduction Strategy Paper (PRSP). The PEAP can also to some extent qualify as Uganda's National Strategy for Sustainable Development (NSSD), but needs further refinement in order for it to resemble a true NSSD.

1.3 Emerging Issues

Where the SOER 2004/05 differs from the previous ones is that instead of using the IPSR model for reporting, it adopts the new paradigm of DPSIR, which stands for driving forces-pressure-state-impact-response. That is, the report looks at the drivers of environmental change, the ensuing pressures, the state of the environment, the impacts caused and the responses adopted if any, all reported in an integrated format.

Second, the SOER 2004/05 is informed of new evidence emerging that suggests that Uganda's current pattern of development is unsustainable. Economic growth is being achieved by mining the country's natural capital, particularly soils, as a result of soil erosion caused largely by inappropriate crop husbandry and livestock management practices.

Third, the SOER 2004/05 is also informed by the current global interest in international comparisons. Various indices including genuine savings, living planet and water scarcity indices are currently in vogue and have been prepared to rank countries according to environmental performance or status. These indices are reported upon in various sections with particular emphasis on Uganda.

Finally, unlike the other previous SOERs, the current one has a section on conclusions and recommendations as a way forward. The recommendations highlight some of the urgent policy responses needed for more effective environmental management.

1.4 Report Structure

The SOER 2004/05 is divided into three parts and nine chapters including this introduction. Part I of the report deals with the introduction and country overview. Part II is a description of the state of environment and includes chapters on: atmospheric, terrestrial, aquatic and cross-sectoral resources representing the biophysical component of the environment; and the socioeconomic and cultural environment. Part III of the report contains chapters dealing with management systems and tools, financing mechanisms and conclusions and recommendations. References are presented at the end of each chapter.

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2.0 COUNTRY OVERVIEW

2.1 Location and Administrative Boundaries

2.1.1 Location

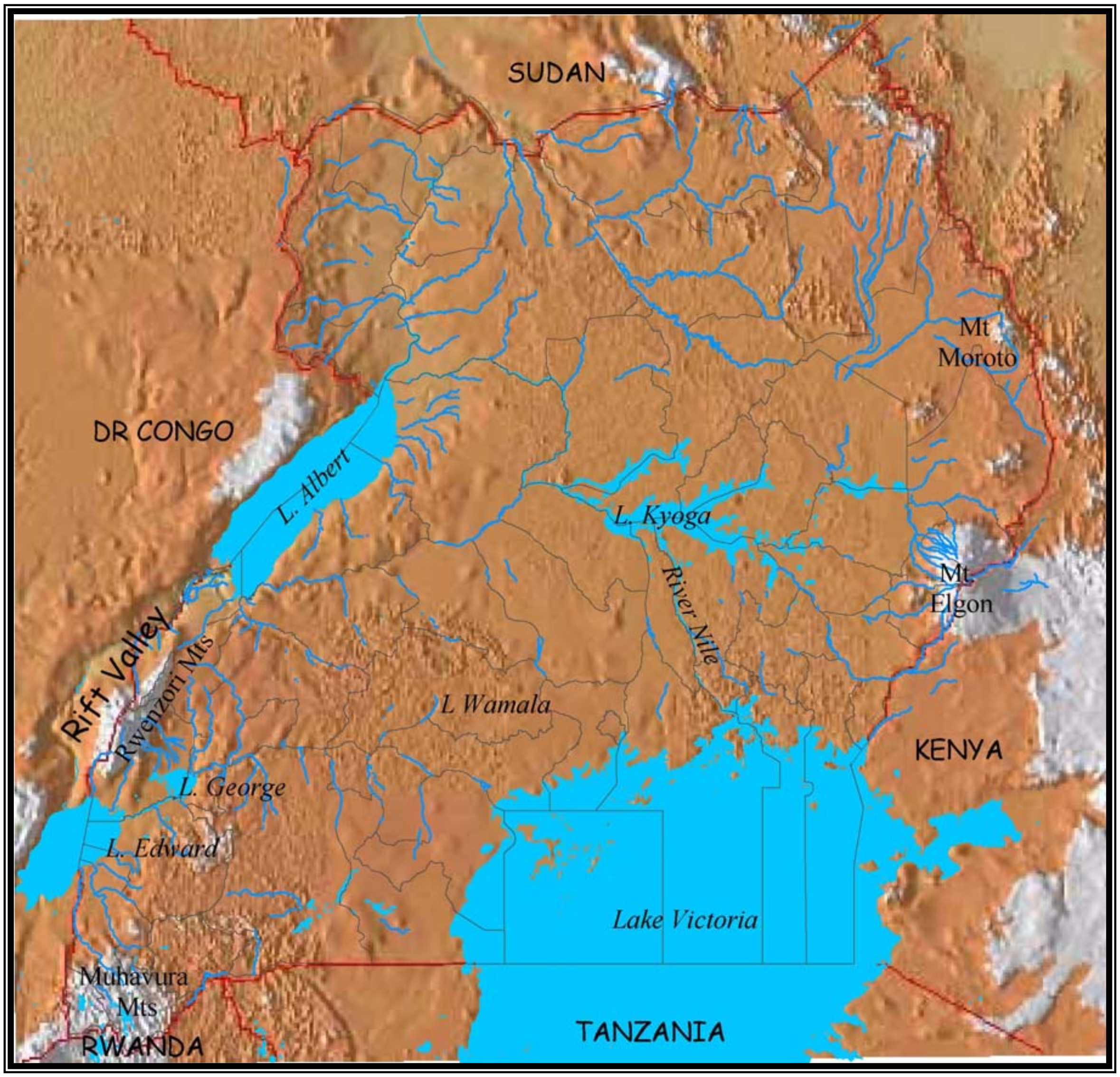
Uganda, dubbed by Sir Winston Churchill as the 'Pearl of Africa' is a relatively small, land-locked country which lies astride the Equator. The country is located in the eastern part of Africa and lies between Latitude $1^o30'$ South and 4^o North, and Longitude $29^o30'$ East and 35^0 East. The country covers an area of about 241 500 sq. km of which 15.3% is open water. Uganda's perimeter is about 16 630 km long. Its neighbours include the Republic of Kenya in the east, Tanzania and Rwanda in the south, the Democratic Republic of Congo in the west, and Sudan in the north (*Figure 2.1*). Important natural resources exist across the national boundaries and their management present great challenges, which require closer cooperation with the neighbouring states.

Being land-locked, Uganda has to maintain good neighbourliness with Kenya and Tanzania to ensure access to the sea and to ease on the costs of transportation. Fortunately, as a result of historical events and new realities of a globalising world, the three East African countries Kenya, Tanzania and Uganda have revived the East African Community, and hope to enter a political union by 2013. Already, a Customs Union is in place.

Uganda shares important ecosystems with its neighbours. It shares Lake Victoria with Kenya and Tanzania. The Nile Basin has ten countries, including Uganda where the River Nile originates. Lakes Edward and Albert are shared with the Democratic Republic of Congo (DRC). The Mount Elgon ecosystem is shared with Kenya. The Rwenzori Mountains ecosystem is shared with the DRC. The mountains of the Virungas (Muhavura, Gahinga and Sabinyo) in the southwest are shared with Rwanda and DRC. Other important biodiversity areas such as Queen Elizabeth, Bwindi, Semliki and Rwenzori national parks border the DRC. Mgahinga Gorilla National Park borders Rwanda. Kidepo Valley National Park borders the Sudan. The region from Lake Albert down to Mgahinga Gorilla National Park of the Albertine Rift is an area of endemism, an eco-region of international importance in the conservation of biodiversity. It is globally ranked among the world's top areas.

The implications of the existence of substantial transboundary natural resources is clear. The country and its partners must put in place protocols, agreements or mechanisms for the conservation, sustainable use and equitable sharing of the benefits of the transboundary resources. Significant success has been achieved with respect to the management of Lake Victoria. An institutional structure is in place for the management of the Nile Basin, called the Nile Basin Initiative (NBI). Studies are underway to identify suitable approaches for the joint management of the Mount Elgon ecosystem. Regional collaboration is also in place for the management of the mountain gorillas of the Virungas and Bwindi Impenetrable National Park, at the technical level at least. There is also an effort funded by the McArthur Foundation involving the joint management of the 'Greater Virunga Landscape'. However, collaboration is generally weak at the moment when it comes to the management of the other transboundary natural resources Uganda shares with the DRC.

Figure 2.1 Location of Uganda, its neighbours and key transboundary natural resources



Source: Adapted by Geo-Information & Communication from exisiting thematic maps

2.1.2 Administrative Boundaries

Decentralisation – the steps that central governments take to give regional, municipal and local institutions responsibility for some public sector functions – is an important development in environmental governance (WRI 2003). Decentralisation goes directly to the question of who gets to make decisions about the environment. It can make environmental decision-making more accessible to communities and their representatives, in turn increasing the relevance of those decisions and the likelihood that they will be implemented (WRI 2003).

One of the key features of the National Environment Management Policy 1994 is the decentralisation of the management of environmental protection and natural resources management (MNR 1994). The sub-county is the lowest unit of government, followed by districts and then the centre. Increasingly, there is an expressed desire, facilitated by the provisions of the Constitution of the Republic of Uganda, to have regional tiers whereby a group of districts agree to come together and cooperate in the area of development including environment and natural resources management.

When the first State of Environment Report for Uganda was produced in 1994, the country had 39 districts. By the time the last SOER for Uganda was produced in 2002, there were 56 districts. This SOER 2004/05 is being produced when there are 70 districts. The stated reason for the creation of more districts is to take services closer to the people, brought about by increasing population. The new districts are:

1. Amolatar
2. Amuria
3. Budaka
4. Bukwa
5. Buteleja
6. Ibanda
7. Isingiro
8. Kaabong
9. Kaliro
10. Kiruhura
11. Koboko
12. Manafwa
13. Mityana
14. Nakaseke

Figure 2.2 shows the boundaries of the districts. The new ones are shaded yellow.

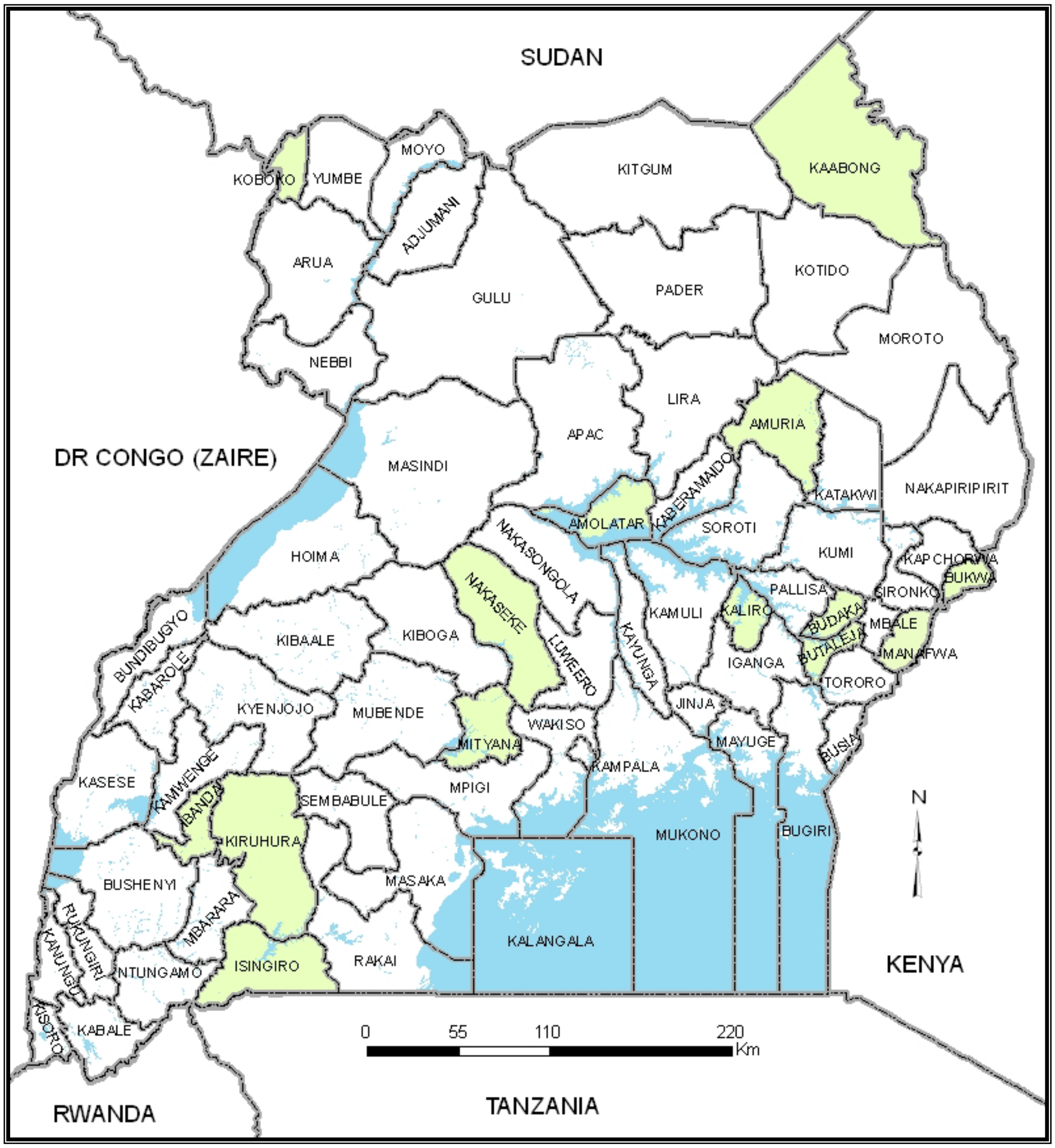
From the perspective of environmental management, the new districts will need to: appoint district environment and natural resources management officers (lands, forestry, environment and wetlands) to fill the new positions created at district level. Similar to the older districts the new ones will have to undergo the district environment action plan (DEAP) process. To some extent, the DEAP process may not be as involving as was the case in the past.

The reason is that a number of the districts have been formed by combining several sub-counties of former districts. Where such a district had undergone the DEAP process, each of the sub-counties brought together to form the new district would have had a Sub-County Environment Action Plan (SEAP). Hence, the SEAPs of the sub-counties forming the new district would only need to be updated and synthesized into a DEAP for the new district.

Notwithstanding the foregoing, whether a new DEAP calls for synthesizing existing SEAPs or a whole new effort, resources will have to be made available for the preparation of the DEAPs. The district environment offices will have to be equipped and the capacities of the officers built or strengthened.

Previously, there were debates about the appropriate institutional home of the District Environment Office. Several districts put environment together with production; others with health; and a few others with the planning department. Due to its cross-sectoral nature and to facilitate mainstreaming of environment into district sectoral development plans, Moyini *et al* (2001) had advocated for the environment office to be housed with planning. The Ministry of Public Service has recommended the establishment of a district level Directorate or Department (depending on the size of the district) of Enviroment and Natural Resources to house lands, forestry, environment and wetlands through the current institutional re-structuring exercise. Thus, even at district level, environment has gained a higher level of prominence. Furthermore, the close association of environment with the other natural resources sectors (lands, forestry and wetlands) can be seen as a positive development. A further improvement in terms of fulfilling one of the goals of the National Environment Management Policy (MNR 1994) would be to bring fisheries into the newly created Directorate or Department of Environment and Natural Resources. Furthermore, since districts are responsible for the management of vermin once UWA makes a declaration on certain species or animal populations as provided for by the Wildlife Act (GoU 1996) and the Local Governments Act (GoU 1997), a wildlife management unit should also be made part of the new environment and natural resources institutional structure. Such a move would assist the Uganda Wildlife Authority (UWA) to delegate the responsibility of managing wildlife biodiversity outside protected areas to the districts. It would also facilitate easier supervision of the wildlife use rights classes specified in the Wildlife Act.

Figure 2.2 The districts of Uganda as of December 2005.



- new districts

Source: Ministry of Local Government

2.2 Morphology, Relief and Drainage

2.2.1 Morphology and Relief

Most of Uganda forms part of the interior plateau of the African continent. Uganda is characterised by flat-topped hills in the central, western and eastern parts of the country. The rise of the plateau in the eastern and western parts of the country is represented by spectacular mountain topography located along the borders. For example, the Rwenzori Mountains and Mufumbira volcanoes in the west and Mt. Elgon, Mt. Moroto, Mt. Murungole and Mt.Timu in the east. On a straightline alignment, Mt. Otce in Moyo District is the highest point from the Uganda border up to Cairo, Egypt.

2.2.2 Drainage

Most of the rivers in the southern part of the country drain into Lake Victoria. The waters of the Lake then drain through the Owen Falls Dam; traversing Victoria Nile and Lake Kyoga into Lake Albert (Lake Albert also receives water from the DRC mainly through river Semliki), the Albert Nile or White Nile in Sudan, down to the Mediterranean Sea through Egypt. The drainage pattern represents past geological adjustments, which include the reversal of the direction of flow of some of the rivers in Uganda, which originally flowed westwards of Lake Victoria. Areas of impeded flow are due to the influence of warping and are associated with the wetland areas. The Lakes in Uganda cover almost one-fifth of the total area of the country. Lake Victoria, shared with Kenya and Tanzania, is the biggest water body and has spectacular scenic contrasts. It is the second largest freshwater lake in the world. Other lakes of interest are the crater lakes in the western part of the country associated with the Western Rift Valley. The management of the waters and fisheries of lakes Victoria, Edward and Albert, which are transboundary, calls for the need for cooperation with neighbouring countries with whom Uganda shares these waterbodies. This cooperation is strong in the case of Lake Victoria largely for historical and colonial reasons, but not so for the others as yet. Nevertheless, it is gratifying to note that Uganda, the DRC and other countries are members of the Nile Basin Initiative.

2.3 Geology and Soils

The geological formations of Uganda reveal very old rocks formed in the pre-Cambrian era around 3 000 and 6 000 million years ago. The younger rocks are either sediments or of volcanic origin, formed from about 135 million years ago (Cretaceous period) to the present. Thus, a gap of about 460 million years remains in the knowledge of the geological history of Uganda. A number of parameters define the soils of Uganda and these include parent rock, and the age of soil and climate. The most dominant soil type is ferralitic soil, which accounts for about two-thirds of the soils found in the country. Based on studies carried out in the past (NEMA 1996), Uganda's soils are divided into six categories according to productivity: (a) very high to high productivity; (b) moderate productivity; (c) fair productivity; (d) low productivity; (e) negligible productivity; and (f) zero productivity. The high productivity soils cover only 8% of the area of Uganda (MWLE 2001). Considering the country's size, this is indeed a small area. Therefore, moderate and fair productivity soils must be effectively managed in order to sustain Uganda's agriculture. Furthermore, through intensive but sustainable agricultural practices, yields on low productivity soils can be enhanced.

2.4 Climate and Vegetation

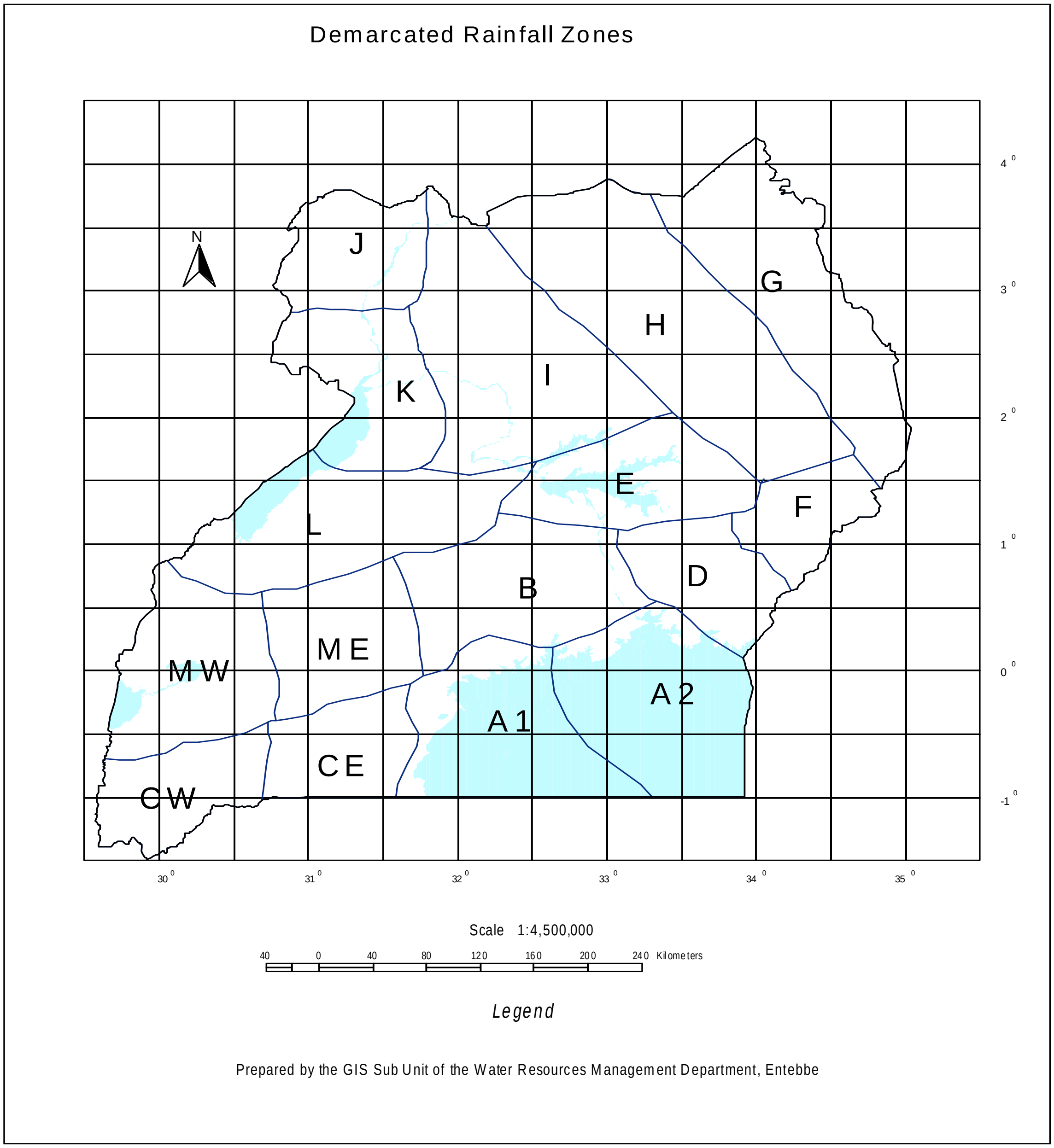
2.4.1 Climate

The Inter-Tropical Convergence Zone (ITCZ) and the air currents such as the southeast and northeast monsoons influence the climate of Uganda. In most parts of the country, the seasons are fairly well marked - as rainy and dry seasons. Depending on elevation and landscape, the mean temperatures over the whole country show great variation. However, in areas adjacent to waterbodies such as Lake Victoria, maritime conditions tend to modify the temperatures. The variation in mean monthly and annul evaporation rates are much smaller than corresponding variations in rainfall, which respectively, are 10-20% and 20-40% in the southern and northern parts of the country. The movement of the ITCZ is to a great extent responsible for the variations in meteorological factors that determine evaporation.

Taking precipitation in a given area as the dependent variable, Uganda has fourteen climatic zones (*Figure 2.3*). Based on hydro-climatic study, two zones M and C in the southwestern region were subdivided along longitude $30^{\circ}75'$ in order to show clearly the relatively dry column along what is popularly known as the *cattle corridor* further described in Chapter 3.0 under rangelands. Zone A1 covering the western lake basin, which extends into Masaka and Rakai was also subdivided into two zones in order to separate the eastern part where rainfall is much higher from the western parts with lower precipitation. This gives a total of 17 zones. The future intention is to further subdivide a few more zones, particularly zone B, where there are rather wide variations in the spatial rainfall amounts (WRMD 2003). Specific precipitation figures for all the zones are indicated in *Figure 2.3*.

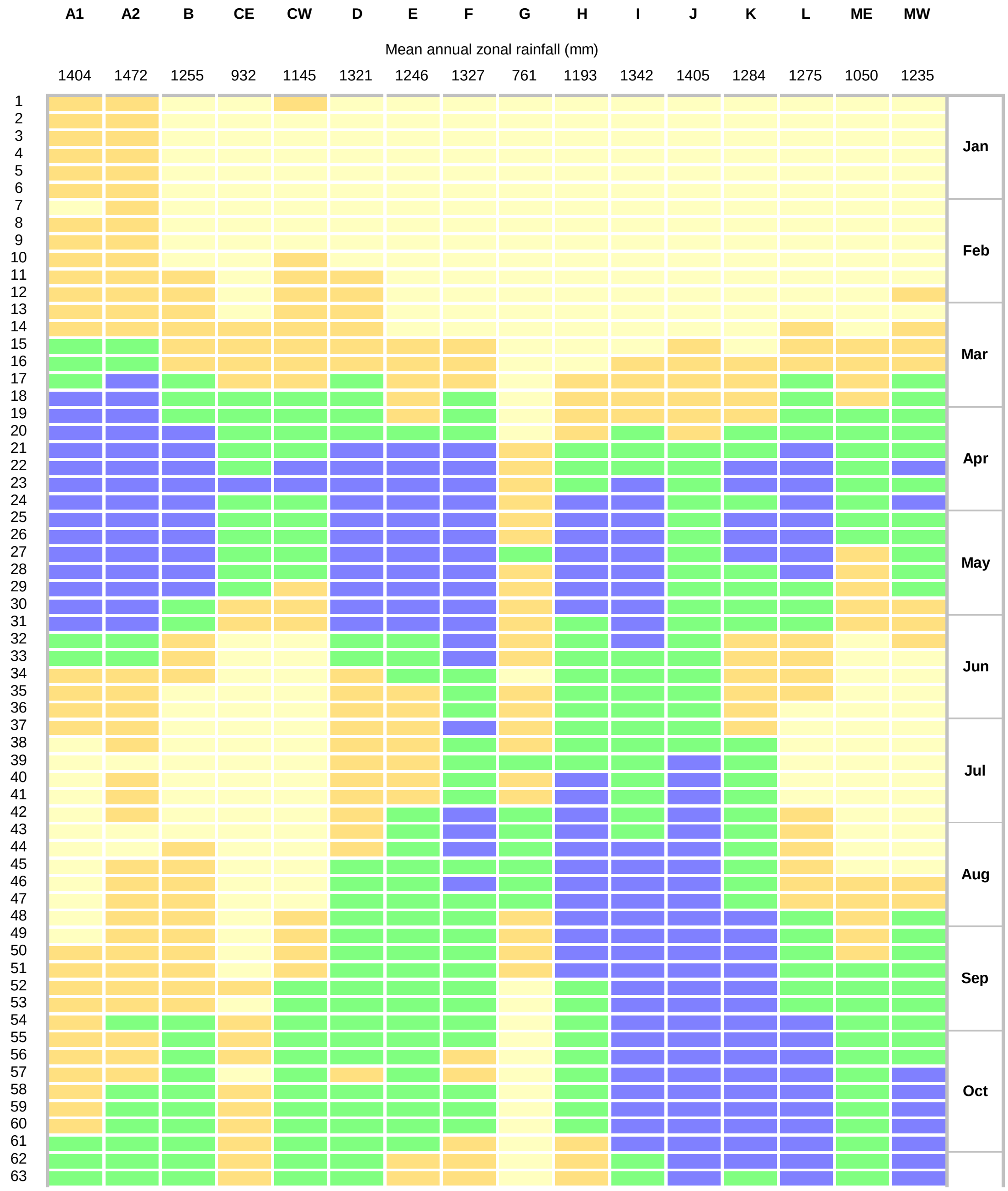
When further considered with agriculture and altitude, one can identify two highland agricultural zones in Uganda and seven zones with different agro-climatic potential.

Figure 2.3 Major climatic zones of Uganda



Source: WRMD (2003)

Figure 2.4 Average pentad wetness indices for all zones



Source: WRMD (2003)

2.4.2 Vegetation

Vegetation is the most practical way of describing the ecosystems of a country, because the different vegetation types are most practical and, easily observable than most other organisms (Pomeroy *et al* 2002). Although Uganda has been inhabited by people for tens of thousands of years, agriculture with its modifying effects on vegetation did not begin until 2 300 years ago (Jolly *et al* 1997). Therefore, one can argue that no ecosystem in the country is completely 'natural' in the sense that it is unaffected by human activities (Pomeroy *et al* 2002). Not all modifying effects originate from Uganda. Osmaston & Kaser (2001) showed that the upper reaches of the Rwenzori Mountains are already showing marked changes with receding ice caps, probably due to global warming, further described in Chapter 3.0.

Vegetation in Uganda has been classified in various ways ranging from Langdale-Brown *et al* (1964) to Pratt & Gywnne (1977), White (1983), Green *et al* (1996), the National Biomass Study Project (1996), and Olson & Dimerstein (1998). These descriptions are detailed below.

- Langdale-Brown *et al* (1964) mapped the vegetation of the whole country at a scale of 1:500 000, using aerial photography of the mid-1950s as a basis coupled with considerable ground truthing. The major forests were mapped at 1:50 000 and these maps formed the basis for the ones at 1:500 000 (Pomeroy *et al* 2002). Unfortunately, the larger-scale maps have not been digitised and it would be useful to do so, as an important contribution to baseline conditions pertaining just after Uganda's independence in 1962. Langdale-Brown *et al* (1964) recognised 22 *plant communities*, identified by letters A to Z, further subdivided into *mapping units* (designated A1, A2, etc) of which there are 86. Their plant communities can be considered as being more-or-less the same as ecosystems or simply vegetation types (Pomeroy *et al* 2002), themselves units of measure of biodiversity richness.

- Pratt and Gywnne (1977) described the vegetation of Uganda somewhat, but their main interest was East Africa's rangelands.

- White (1983) mapped the whole of Africa and his map was based primarily upon a system of 18 phytochoria – extensive areas of vegetation which are differentiated from each of the others by at least a thousand plant species endemic to them.

- Green *et al* (1996) at global level organised the world into 'ecoflorisitc zones', ranking those in the tropics in terms of conservation importance. They recognised 65 such zones for Africa, with nine in Uganda.

- The National Biomass Study Project with support from Norway used SPOT and LANDSAT satellite imagery obtained between 1989 and 1995, supported by aerial photographs and extensive fieldwork from 1993 and 1995. From all this work they mapped vegetation at a scale of 1:50 000. Based on the focus of their study, namely biomass, they recognised only four types of natural vegetation: forest and woodland, bushland, grassland and wetland (Pomeroy *et al* 2002). The four types of vegetation recognised, correspond to *biomes* rather than ecosystems (Pomeroy *et al* 2002). Biomes are defined as communities characteristic of broad climatic regions (Begon *et al* 1990).

- Of the terrestrial *ecoregions* of the WWF, there are 119 in Africa, seven occurring in Uganda (Olson & Dimerstein, 1998).

From the foregoing, the Langdale-Brown *et al* (1964) and the National Biomass Study Project classifications are probably the two most useful. These classifications are presented jointly (biomes and L-B communities) in *Table 2.1* and the approximate extent in *Table 2.2*. Pomeroy *et al* (2002) however caution that their estimates remain ‘broad brush’ in the sense that many vegetation types are, in reality, intermediate of one sort or another; and considerable agricultural expansion into areas of natural vegetation has occurred since the National Biomass Study Project database was created.

Table 2.1 The 22 letter grades of the language-brown *et al* vegetation type and open water. On the left are the corresponding biomes. The approximate extent each type is given in Table 2.

Biome[a]	L-B Communities	Characteristics
HIGH ALT.	A: High altitude moorland and heath	Mainly above 3 000m, and including the giant species of *Senecio* and *Lobelia*, as well as ice and rocks
FORESTED	B:High altitude forests	Montanne forests, above 1500m, and including bamboo zones in some places
	C: Medium altitude moist evergreen forests	Widespread below 1 500m
	D: Medium altitude moist semi-deciduous forests	Also widespread, typically in the areas of lower rainfall
	F: Forests/savanna mosiaics	These can extend as high as 3 000m, with forest in the valleys and savanna on the ridges, maintained by fire
MOIST SAVANNAS	G: Moist thickets	Thickets can occur as climax vegetation, but also as post-cultivation precursors of forest
	H: Woodlands	"… have neither the many -layers structure of the forests nor the dense, dominant grass layer of the savannas"(L-B)
	J: Moist *Accia* savannas	Probably derived from forest by "long continued cutting, and burning (L-B)
	K:Moist *Combretum* savannas	Dominated by *Combretum* trees and *Hyparrhenia* grasses
	L:*Butyrospermum* savannas	Typical of monomodal rainfall zones in the area of former cultivation
DRYLANDS	M: Palm savannas	Dominated by *Borassus* palms, the grasslands are maintained by fire
	N: Dry *Combretum* savannas	Fire influences this type again; *Acacia* is often present too
	P: Dry *Acacia* savannas	
	Q: Grass savannas	Extensive tall grasslands, dominated by *Themeda trindra* or species of *Hyparrhenia*
	R: Tree and Shrub steppes	Typical of areas with 6-700mm a year of rain, with many small trees shrubs.
	S: Grass steppes	Areas of short grass and bare ground, mainly in Karamoja
	T: Bushlands	These are characteristic of over-grazed areas which would otherwise be more open savannnas
	V: Dry thickets	Dense spiny trees and shrubs which can become almost impenetrable
WETLANDS	W: Communities on sites with impeded drainage	Most extensive in valley bottoms, and often with large termite mounds covered by thickets
	ww: Open water	Not an L-B category, but obviously important. Standing water less than 6m deep is classified as a wetland under the Ramsar convention.
	X: Swamp	Permanent swamps, often dominated by papyrus and other macrophytes
	Y: Swamp forests	Seasonally or in some cases permanent flooded forests occur most notably in Sango Bay area.
Post-cultivation	Z: Post-cultivation communities	In the days of shifting cultivation, post- cultivation communities were wide spread: but many are now cultivated more-or-less permanently.
Note: a our own assessment		

Source: Pomeroy *et al* (2002)

Table 2.2 Correspondence between language-brown vegetation types (rows) and national biomass categories (column). Figures are in sq km.

		Broadleaved Tree Plantations or woodlots	Coniferous Plantations	Tropical High Forest-Fully stocked	Tropical High Forest Degraded	Woodland	Bushland	Grassland	Wetland	Farmland Small Scale	Farmland Large-Scale	Built-up Area	Open Water	TOTAL
A	High altitude moorland and heath	0	0	135[a]	0	339	14[a]	189[a]	0	0	0	0	0	**677**
B	High altitude forests	0	30	1,023	295	784	478	187	0	279	0	0	0	**3,078**
C	Medium altitude moist evergreen forests	0	5	1,369	212	42	5	145	24	1.125	13	5	270	**3,215**
D	medium altitude moist semi-deciduous forests	19	4	2,486	428	489	27	135	27	1,544	6	0	89	**5,254**
F	Forest/savanna mosaics	13	31	1,054	823	1,354	12	757	109	20,007	103	158	75	**24,495**
G	Moist thickets	0	0	126	4	819	232	471	24	850	0	2	60	**2,587**
H	Woodlands	0	3	0	0	1,674	16	457	20	1,968	0	0	29	**4,167**
J	Moist *Acacia* savannas	0	0	61	51	802	74	712	23	4,430	0	1	51	**6,205**
K	Moist *Combretum* savannas	0	2	137	38	2,594	86	1,630	87	10,384	16	11	28	**15,013**
L	*Butyrospermum* savannas	0	0	0	0	8,479	417	3,589	7	13,211	0	2	0	**25,705**
M	Palm savannas	0	0	1	1	318	39	776	130	1,367	1	9	10	**2,652**
N	Dry *Combretum* savannas	0	37	198	81	13,222	2,581	9,634	116	11,895	6	8	51	**37,830**
P	Dry *Acacia* savannas	0	0	17	9	755	2,543	6,831	56	4,105	9	2	26	**14,353**
Q	Grass savannas	0	25	118	67	2,012	580	6,395	35	4,432	21	19	133	**13,837**
R	Tree and shrub steppes	0	0	0	0	16	457	837	0	262	0	1	0	**1,573**
S	Grass steppes	0	0	0	0	1	106	691	0	0	0	0	0	**798**
T	Bushlands	0	0	0	0	302	1,503	2,035	0	408	0	0	1	**4,249**
V	Dry thickets	0	0	0	1	572	1,800	1,559	71	496	0	0	93	**4,592**
W	Communities on sites with impeded drainage	1	0	0	13	2,614	1,138	9,601	513	4,685	24	3	138	**18,731**
ww	Open water[b]	0	0	64	30	64	17	202	234	174	0	4	34,861	**35,649**
X	Swamps	0	1	255	172	675	152	1,671	2,299	2,173	6	11	1,164	**8,579**
Y	Swamp forests	0	0	147[c]	1	42	0	46	7	14	0	0	1	**259**
Z	Post-cultivation communities	2	9	65	9	335	134	666	67	5,477	18	26	83	**6,892**
	TOTAL	35	149	7,257	2,236	38,305	12,408	49,217	3,847	89,287	223	263	37,162	**240,388**

Notes:
a the NBS was not really concerned with high altitude non-forest types, hence the curious set of categories corresponding to L-B' type A
b not an L-B category
c mostly seasonally-flooded forest of the Sango Bay area

Source: Pomeroy *et al* (2002)

2.5 The People and Population Dynamics

2.5.1 The People

The hospitality of the people of Uganda is acknowledged worldwide. The *Uganda Constitution 1995* recognises 46 indigenous tribes (GoU 1995a) with varying production and consumption patterns in the traditional setting. Modes of production and the rural livelihood coping strategies range from mainly cultivators (e.g. Baganda, Bakiga, Bagishu and Basoga) to pastoralists (e.g. the Karimojong and the Bahima). The rest of the people derive their livelihoods from a mix of livestock keeping and cultivation, or agro-pastoralism. In addition, Uganda has been and still is, home to several thousand refugees from neighbouring countries. There are also other non-citizens residing in Uganda as a preferred place for home or where they are engaged in various economic activities. This mosaic provides Uganda with a rich cultural base and opportunities for modernisation. However, there are also challenges such as learning to live together in harmony as a truly global village. The major challenges the people of Uganda face, among others are: (i) rapid population growth and the ensuing pressures on the country's natural capital; (ii) inadequate provision of, and demand for, social services and infrastructure; and (iii) poor environmental health conditions.

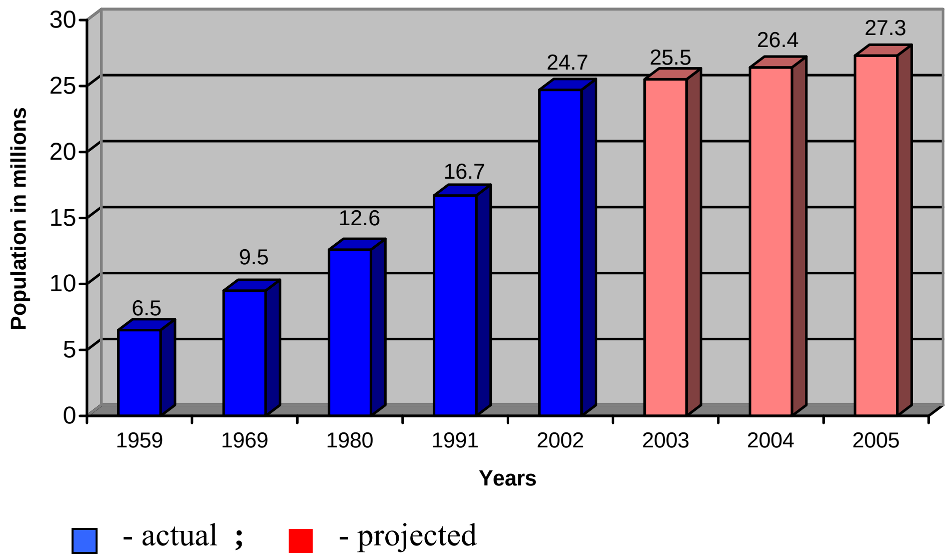
2.5.2 Population Dynamics

Growth

In Uganda, the 20th Century marked an unprecedented population growth and economic development as well as environmental change. The Census Report of 2002 put the country's population at 24.7 million people. However, UN (2001) shows a rapid population growth from 6.5 million in 1959 to an estimated 25.3 million in 2003. The current growth rate of 3.4% per year is higher than the 2.9% that was envisaged for the period 1991-2002. With the prevailing trends, the population of Uganda is likely to reach close to 50 million by 2025. *Figure 2.5* shows the population trends in Uganda from 1959 to 2005. Population is a key determinant of economic and social well-being and the main underlying force behind environmental degradation.

Considering the size of Uganda and comparing this with cities such as Mexico and Lagos whose population, respectively, are in excess of 20 and 13 million people, respectively it can easily be concluded that Uganda does not have a problem with its population size. In fact demographers agree that the entire African continent, to which Uganda belongs, is the least populated in the world (UNEP 2002). While absolute numbers may suggest Uganda is relatively under-populated, the concern is the inability to provide for these relatively few people. In the absence of adequate social services, even a small population becomes a constraint. In addition, a poor population however small, needs attending to otherwise its people may engage in activities detrimental to the environment especially where alternative livelihood options are limited.

Figure 2.5 Population trend in Uganda, 1959-2003



Source: UN System (2004)

Structure

A look at the structure of the Ugandan population with respect to age composition reveals that the country is made up mainly of young people (*Table 2.3*). The age group 15 years and below constitutes 49% while those less than 18 years are at 56% of the total population. Interesting to note is the fact that children who qualify for enrolment in primary schools (i.e. age group from 6-12 years) constitute 22% of the population!

The proportion of the elderly (dependants) aged 60 years and above had decreased from 5.9% in 1969 to 4.5% in 2002. Despite the depicted decrease in the percentage of elderly people, a significant quantitative increase from 556 000 people in 1969 to 1.1 million people in 2002 was recorded (UBOS 2002).

Table 2.3 further depicts that the median age of Ugandans has been declining over time from 17.2 in 1969 to 15.6 in 2002. This indicates that the Ugandan population is becoming younger gradually. When this high population of the young reaches productive age, the result will be a high population growth rate for some years to come (UBOS 2001). Other things being equal, this may also mean increased pressure on the country's natural resources and possibly higher levels of environmental degradation. On the other hand, a youthful population offers opportunities for the creation of increasing environmental awareness through education within the Universal Primary Education (UPE) system and the proposed Universal Secondary Education (USE). The National Environment Management Authority has already in place environmental education strategy for the formal sector (NEMA 1997), which has been incorporated into the formal curriculum. What is required is increased levels of operationalisation of the strategy.

Table 2.3 Selected percentages of Uganda's population 1969, 1991 and 2002

Age category	1969	1991	2002
Population aged less than 5 years	19.3	18.9	18.6
Population aged 6 – 12 years	22.7	23.3	22.0
Population aged less than 15 years	46.2	47.3	49.3
Population aged less than 18 years	51.4	53.8	56.1
Population aged 10 – 24 years	27.8	33.3	34.3
Population aged 18 – 30 years	21.7	23.6	22.4
Population aged 60 years or more	5.9	5.0	4.5
Median age	17.2	16.3	15.6

Note: These age categories are not mutually exclusive and therefore do not add to 100%.
Source: UBOS (2002)

Household composition

Males head almost three out of four households while females head the remaining 25% (*Table 2.4*). The table further shows that one in every nine households has only one member. However, very large households that comprise nine persons or more still exist in Uganda particularly in rural areas (UBOS 2001). The mean household size for Uganda is 4.8 persons while it is 4.2 and 4.9 in urban and rural areas, respectively (UBOS 2001).

In cases where households are owned by females, control and ownership of resources of production especially land is very difficult in rural areas. Over 97 per cent of the women have access to land but only 5% to7% actually own it (UBOS 2004b).

Table 2.4 Household composition

Percentage distribution of households by sex of head of household size and resident, Uganda 2001-2004			
	Residence		
	Urban	**Rural**	**Total**
Sex of head of household			
Male	69.2	73.0	72.5
Female	30.8	27.0	27.5
Total	**100.0**	**100.0**	**100.0**
Numbers of usual members			
1	16.4	10.1	11.0
2	16.1	11.0	11.8
3	15.0	12.6	12.9
4	15.5	14.6	14.8
5	11.2	14.2	13.8
6	8.8	11.8	11.4
7	5.6	8.9	8.4
8	3.5	6.2	5.8
9+	7.8	10.4	10.0
Total	**100.0**	**100.0**	**100.0**
Mean size	**4.2**	**4.9**	**4.8**

Source: UBOS (2004b)

Fosterhood and orphanhood

In Uganda, a child is defined as a person less than 18 years of age, while some countries classify a child as a person under 16 years of age (UBOS 2001). Notwithstanding the different definitions of who is a child, overall, 58% of children under 18 years of age are living with their parents, while 18% live on their own (UBOS 2001). The majority of orphaned children (about 17%) live with single parents, most of whom are women, further complicating the women's survival burden.

Continual armed conflict, civil strife and the HIV/AIDS scourge have left Uganda with many orphans. An orphan is defined in Uganda as a child under 18 years who has lost at least one of his/her biological parents. According to (UBOS 2001), 14% of children under 18 years of age are orphans. Household poverty is further exacerbated by orphanage whose consequences are significant on the environment and natural resources of the country.

Education level and migration

Education has influence on many aspects of life. Consequently, the way individuals relate with the environment and natural resources is largely influenced by their levels of education. *Table 2.5* shows the education levels of Ugandans during 2003/2004. From the data, more than one quarter of the population had no education. However, this fraction is confined to those over 65 years of age. Although there exists a considerable portion of the population between the age of 20-54 years with no formal education and needs to be targeted for informal environmental education, the majority of the young are now benefiting from formal environmental education (*Table 2.6*) as a result of the Universal Primary Education.

Table 2.5 Educational attainment of household population, 2003-2004

Education Status	Percent Total
No Education	26.5
Some Primary	55.9
Complete Primary	7.3
Some Secondary	7.8
Completed Secondary	0.3
More than Secondary	1.8
Other/Don't know	0.4
Total	**100.0**

Source: UBOS (2004b)

Table 2.6 Trend of primary education in Uganda 1998 - 2003

	1999	2000	2001	2002	2003
Enrolment	6,288,239	6,559,013	6,900,916	7,354,153	7,633,314
No. of schools	109,733	110,366	127,038	13,332	13,353
No. of teachers	10,597	12,480	12,280	139,484	145,587
Annual % change in enrolment	8.3	4.3	5.2	6.6	3.8

Source: MoES (2004)

Rural-urban migration

The 1991 Census results indicated that over 2 million Ugandans constituting approximately 17.7% were lifetime internal migrants (MFPED 1994). The major mode of migration in Uganda, as common with most developing countries, is rural-urban migration. Urban areas provide better economic opportunities that attract many people from rural areas to migrate to towns and the capital city, Kampala. In most cases this situation has created a number of urban environmental challenges due to over-crowding caused by an increase in the population of the urban poor whose livelihoods are characterised by slum dwelling, poor sanitation, and scarcity of affordable safe potable water.

2.6 Governance

Under the revised Poverty Eradication Action Plan (MFPED, 2004b), governance focuses on key areas that all relate to civil rights proclaimed in the legislative instruments such as the International Covenant on Civil and Political rights (ICCPR), the national Constitution and other subordinate laws in Uganda. These focal areas, among others, include democratisation, human rights, justice, law and order, fostering regional cooperation, and ensuring accountability and transparency in all public services.

Democratisation: For the last 19 years that the NRM government has been in power, some reasonable progress has been achieved towards democratisation. In its early years of administration, the National Resistance Council (NRC) formed an absolute body of governance under the centralised structure of government. However, with the adoption of decentralisation as an official policy and later its enactment in 1997 into the Local Governments Act, provisions were made for the election of local administrators. Since then, major elections have taken place that include, among others, the Constituent Assembly (CA) elections of 1994 and two presidential and parliamentary elections, respectively, in 1996 and 2001. A Constitutional Review (CR) process that began in 2001 ended in 2005 (UN 2004). One of the features is to enable districts that are willing, to form regional administrations under the 'Regional Tier' arrangement. If implemented, the regional government will be an important structure for inter-district transboundary natural resources management, among others.

Overall, decentralisation has guaranteed local executives the opportunity and the authority to plan, collect revenue (taxes) and prioritise the use of resources for service delivery at local levels. Under decentralisation, local administration is hierarchical in nature consisting of five levels beginning with village-level Local Council (LC) 1 to the district level LC5 (see *Box 2.1*). The sub-county is the lowest level of government having its own budget to fund environment and natural resources management, among others. The Plan for Modernisation of Agriculture (PMA) targets the sub-counties for its non-sectoral conditional grants to among others, fund environment-friendly activities.

Box 2.1

Structure of local government in Uganda
Administration

District	*LC5*
County	LC4
Sub County	LC3
Parish	LC2
Village	LC1

Human rights: Refers to civil and political rights whose principles are the prevalence of the rule of law, equality of all citizens before the law, individual and collective freedom/rights and the right to form and join political parties and trade unions. Further, it includes the right of every individual citizen to participate in free, credible and democratic elections (UN 2004). In regard to these fundamental rights and freedoms, the Constitution of Uganda provides for independence of the judiciary and Parliament, ensures separation of powers from the executive and gives capacity for elected bodies and the judiciary to control the cabinet's actions (GoU 1995a). In addition to the aforementioned principles, others that are also embodied in the institutional framework of Uganda and are practiced to some extent, include full equality for women to participate in political and socio-economic life; transparency and accountability along with the fight against corruption; and lastly, inclusive and participative forms of discussing national or local matters, including issues of environment and natural resources management. Parliamentarians have also had several awareness building workshops on the environment and natural resources.

Accountability and transparency: This area in politics and public administration has been a major concern both for government, international and national civil society as well as other development partners. Based on its *Annual Report 2004,* Transparency International, an umbrella body that oversees corruption, Uganda ranked 103rd out of the 145 countries surveyed. This is only a slight improvement from the previous ranking of 128th in 2003. Still, the Uganda Human Rights Commission (UHRC) mentions in its *Annual Report 2003* cases of embezzlement and misuse of public resources; while according to the IMF, the present growth rate of approximately 6% would have been much higher had corruption been significantly reduced. Moreover, following the World Bank's latest Investment Climate Assessment, the business sector ranks corruption as the sixth most important constraint on their activities. For foreign and export companies, corruption climbs to the second and third constraint, respectively (TI 2004).

Concerns regarding transparency are important when one considers that a large sum of funds devoted to environment and natural resources are contributed by development partners. Corporate values such as ‘zero tolerance for corruption’ adopted by some organisations including the National Forestry Authority (NFA) should be encouraged and adopted by more institutions.

Despite the above issues of corruption or lack of accountability and transparency, societal participation has blossomed in recent years leading to formation of many Civil Society Organisations (CSOs). Some of these are directly represented in elected bodies through special quotas, for instance People with Disabilities (PWDs), while others are involved in the national processes like poverty assessment or PEAP revision, as well as other activities. While the proliferation of civil society organisations, especially those dealing with environment and natural resources is welcome, they are often under-funded and have limited capacity.

The emergence of an independent press with more than 20 daily and weekly newspapers including a high national coverage of independent local and international radio and television stations is, however, a reflection of freedom of speech. Radios are effective means of communicating environmental and natural resources messages especially when local language coverage is encouraged. The country also has Trade Unions completely independent from the government and political parties that handle labour matters. While trade unions could be significant advocates of better environmental and natural resources management, the organisations are weak and rely on old out dated laws.

Though Uganda under the NRM government has embarked on democratisation, a number of challenges have been faced. For instance, insurgency and insecurity in the north have tended to undermine stability. By the same token, the NRM until recently was the sole authorised political organisation allowed to operate nationally. However, this issue has now been resolved, witnessed by a return to multi-party elections. On the other hand, there have also been attempts to cut authority and responsibility of watchdog institutions such as the UHRC, which actively denounces human rights violation even when they are perpetrated by security forces. An example of such incidences was activities of “Operation Wembley” to squash a wave of terrorism in 2001.

Further, between 1997 and 2003, the UHRC registered 7 414 complaints of human rights violations or abuses. *Table 2.7* summarises the complaints received between November 2002 and November 2003. It is intriguing to note the persistence of violations, which has been denounced by the UHRC, international NGOs and the Amnesty International (AI). However, the UHRC has largely been silent when citizens’ rights to a clean and healthy environment have been abused. On the other hand, environmental advocacy groups have repeatedly been singled out as being ‘anti-developmental’ when infact in some cases they are sounding warnings of the repercussions of development for its own sake and at all costs.

Table 2.7 Nature of complaints to UHRC (Nov 2002-Nov 2003)

Type of violation	No. of Cases
1. Right to liberty	212
2. Torture	145
3. Maintenance	122
4. Cruel treatment	68
5. Property	53
6. Speedy and fair hearing	22
7. Education	21
8. Life	15
9. Discrimination	9
10. Children's rights	8

Source: UHRC (2003).

In conclusion, the lack of resources, both human and financial, impedes decentralisation. Furthermore, conflicting policies such as the controversy over the need to increase human resources while budget funds are limited exacerbate decentralisation efforts.

On the other hand, Government has demonstrated its commitment to fighting corruption through among others the establishment of the Office of the Inspector General of Government (IGG). In addition, several commissions of inquiry have, over the years, been instituted to investigate allegations of corruptions. Unfortunately, despite these noble efforts, there are significant weaknesses in the fight against corruption. Notable are weaknesses associated with implementation of the recommendations of the IGG and the various commissions of inquiry.

2.7 The Economy

2.7.1 Economic Growth

Immediately following independence, the Ugandan economy showed remarkable progress. However, this positive progress was shattered after 1971 due to mismanagement in the public sector, political instability and civil war. When the National Resistance Movement (NRM) took power in 1986, the economy had crippled with the GDP falling 20% lower than its peak in 1970. High inflation rates, chronic budget deficits, an over-valued exchange rate, significantly lower export earnings, rampant destruction of natural resources such as forests (Hamilton 1984), degradation of the environment and deteriorated infrastructure characterised the economy. The NRM government launched an Economic Recovery Program (ERP) in 1987 to correct these macroeconomic imbalances in order to re-invigorate economic growth.

A sharp decline in coffee prices in 1992 prompted the government to further deepen reforms. Widespread liberalisation measures such as that of coffee, tea and tobacco marketing, and foreign exchange and interest rates were undertaken. In addition, measures to improve fiscal discipline; deepen financial markets; and commitment to end subsidies to state-owned enterprises were instituted including legislative and institutional reforms that paved the way for decentralisation policy to be adopted. The aim was to strengthen people's participation in decision-making and bring services closer to the people.

Upon the above reforms, the Ugandan economy has outperformed that of most African countries. From 1992-1998, the GDP steadily grew at an average annual rate of 7% recording a slight drop of 1% between 1999 and 2004. Inflation plummeted from over 100% in the 1980s to 54% in 1992 and thereafter fluctuated between - 0.3% and 10% (OPM 2005). Volatility of food prices, which constitute a significant part of the composite consumer price index, has contributed to the recent instability in inflation rates. After the sharp fall of the Ugandan Shilling in the 1980s, the currency depreciated more gradually beyond 1995.

2.7.2 Structure

Growth in gross domestic product (GDP) has not been even and steady across all sectors. Agriculture's contribution to GDP dropped from 54% in FY 1989/90 to 39% in FY 2003/4 (*Table 2.8*). The significant drop in the contribution of non-monetary agriculture accounts for much of this change, indicating that the agricultural economy has become more market-based. Gains in the share of GDP have been taken up by manufacturing, construction, transport and communication, and community services. The first three are to some extent responsible for the increasing significance of 'brown issues' (e.g. pollution) as opposed to the previous situation where 'green issues' (e.g. conservation) were the predominant environmental concerns.

Table 2.8 Sector share of GDP, FY 1989/00 – FY 2003/04 (percent)

Monetary GDP (%)	**1989/0**	**1992/3**	**1995/6**	**19989/9**	**2001/2**	**2002/3**	**2003/4**
Agriculture	24.3	24.6	23.7	23.1	22.5	22.3	22.3
Manufacturing	5.4	6.2	7.9	9.6	9.4	9.4	9.2
Construction	5.1	5.2	6.9	7.3	6.8	7.3	7.5
Wholesale and retail trade	11	11.2	13.1	13.1	11.1	11	10.9
Transport & communication	4.1	4.2	4.7	5.2	5.4	5.9	6.3
Community services	14.4	15.8	15.2	15.1	18.4	18.4	18.2
Others	2.2	2.6	3.1	3.4	5.1	5.1	5.2
Sub-total	**66.5**	**69.8**	**74.6**	**76.8**	**78.7**	**79.4**	**79.6**
Non-Monetary GDP (%)							
Agriculture	29.6	26.5	22	19.7	17.2	16.4	16.2
Others	3.9	3.7	3.4	3.5	4.1	4.2	4.2
Sub-total	**33.5**	**30.2**	**25.4**	**23.2**	**21.3**	**20.6**	**20.4**
Total GDP (%)	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: OPM (2005).

Currently, there has been a significant change in the structure of exports. The share of traditional export crops such as coffee, cotton, tea and tobacco has fallen sharply from 80% in 1994 to 37% in 2004. This has arisen partly due to fluctuation in coffee prices, Uganda's major export commodity, with earnings per tonne peaking in 1995 at US$ 2,300 before falling to US$ 800 in 1999. Although coffee prices have gained since 2000, the volume of coffee production has not recovered. At the same time, the share of non-traditional exports has risen, particularly fish and fish products, tourism, floriculture, and maize. Increased exports of fish and fish products has implications for annual harvest rates. On the other hand floriculture is chemicals-intensive and the location of the flower farms along the shores of Lake Victoria pose significant pollution threats. The adverse environmental effects of tourism have to be addressed. Increases in production of maize is also showing signs of declining yields and expansion into marginal lands.

Economic stability in Uganda was attained by the mid 1990s, laying a strong foundation for agricultural growth. On the basis of its strong policy reform agenda and good economic performance, Uganda was one of the first countries to become eligible for the Highly Indebted Poor Countries (HIPC) initiative in 1997 and then again in 2001, leading to a substantial external debt cancellation.

2.7.3 Sustainable Development

While economic growth in itself is a good thing, from an environmental sustainability perspective it is also important to know how Uganda achieved a fast economic growth over the 1991 to 2005 period. Furthermore, it is equally important to re-assure Ugandans that the impressive economic growth achieved up to 2005 can be sustained into the future, in the medium term at least. One useful measure of sustainable development is genuine savings, or more correctly adjusted net savings (ANS).

Achieving sustainable development is at the heart of a process to maintain wealth for future generations. Wealth is conceived broadly to include not only traditional measures of capital, such as produced capital and human capital, but also natural capital. The latter comprises assets such as land, forest, and subsoil. All three types of capital are key inputs for sustaining economic growth (World Bank 2001).

The standard government national accounts measure the change in a country's wealth by focusing solely on produced assets. A country's saving is measured by its gross national savings, which represents the total amount of produced output that is set aside for the future. Gross national saving can say little about sustainable development, as productive assets depreciate over time (Hamilton & Clemens 1999). If depreciation is greater than gross savings, then aggregate wealth is in decline. This is measured by net national saving. Net national saving equals gross national savings minus depreciation of fixed capital and is one step closer to measuring sustainability. Goal Seven of the Millennium Development Goals (MDGs) states the importance of maintaining natural resources in order to sustain our current standard. In spite of the importance of natural resources, the traditional measure of net savings focuses solely on fixed capital, and therefore overlooks depreciation and degradation of natural resources.

Genuine savings provides a much broader indicator of sustainability by valuing changes in natural resources, environmental quality, and human capital, in addition to the traditional measure of changes in produced assets. Negative genuine savings rates imply that total wealth is in decline; policies leading to persistently negative genuine savings are unsustainable. In addition to serving as an indicator of sustainability, genuine savings has the advantage of presenting resource and environmental issues within a framework that finance and development planning ministries can understand. It makes the growth-environment tradeoff explicit, since those countries pursuing economic growth today at the expense of natural resources will be notable by their depressed rates of genuine savings. Of the 140 countries assessed for 2003, just over 30 were estimated to have negative savings rates.

Table 2.9 shows genuine savings for Kenya, Tanzania and Uganda. The data ranks Kenya first among the three countries followed by Tanzania and Uganda in the year 2000. Uganda's low ranking partly explains the fact that the country had not fully recovered from the difficult periods of the 1970s and 1980s compared to the consistently stable situations in the other two countries.

Table 2.9 Comparison of the genuine savings for Uganda, Kenya and Tanzania for the year 2000

	Gross national saving % of GDP	**Net national saving % of GDP**	**General savings % of GDP**
Kenya	13.4	5.7	10.9
Tanzania	12.4	5.1	6.8
Uganda	15	7.7	3.4

Source: World Bank (2001)

Adjusted net or genuine savings measures the true level of savings in a country after depreciation of produced capital, investments in human capital (as measured by education expenditures), depletion of minerals, energy, forests, and damages from local and global air pollutants are taken into account.

In estimating the Adjusted Net Savings (ANS) for Uganda, Yaron, Moyini & Others (2003) aimed to further the inclusion of measures of Genuine Savings alongside traditional measures so as to focus attention on the sustainability of Uganda's growth. The World Bank (2003) noted that Uganda is one of the relatively few countries for which genuine savings data existed for 1980-89. The ANS for these years shows significant negative savings rates in the early part of the period that were brought closer to zero by the late 1980s. It appears that Uganda has made progress over this period but the ANS remains below Kenya and Tanzania as noted in T*able 2.9* above.

IFPRI (2003) soil nutrient loss studies, the 2002 Census and other sources, provided background data that Yaron, Moyini & Others (2003) used to calculate the value of soil nutrient loss in Uganda, estimated to be US$ 625 million per annum (in 2001/2002 prices). When the loss of soil nutrients was taken into account, Uganda's net savings were found to be significantly negative, indicating the practices which existed were not sustainable. Yaron, Moyini & Others (2003), concluded that the formation of physical and human capital were too slow to offset the loss of natural capital (*Table 2.10)*.

Table 2.10 Adjusted net savings in Uganda including soil nutrient loss

	2001 (US$)	**% of GNI**
Gross National Investment (GNI)	5556150784	
Gross National Savings	765219200	13.77%
Consumption of fixed capital	420933715	7.58%
Education expenditure	107580353	1.94%
CO2 damage	9469189.72	0.17%
Value of net forest depreciation	344459083	6.20%
Value of mineral depletion	0	0.00%
Value of energy depletion	0	0.00%
ANS (excluding soil nutrient loss)	97937565	1.76%
Value of soil nutrient loss	625355848	11.26%
ANS (including soil nutrient loss)	**-527418283**	**-9.49%**

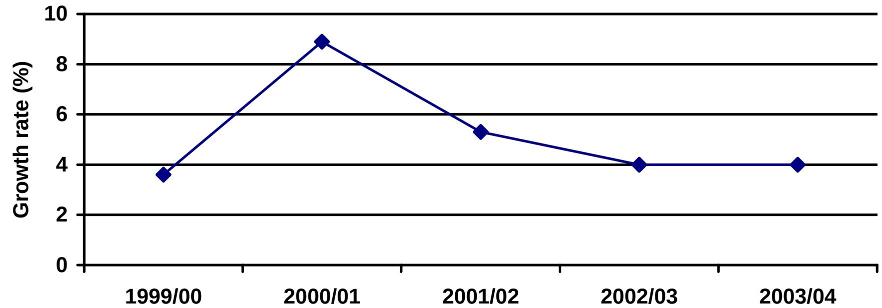
Source: Yaron, Moyini & Others (2003)

2.7.4 Industrialisation

In 1991, the Uganda Investment Authority (UIA) was established as a “one stop” centre to process investment licenses and safeguard the environment and health of employees. Before 1986, the industrial sector had severe setbacks due to poor macroeconomic conditions, insecurity, neglect, poor management and shortage of inputs. However, with a new government in power since that time, the sector improved at an average annual rate of almost 12% which has since then reduced somewhat.

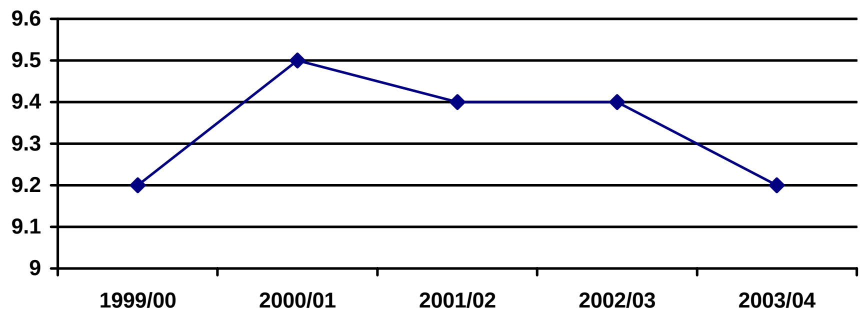
The manufacturing sector was estimated to increase by 4.0 percent in 2003/04, similar to that of 2002/03. Formal manufacturing output grew by 4.7 percent in 2003/04 compared to 4.1 percent in 2002/03 (*Figure 2.6*). The growth in manufacturing was due to higher production in paper and printing, textile, clothing and foot wear, drinks and cement, and chemicals, paint, soap and foam products. Some of these industries such as cement production are highly polluting and require regular inspections to ensure that operations are less harmful both to the workers and the environment. On the other hand, informal manufacturing output increased by 2.3 percent in 2003/04 compared to an increase of 3.8 percent in 2002/03. The pollution effects of small manufacturing enterprises may be small at the individual firm level, but taken together, the impacts may be considerable. In this case attention should be paid to the cumulative effects of the impacts, calling for strategic environmental assessments (SEAs). Reflecting back to the situation in 1994, the industrial sector had just recovered from mismanagement of the 1970s and early 1980s and the sectors’ contribution to GDP was only 4.7 per cent. By 2004, the manufacturing sector’s contribution was 9.2% almost double that of baseline period (*Figure 2.7*).

Figure 2.6 Percentage growth rates of the manufacturing sector (1999/00-2003/04).



Source: UBOS (2004b)

Figure 2.7 Gross domestic product percentage contribution of manufacturing sector 1999/00-2003/04.



*Source: UB*OS (2004b)

Industrial production

The Index of Industrial Production (IIP) measures trends in the manufacturing sector of the country within a specified period of time. Data for the compilation of the index are collected on a monthly basis from about 150 operational establishments. The establishments covered are those employing five or more persons located in the industrial belt of the country. The area covered includes the districts of Mbarara, Bushenyi, Kasese, Hoima, Masaka, Kampala, Mpigi, Wakiso, Mukono, Jinja, Bugiri, Tororo and Mbale. The index increased from 123.4 in 1999 to 150.5 in 2003 (*Table 2.11*). An opportunity exists here for the Uganda Bureau of Statistics to track some environmental indicators during these monthly surveys, which in turn requires the identification of appropriate indicators.

Table 2.11 Index of industrial production, annual group summary, 1999-2003 (Base 1997/1998=100)

Group	No. of Estabs. 2002	Weight	1999	2000	2001	2002	2003
Food processing	46	39.3	123.6	118.2	131.9	135.3	136.1
Tobacco& Beverage.	11	18.6	123.0	116.0	119.0	122.5	137.3
Textiles, Clothing, Leather & Foot wear.	7	4.6	185.4	178.9	166.3	168.4	208.2
Paper & Printing.	13	6.2	134.1	163.8	183.8	156.7	196.2
Chemicals, Paint, soap & Foam products.	18	8.2	125.3	124.8	138.2	132.0	150.0
Bricks and Cement.	10	5.6	118.6	136.2	148.6	167.9	158.5
Metal Products.	15	10.5	126.6	155.9	204.9	202.6	178.6
Miscellaneous.	15	7.0	98.1	98.0	103.7	152.1	140.7
All Items.	135	100.0	123.4	127.5	141.4	145.5	150.5

Source: UBOS (2004b)

Small Scale Industries (SSIs)

Since 1986, policy makers have given greater recognition to the importance of small-scale industries to the growth of Ugandan's economy. This was demonstrated by the formation of a small-scale industry division within the then Ministry of Industry and Technology.

In 1990 a survey estimated that small-scale industries (SSIs) could contribute as much as 70% of industrial output and most of the employment opportunities and that their development would help to stem the drift from rural to urban areas. Another positive aspect of SSI is that, in contrast to the early large industries that pursued an import substitution strategy, they are based on the local resources of agriculture, fisheries and forestry.

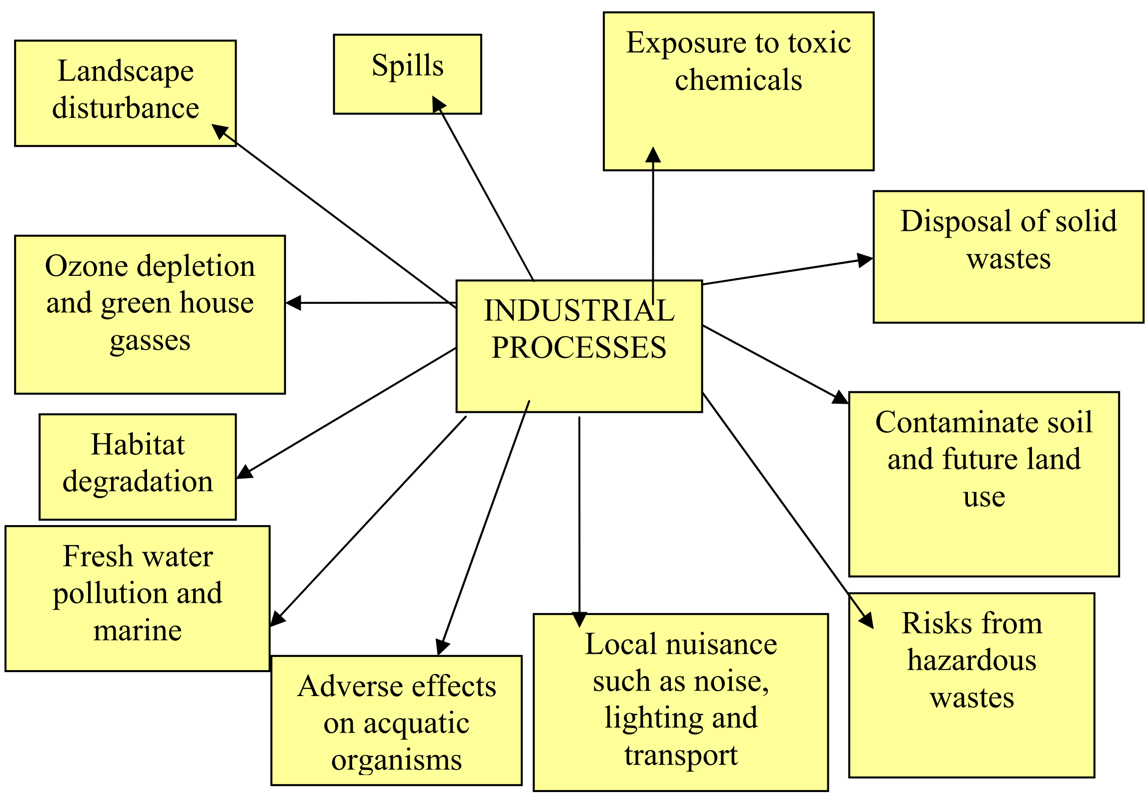
However, these SSIs still suffer from weak linkages with large-scale industry, lack of access to credit, past government concentration on the development of large-scale industries to their neglect, and lack of coordination among SSIs support agencies. There are a few industry organisations representing the SSIs. The Uganda Manufacturers Association (UMA) represents mostly larger enterprises as does the Uganda Chamber of Commerce and Industry.

Only the Uganda Small Scale Industries Association (USSIA) truly represents the SSIs. Most SSIs are engaged in five sub-sectors: grain milling and bakeries, wood working and furniture making, brick and tile manufacture, textiles and foot wear, and steel fabrication, including equipment for grain milling, brick making and edible oil extraction. While individually, pollution effects of these small and medium enterprises (SMEs) may be small and often negligible, cumulatively, they pose major environmental concerns as mentioned earlier. Case in point is the total annual national quantity of clays extracted from wetlands for purposes of brickmaking which often leave ugly scars on the landscape, especially in wetlands.

Industrial pollution

Industrial processes mainly depend on environmental resources and services. However, the current functioning of the industrial processes deplete and degrade these resources and services in a variety of ways. The degradation of environmental support systems occurs mainly via two routes: depletion of resources, which act as raw materials for industrial production; and pollution of environmental resources during and after industrial production. *Figure 2.8* shows pollution pathways of industrial development.

Figure 2.8 Conceptual Pollution pathways of industrial development



Pollution and wastes are unwanted by-products from the processing of raw materials into finished goods. Gaseous wastes include a range of pollutants causing smog, acid rain, Ozone depletion and global warming. Liquid wastes can pollute ground water and surface water sources. Hazardous and solid wastes may result in the creation of contaminated sites, which result from poor landfilling, and spills of toxic and hazardous materials. This can also lead to soil contamination and pollution of surface and underground water supplies. The cost of remediation of such sites is often very high.

Pollutants discharged into the air, water and land are potentially harmful to living resources and ecological systems. For example, wastewater may contain hydrocarbons, metals, acids, bases, organic compounds and nutrients. If discharged untreated, wastewater can cause eutrophication and water pollution with serious effects on aquatic resources. Even when treated, conventional sewage treatment plants do not remove all the constituents of industrial effluents. In some instances, these constituents can damage the treatment system itself. Some scientists and industrialists have concluded that the scale of industrial pollution is now so great that even normally non-toxic emissions, such as carbon dioxide, have become a serious threat to the global ecosystem. In a food chain this intoxification leads to biological magnification.

2.7.5 Transport and Communications

In most developing countries, Uganda inclusive, the demand for the transport sector is very high yet the resources available to government to provide transport services are limited. Uganda's transport infrastructure includes roads, railways, piers, jetties, aerodromes, runways and taxiways. It has been noted that the growth of transport and communications was 14.4 per cent in the year 2003/04 over the previous year (UBOS 2004a).

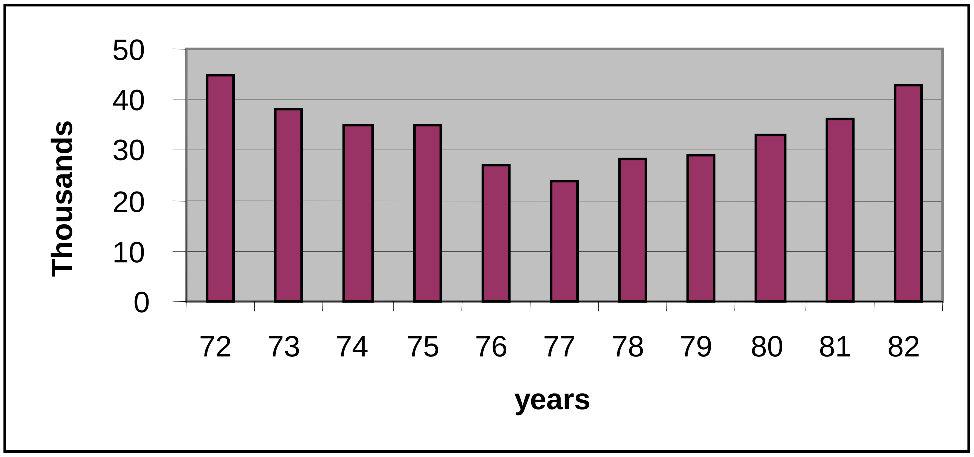
Road transport

With the turmoil in the 1970s and 1980s, Uganda's road network deteriorated greatly. For example:

- 50% of the 20 300 km of feeder roads required full rehabilitation, 20% were expected to deteriorate further, while the remaining 30% needed only routine maintenance;
- about 30% of rural households had no roads and were being served by footpaths; and
- 1 979 km of trunk roads were tarmac, while the remaining 7 939 km were murram (NEIC 1994).

While the number of cars and private vehicles declined in the 1970s and early 1980s, by 1991 there was a noticeable increase. As of 1994, 80% of the vehicles in the country were privately owned, 10% owned by government, while 7% and 3%, respectively belonged to projects and diplomatic missions. From the mid-1980s, Uganda imported many re-conditioned vehicles mainly from Japan. Two public companies were responsible for transporting the bulk of passengers – Uganda Transport Company in Kampala and Peoples Transport Company in Jinja - both government-owned. However, for reasons of questionable viability Government decided to close both companies. In haulage, the major freight transporter in the country was the Uganda Cooperative Transport Union (UCTU), a cooperative owned by regional cooperative unions. *Figure 2.9* shows the previous trend in the number of vehicles in Uganda up to 1982.

Figure 2.9 Trends of number of vehicles on the road, 1972-92, 2002 and 2003



Source: BOU (1993).

Overall, road transport still remains the most common form of transport in Uganda. It has continued to contribute to increased agriculture, industrial production, trade, tourism, and social and administrative services. Road transport has over the years registered tremendous growth. On the whole, transport and communications growth has been 14.4 % in 2003/04 (*Table 2.12*).

Table 2.12 Estimated number of motor vehicles on the road, 1999 – 2003

	1999	2000	2001	2002	2003
Newly registered vehicles	29,362	22,005	26,535	25,649	33,291
Percentage increase	-	25.1	20.6	-3.3	29.8
Estimated number of vehicles	186,244	189,105	201,521	209,278	226,191
Percentage increase	-	1.5	6.6	3.8	8.1

Source: MoWHC (2004a).

By 2004, total kilometres of roads in Uganda were 85 342 km. The extent of pavement is 3 915 km. The gravel roads are 1 038.1 km and the number of kilometres of roads in rural areas is 54 136 km (*Table 2.13* and *Table 2.14*).

Table 2.13 Total length for national, district, urban, and community access roads-2005

S/no	Roads	Length (km)
1	National Roads	10,820.00
2	Urban Roads	27,974.45
3	Community Access Roads	54,136.80

Source: MoWHC (2005).

Table 2.14 Paved road network by category in percentages, 2005

S/no	Roads	Length (km)	As % of Total
1	National Roads	2,667.00	24.65
2	Urban Roads	1,248.10	32.12

Source: MoWHC (2005).

Conditions of roads and their management

District roads are those roads formerly referred to as feeder roads. They are the responsibility of district local governments. The total length of these roads keeps varying from year to year depending on decisions made by the Central Government or local governments to upgrade some roads. The total length of district roads currently stands at 24 603 km (MoWHC 2001). Maintenance of district roads is a responsibility of district governments. Urban roads are all those roads (bitumen, gravel or earth surfaced) that fall within the boundaries of urban councils. They currently total up to 3 022 km (MoWHC 2001). Maintenance of urban roads is a mandated responsibility of urban councils. Community roads are the smaller roads linking communities to district or national roads. They are a responsibility of communities. Their length is approximately 30 000 km (MoWHC 2001). The national road network comprises of the following road classes.

- Class A (primary) roads: the main international routes, which connect the major urban centres. The primary network makes up 37 per cent of the national road network, and approximately 65 per cent of it is paved;
- Class B (secondary) roads: these bridge the gap between regional communities and the primary road network, and also serve as collectors for tertiary roads. The class B network accounts for 33 percent of the national roads network and is almost totally unpaved; and
- Class C (tertiary) roads: these are local roads, providing access to small communities and district administrative centres. The tertiary network is 30 per cent of the national road network and is entirely unpaved (MoWHC 2001).

Through the 1970s and early 1980s, during the political upheavals and economic mismanagement in the country, district, urban and community roads suffered neglect and disrepair. By 1986, only 15% of the district road network could be described as fair. For urban roads, the percentage was under 5%. Most of the community roads had disappeared altogether. As of now, some 12 000 km of district roads have been rehabilitated and

15 000 km or 60% of the network is under continuous routine maintenance and could be described as being in fair to good condition. For urban roads, 113 km of bitumen surfaced roads have been resealed or constructed anew while 284 km have been graded and shaped. Community roads are still in a poor state; only 10% of the networks of community roads have been rehabilitated.

Trends in roads development

Several roads have since 1994 been developed through various programmes as listed below.

- Kampala city roads rehabilitation project phase II (1994-1995): achievement 35 km
- First urban project to reseal Kampala city roads (1994): achievement 15 km
- JICA II urban resealing project plus city, municipal and town councils' own effort (1994-2001) achieved 22 km.
- Northern Uganda Reconstruction Project - rehabilitation of urban streets and markets (1995-1997) achieved a total of 37 km in Gulu, Kitgum, Lira, Apac, Soroti, Kumi and Pallisa urban councils.
- JICA II urban roads resealing project 1993 – to date has resealed a total of 74 km in townships of Kampala, Jinja, Fort Portal, Mbarara, Kabale, Masaka and Mbale urban councils (MoWHC 2001).

Despite the positive developments in the road sector, there are environmental degradation issues that have followed the construction and maintenance of roads, including the following:

- gravel pits (stagnant water, out-hanging cliffs and their restoration);
- loss of vegetation cover;
- disruption of ecology within various ecosystems;
- siltation of wetlands;
- erosion of the soil;
- poor drainage and drainage into people's fields;
- noise pollution from heavy equipment;
- disruption of livelihoods of those already settled along improved roads;
- disruption of wildlife migratory routes;
- communicable disease spread by migrant workers; and
- stone quarrying and associated pollution effects.

In order to mitigate potentially adverse environmental impacts and enhance positive ones, the MoWHC has produced *EIA Guidelines for the Roads Sub-Sector* (MoWHC 2004b). The Ministry has also produced policy statements on, and guidelines for, mainstreaming cross-cutting issues (gender, people with disabilities, occupational health, and HIV/AIDS) in roadworks.

Railway transport

Railways are a more effective and less polluting means of transport compared to roads. According to NEIC (1994), the history of railways went as far back as 1905 (almost 100 years ago), when a rail-line was built from Mombasa to Jinja. Later extensions were made to: Namasagali (1912), Kampala (1932), Kasese (1953), Tororo to Soroti (1992), Soroti to Lira (1962) and Lira to Pakwach (1964), all constituting 1 280 km of single track. After its glory days between 1963 and 1977 when the East African Railways and Harbours Corporation managed the networks in Kenya, Tanzania and Uganda, this mode of transport declined drastically in Uganda, partly due to inefficient management but also as a result of both technological obsolescence and lack of wagons, among others.

After the 1977 dissolution of the East African Railways and Harbours Corporation, Uganda Railways Corporation (URC) was created as a small parastatal entity operating rail and marine services within the country. URC inherited an operable railway network of 1 241 km as well as a marine terminal on Lake Victoria and lake vessels for transporting goods and passengers. In the 1980s, railway transport was the most efficient mode of transport but recently some segments have been closed due to low traffic and high maintenance costs. However, Uganda Railways Corporation is the major mode of transport for container goods. The Corporation's activities for 2003 were via the northern corridor (Kampala-Malaba and Kampala-Port Bell-Kisumu) and the southern corridor (Kampala-Portbell-Mwanza). Kenya and Uganda are in the process of leasing their railways facilities to a private operator in the hopes that this will improve efficiency and inject much needed capital in the operations.

A total of 854 229 tonnes of goods was hauled in 2003 compared to 903 662 tonnes in 2002. The goods traffic in tonnes-kilometres decreased by 2.2%, from 217 476 to 212 616 thousand tonne–kilometres in 2002 and 2003, respectively (UBOS 2004b). During the 2002-2004 period the URC sector transported mainly imports and exports. This is about 44% of all regional freight. As far as domestic goods are concerned, the railway transports about 0.4%. All passenger services were terminated due to high maintenance costs. *Table 2.15* shows freight and other railway traffic.

Table 2.15 Freight and other railway traffic

Traffic 000 tonnes kms	**1996**	**1997**	**1998**	**1999**	**2000**
Passenger traffic	27,000	0	0	0	0
Goods traffic	163,300	144,000	147,000	199,585	209,534
Parcels and luggage	3,000	75	n.a	n.a	n.a
Revenue collected (million Ushs)					
Passenger traffic	427	0	0	0	0
Goods traffic	17,285	12,968	15,874	25,513	27,080
Parcels, luggage and mail	96.2	7.6	27.9	6.5	35.0
Livestock	n.a	1.3	1.0		
Total	**17,808**	**12,978**	**15,903**	**25,519**	**27,115**

n.a – Not available,
Source: URC (2002).

Air transport

International and domestic air travel by 1994

Uganda Airlines was formed in 1976 and became the sole national carrier with the collapse of the then East African Community and the East African Airways. As of 1994, Ugandan infrastructure for air travel consisted of the international airport at Entebbe and 12 gazetted domestic airfields. There were also a few private airstrips.

Air transport which is run by the Civil Aviation Authority, is the only direct access to the outside world. Air transport has been growing since 1996 but with a few setbacks in 2000. Since the European Union lifted the ban on fish exports, the volume of exports has increased. Air transport is the quickest means of transport for perishables and high import value goods like medicines. *Table 2.16* shows commercial traffic at Entebbe International Airport. By 2004, there have been improvements in air transport. For instance:

- increase of 14% (416 697 in 2003 to 475 505) of international passengers;
- increase of 28% (21 748 tonnes for financial year 2002/2003 to 27 814 tonnes for financial year 2003/2004) of cargo exports registered;
- security and safety in the aviation industry was enhanced and an award for best performance in Africa for second year running received by CAA; and
- infrastructure improvements at both Entebbe and up-country aerodromes were maintained (perimeter wall fencing for 12 up-country aerodromes constructed and quality of services and facilities improved (MoWHC 2005).

However, compared to other types of transport, air transport causes a lot of noise pollution as well as air pollution. The effects are felt most in densely populated areas. Air transport levels are still low and hence pollution impacts relatively less when compared to road transport.

Table 2.16 Commercial traffic at Entebbe International Airport, 2002–2003

S/No	Description		2002	2003
1	Average daily number of commercial aircrafts	International	29	34
		Domestic	11	13
2	Average daily number international PAX	Arrivals	492	571
		Departures	506	568
3	Average daily number of domestic PAX	Arrivals	46	62
		Departures	46	60
4	International cargo (tonnes)	Imports	36	34
		Exports	59	64
5	Domestic cargo (tonnes)	Unloaded	0.0	0.0
		Loaded	0.2	0.3

Source: CAA (2003)

Table 2.17 shows trends in commercial traffic at Entebbe International Airport for the period 1999 to 2003.

Table 2.17 Commercial traffic at Entebbe International Airport, 1999-2003

Mode of Traffic		1999	2000	2001	2002	2003
Commercial aircraft movement	No.	17,807	16,190	15,626	14,523	17,274
Over flight at Entebbe	No.	2,709	3,014	2,859	3,411	3,197
International Passengers						
Landed	No.	170,981	157, 293	155,881	179,518	209,632
Embarked	No.	159,167	172,192	172,151	179,679	208,328
In transit	No.	71,325	58,510	39,761	26,757	31,759
Domestic						
Landed	No.	16,294	14,482	13,221	16,920	22,596
Embarked	No.	15,924	14,638	13,074	16,898	21,787
Total	No.	443,619	417,115	394,088	419,772	494,102

Source: CAA (2004).

Water transport

Before Uganda's extensive trunk road system was developed, water transport was a major form of transportation especially from southern Sudan to Butiaba, Masindi District then criss-crossing by road to Masindi Port, onto another steamer up to Namasagali; and thereafter continuing by rail or road to Kampala. Unfortunately, water transport on Uganda's open waterbodies (lakes and rivers) have not been significantly developed for transport, especially after the demise of the then East African Community in 1977.

It is important to know that at least 15% of the total surface area of Uganda is covered by lakes and rivers and most of these waterways are navigable. These waterways are operated by URC, MoWHC, UWA and a large number of private operators licensed by the Department of Fisheries Resources. The quantity of cargo moved through Lake Victoria by URC increased from 118 870 metric tonnes in 1996 to 216 244 metric tonnes by 2000 (MoWHC 2002). The government's objective as far as waterways is concerned is to ensure safety of inland water transport. The promotion of water transport has to be planned to avoid accidents such as oil spills and loss of human lives. Oil spills would be particularly damaging to the country's aquatic resources, an important source of economic activity and rural livelihoods.

Communications

Posts and telephone lines have a direct bearing on the performance of the economy and society because they facilitate communication. In the 1970s and 80s, Uganda was poorly served with TVs, radios and telephone services.

Like all other sectors in the economy, posts and telecommunications suffered during the periods of macroeconomic mismanagement. For example:

- by 1988 there were about 27 900 Direct Exchange Lines (DELs) and the waiting list for telephone services was 25 400 registered applicants;

- also by 1988 Uganda had an installed capacity of 57 900 connected subscriber lines and telephone density of 0.2 DELs per 100 persons, comparable to Tanzania also at 0.2 but considerably lower than Kenya (0.6). Furthermore, the fault rate of 2.7 DELs per annum was the highest in the world; and

- there were 890 telex subscribers in Uganda, 90% of them in Kampala.

In short, telecommunications was very poor as of 1994. Few Ugandans had access to or could be accessed by telephone.

Telecommunications

The government owned the telecommunications sub-sector in the 1970s. Currently due to liberalisation the telecommunications sub-sector has shown some improvements partly as a result of private sector involvement. The progress in rolling out of telephone services has continued. By September 2003, the coverage was in 55 out of the then 56 districts. The telecommunications sub-sector realised tremendous growth and registered an increase of 76.6% in mobile cellular subscribers from 505 627 as of December 2002 to 893 035 by December 2003 (UBOS 2004) as shown in *Table 2.18*. The sector also registered 18 Internet service providers in 2003 compared to the 17 providers in 2002. Furthermore, the subscribers to the Internet increased from 6 500 in 2002 to 7 024 in 2003 (UBOS 2004) as shown in *Table 2.19*.

Table 2.18 Telecommunications statistics as at December, 1999-2003

Item	1999	2000	2001	2002	2003
Fixed telephone lines	58,216	61,462	56,149	59,472	65,793
Mobile cellular Subscribers	72,602	188,568	276,034	505,627	893,035
Pay phones	1,680	3,075	3,310	3,200	3,456
Internet/email subscribers	4,248	5,688	5,999	6,500	7,024
Mobile cellular Operators	2	2	3	3	3
Internet services Operators	9	11	11	17	18
Private FM radio Stations	37	100	112	117	125
Private TV stations Registered	11	19	20	22	23

Source: UCC (2004)

In the early 1990s there was only one mobile network (Celtel Uganda) and at that time mobile phones and subscriber fees were very expensive. But with the coming of MTN and then the Mango networks, the situation improved. Internet connections have also increased. In addition, many Internet cafes have been opened. The mobile telephone services are highly taxed and this has increased the government's revenue. MTN Uganda Ltd, a mobile phone company, is the largest corporate tax payer to government. In addition, the sector has employed many people thus solving the unemployment problem of the country. A major environmental concern is the indiscriminate disposal of the non-decomposable plastic airtime cards. On the positive side, the wider national coverage by cellphone companies means it is easier to report environmental disasters or inappropriate actions on Uganda's natural resources capital promptly.

Table 2.19 Telephone and Internet subscribers, 1999 – 2003

Service	1999	2000	2001	2002	2003
Fixed telephone	58,261	61,462	56,149	59,472	65,793
Cellular phone	72,602	118,568	276,034	505,627	893,035
Internet subscribers	4,248	5,688	5,999	6,500	7,024

Source: UCC (2004)

Postal services status

The current situation is a significant improvement over the 1994 baseline situation. The country is relatively well-served with postal services. There have been a lot of improvements within Posta Uganda as far as letters and parcels are concerned. More private companies like FedEx, DHL and Daks Courier have joined in to give efficient and faster services. Despite the increasing number of Internet service users, postal services have registered steady growth in the number of letters and parcels handled. That is, between 2002 and 2003, the volume of letters increased from 17 852 to 22 801, while parcels posted increased from 2 381 to 3 712. On the other hand, letters received decreased from 11 393 to 5 559, while parcels increased from 15 439 to 15 604 (UBOS 2004b) as shown in *Table 2.18*. The increased efficiency in postal services should facilitate timely delivery of print material (posters, flyers, etc.) about environment and natural resources messages.

Table 2.20 Postal statistics, 1999-2003

Item	Unit	1999	2000	2001	2002	2003
Letters posted internally	‘000	8,166	9,223	9,930	11,037	14,084
Letters posted internationally	‘000	5,208	5,649	6,137	6,815	8,717
Letters received from abroad for delivery	‘000	8,997	9,384	10,267	11,393	5,559
Letters in transit	pieces	30,814	33,171	36,488	40,469	-
Parcels posted internally	pieces	102	88	98	109	3
Parcels posted internationally	pieces	3,415	1,864	2,048	2,272	3,712
Parcels received from abroad for delivery	pieces	14,945	12,395	13,952	15,439	15,604
Employees as at end of year	persons	486	477	412	428	589

Source: Posta Uganda (2004)

Mass media

Generally, the mass media sector is growing at a very high rate. Newspapers in English and other local languages as well as FM radio stations are all over the country. Currently there are over 10 TV channels and over 60 radio stations (MoWHC 2004). All these improvements are due to liberalisation of the communications sector. Most of the FM stations broadcast in local languages. This increases the level of awareness of the people and keeps them informed throughout the country. Hence the FM stations offer an important avenue for the broadcast of environmental and natural resources management messages. On the other hand, the poor disposal of used sets and misuse of broadcasts to convey negative messages are some of the undesirable effects.

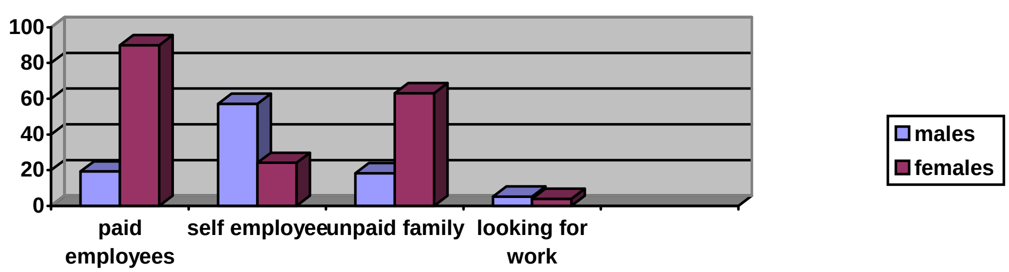
2.7.6 Employment

During the baseline period (1991-1994), employment in Uganda was predominantly agricultural or natural resource-based. Those employed included households cultivating their own land, working as day or contract labourers and those working on tea, sugar and other plantations. They also included households engaged in subsistence fishing, local woodlots, logging operations, fuelwood harvesting, hunting and gathering. Kilembe Copper Mines, a major employer had ceased significant production operations by 1994, laying off a large number of workers.

However, currently the employment status among persons aged 10 years and above indicates that 57% of the population is in employment, out of which 42% is self-employed while 39% were unpaid family workers; and the remaining 4.6% were looking for work.

Considering gender sensitivity in employment status, wider sex differentials were recorded for unpaid family workers (63% of women compared to 18% of men). Nearly 25% of the women were self-employed compared to 57% for men (*Figure 2.10*). High levels of unemployment leads to high pressures on the nation's natural resources for survival. Skewness of unemployment towards males means more illicit activities such as poaching, illegal logging and illicit brewing. Women rarely engage in such activities.

Figure 2.10 Employment status by sex, 2002



Source: UBOS (2003)

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PART II

STATE OF THE ENVIRONMENT

- **Atmospheric Resources**
- **Terrestrial Resources**
- **Aquatic Resources**
- **Cross-Sectoral Resources**

3.0 ATMOSPHERIC RESOURCES

Atmospheric resources refer mainly to climate. While appreciation may be lucklustre, climate is an important resource, just as the terrestrial and aquatic resources described in the latter parts of this report. Climate is an important resource because the livelihoods of Ugandans and other living things depend on it. For one, Uganda's agriculture relies on rainfall, an important parameter of climate.

As further described below, issues of concern regarding atmospheric conditions in Uganda are climate change and climate variability. The vulnerability of, and adaptation to, the deleterious effects of climate change and climate variability are another issue; and so are the recognised linkages between what happens to the atmospheric resources and their impacts on other sectors of Ugandan's economy such as land degradation, droughts, desertification, biodiversity loss and increased poverty.

According to Sestini *et al* (1989), many important economic and social decisions being made today are based on the assumptions that past climatic data provide a reliable guide to the future. However, as seen today, environmental problems associated with potential impacts of expected climatic variations may prove to be among the major environmental problems the country may face.

Uganda's atmospheric resources are not compartmentalised and exclusive to the country. Atmospheric resources know no national boundaries. Hence global collaboration is a key tenet of efficient atmospheric resources management.

3.1 Climate Change

Climate change refers to the long-term change of one or more climatic elements from previously accepted long term mean value. The main variable of climate change is temperature. Globally, the earth's temperature has been rising due to the effects of the greenhouse gases (GHGs) over the last 40 to 50 years. Such a condition is referred to as *"global warming"*, which occurs due to the long–lived industrially and agriculturally generated atmospheric trace gases such as carbon dioxide (CO_2); chlorofluorocarbons (CFCs); ammonia (NH_3) and nitrous oxides (N_2O) that absorb some of the terrestrial radiation. Climate change can affect human health and wellbeing through a variety of ways. For example, it can adversely affect the availability of freshwater, the ability to produce food, and the distribution and seasonal transmission of vector-borne diseases like malaria.

The Earth's surface temperature is rising, caused by a build up of GHGs in the atmosphere as a result of fossil-fuel-intensive mode of global development. While Uganda's development is less energy-intensive, the country cannot escape the harmful effects of any global build up of GHGs since atmospheric gases know no national boundaries.

Since the industrial revolution the concentration of CO_2, one of the major GHGs in the atmosphere, has increased significantly. This has contributed to greater greenhouse effect. Global warming is a "modern" problem, complicated, involving the entire world, tangled up with difficult issues such as poverty, economic growth, and population growth. Dealing with it will not be easy, and ignoring it will be worse. The increase in GHGs is largely due to anthropogenic emissions of CO_2 from fossil fuel combustion and, to a lesser extent, changes in land use. Although CO_2 accounts for about 60% of the additional GHGs, the concentrations of other GHGs, for example methane (CH_4), N_2O, and CFCs have also increased. Greenhouse gases make up only 1% of the atmosphere, but they act like a blanket around the earth. They trap heat and keep the planet some 3^0C warmer than it would otherwise be.

The main issues pertaining to GHG emissions include: (i) inefficient utilisation of fuels; (ii) poorly planned modes of transport; (iii) poorly serviced motor vehicles; (iv) inefficient cookstoves and fire places; and (v) rudimentary kilns and stoves in industries. All the above contribute to greater emissions and the subsequent accumulation of GHGs in the atmosphere. For instance, during charcoal production, significant amounts of CO_2 and other trace GHGs such as nitrogen dioxide (NO_2), and carbon monoxide (CO), sulphurdioxide (SO_2) are released into the atmosphere in smoke and fumes. However, the emissions released depend on biomass type, amount consumed in the combustion process, carbon content, and burning efficiency. In general, Africa as a whole, emits only 3.5% of the world's total CO_2 at present and this is expected to increase to only 3.8% by the year 2010 (World Bank 1998).

According to Ottichilo *et al* (1991), climate change is expected to have far-reaching impacts on both the existing and potential development activities in Africa. It affects the bio- productive system on which most economic investments in Africa are based. The impacts of increased temperature and decreased rainfall will cause shifts in vegetation zones and this will be felt in the various sectors of the economy such as agriculture, tourism and industry.

Based on the World Bank report (2000), people living in poverty are more susceptible to climate change. Consequently, Uganda, with at least 38% of its population still living below the line poverty and deriving their livelihoods largely from agriculture, climate change poses a critical question. Uganda, like most African countries, remains vulnerable to the effects of climate change since agriculture depends primarily on climate. Under the current situation of climate change which has a big influence on economic and ecological issues, the condition of vulnerable social groups like women and children in Uganda and most African countries is likely to worsen. Some highlights of potential effects of climate change on the African continent are given in *Box 3.1*.

Box 3.1

Significance of climate change in Africa

Climate change is likely to impact seriously on Africa. Increased intensity of drought, floods and changes to growing seasons may have significant implications for soil productivity, water supply, food security, food supply, and in turn human welfare and poverty, as well as deleterious and, in many cases, irreversible impacts on biodiversity.

Current GHG emissions from Africa are of little importance on a global scale, and have contributed only a negligible share to the build-up of GHGs in the atmosphere so far. Still, Africa's share of global emissions may increase considerably in the future. In the worst-case scenario, Africa's emissions could become comparable to those of other regions towards the end of the next century. Variables that produce the scenario variations include: (i) population growth; (ii) economic growth; (iii) energy intensity; i.e. the amount of energy consumed per unit output; (iv) use of fossils fuels; (v) deforestation rates; and (vi) the burning of vegetation.

It is anticipated that a given climate change will result in more adverse socio-economic impacts in Africa than in other parts of the world. This is due to several factors including high dependency on the agricultural and forest sectors, restricted population mobility, poor health facilities, high population growth rates and low material standards. Further, countries in Africa tend to have a much higher share of their economy dependent on climate sensitive sectors such as agriculture unlike the industrialised countries.

Source: World Bank (1998)

The United Nations Framework Convention on Climate Change (UNFCCC) aims at stabilising concentrations of greenhouse gases in the atmosphere and commits Parties (States), in accordance with the principle of common but differentiated responsibility and taking into account their national priorities and aspirations, to take measures to mitigate greenhouse gas (GHG) emissions. Uganda is a signatory to and has ratified the UNFCCC. Uganda is also a party to the Kyoto Protocol. The Kyoto Protocol is an additional treaty to the UNFCCC and has more powerful and legally binding measures in place. The Kyoto Protocol was first adopted at COP3 in Kyoto Japan on 11th December 1997. It also aims at reducing GHG emissions worldwide.

Uganda last carried out a comprehensive inventory of GHG emissions around 1996 using 1994 inventory data. Consequently the data are out-dated because the country has undergone noticeable economic changes since that time. Nonetheless, the 1994 inventory data are still useful in that they inform us about the major sources of emissions. Secondly, conducting another inventory at this time, will be useful in updating old data. The accumulation of country-generated GHGs is not critical since Uganda is largely seen as a net sink of GHG emissions. Scarce resources would be better spent on dealing with coping mechanisms because climate change is a global phenomenon and subsistence agriculture-based economies such as the one of Uganda are most vulnerable. *Table 3.1* shows a summary report for National Green Gas Inventories (Part 1). The data show:

- a part from emissions from bio-fuels, other emissions are minimal;

- emission from fossil fuels – a total of 708.61 Giga grammes of CO_2 were emitted from a total carbon content of 195.07 Giga grammes. This excludes 105.5 Giga grammes of CO_2 which was an emission due to jet fuel; and

- emissions from bio-fuels – the total CO_2 emission from wood-fuel, charcoal, and from wood to charcoal were 11605.42 Gg, 773.67 Gg and 1384.64 Gg, respectively. Smaller amounts of emissions from bagasse were estimated at about 76.28 Gg (MWLE 2002).

In the context of Uganda the key GHG is CO_2 (MWLE 2002). Agricultural activities constitute the single most important contributor to all GHG emissions including methane (CH_4), nitrogen dioxide (N_2O), nitrous oxides (NO_x) and carbon monoxide (CO); but does not contribute to emissions of non-methane volatile organic compounds (NMVOCs). On the other hand, the energy sector is the major contributor of NMVOCs, contributing 4.9956 Gg out of the total 5.9876 Gg of NMVOC (MWLE 2002).

Overall, there are significant GHG emissions, as reflected in biomass burned for energy, agricultural waste burning, savanna burning and grassland conversion (MWLE 2002). In addition to absorbing GHGs from other countries, Uganda's contribution to the world would be to increase the efficiency with which biomass is burned, using agricultural waste for compositing instead of burning, and reducing landuse changes that result in the release of the gases.

Table 3.1 Summary report for national green gas inventories (Part 1)

No.	SOURCE AND SINK CATEGORY	CO_2 (Gg)	CH_4 (Gg)	N_20 (Gg)	NO_x	CO	NMVOC
1	Total (Net) National Emission						
	All Energy (Combustion +Fugitive)						
	A Fuel combustion	*708.610					
	Energy and transformation including	-	-	-	-	-	-
	Industry (SIC)	-	0.207	0.053	-	-	-
	Transport	507.150	0.126	0.540	3.950	27.270	4.990
	Commercial/Institutional	63.000	-	-	-	-	-
	Residential	114.140	-	-	-	-	-
	Agricultural/Forestry	0.979	0.001	0.014	0.000	0.006	0.002
	Other (UEB Generators)	1.483	0.001	0.000	0.021	0.010	0.004
	Biomass Burned for Energy	13,763.000	74.520	4.704	22.810	822.930	-
	B Fugitive Fuel Emission						
	Oil Natural System						
	Coal mining						
2	Industrial Processes	-	-	-	-	-	-
	A Iron and Steel	-	-	-	-	-	-
	B Non-Ferrous Metal						
	C Inorganic Chemical						
	D Organic Chemicals						
	E non-metallic Mineral Products	43,43.000					
	F Other (Foams)	0.070					
3	Solvent Use						
	A paint application	-	-	-	-	-	0.935
	B degreasing and Dry cleaning	0.057					
	C Chemical Products Manufacture/Processing	-	-	-	-	-	-
	D Other	-	-	-	-	-	-
4	Agriculture						
	A Enteric Fermentation	-	197,400		-	-	-
	B Animal Wastes	-	7.050	-	-	-	-
	C Rice Cultivation	-	23.536	-	-	-	-
	D Agriculture Soils (Fertiliser Use)	0.002					
	E Agricultural Waste Burning	# 264.500	1.780	0.380	8.540	37.050	-
	F Savannah Burning	# 72,130.000	960.000	40.000	1,165.000	16,830.000	-
5	Land Use Change and Forestry						
	A Foresting Clearing and On-site Burning of cleared Forests	2,834.750	1.971	0.380	8.540	37.050	-
	B Grassland Conversion 6,641.900	4.015	-	-	-	-	-
	C Abandonment of Managed Lands	-	-	-	-	-	-
	D Managed (Forests Removals)	-1,354.000	-	-	-	-	-
6	Waste						
	A Landfills	-	2.926	-	-	-	-
	B Waste Water	-	-	-	-	-	-
	C Other (Pit latrine)	-	1.600	-	-	-	-

* -Total emissions

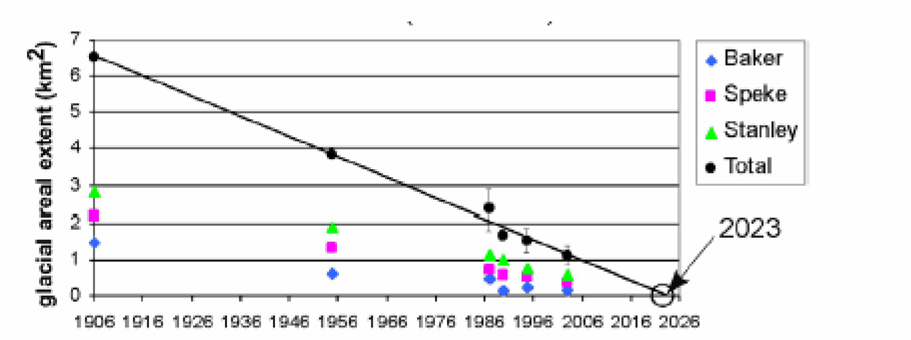
\# -Part of the natural cycle

Source: MNR (1996)

Climate change

Figure 3.1 shows the change in glacial extent (area) on the Rwenzori Mountains for the period 1906 to 2003. If current trends in global warming persist, ice cover on the peaks of the Rwenzoris (Baker, Speke and Stanley) will disappear altogether by 2023 (Mileham *et al* in press). Projected increases in future temperatures will allow future changes in vegetation and other biodiversity to be predicted (Pomeroy & Tushabe 2004). For example, as the climate warms, the various Afroalpine vegetation zones can be expected to move to progressively higher altitudes and consequently to decline in area (Pomeroy & Tushabe 2004). The disappearance of ice cover will mean reduced water flow in the streams downstream which feed into lakes George and Edward, and Semliki River discharging water into Lake Albert and ultimately into the Nile. The biodiversity and tourism potential of the Rwenzori Mountains National Park will also be affected.

Figure 3.1 Changes in glacial extent: Rwenzori Mountains



Source: Mileham *et al*, in press quoted in Pomeroy & Tushabe (2004)

The highest peaks of Rwenzori, from the slopes of Kiyanja

Source: Pomeroy & Tushabe (2004)

3.2 Climate Variability

While climate change is gradual and long-term, climate variability on the otherhand is the disruption of normal climatic patterns that result in either excessive rainfall totals or prolonged drought conditions. It involves sharp, short-term variations of meteorological elements compared to a long–term mean. The key variables used to measure climate variability are temperature and rainfall. Climate variability has had a significant impact on the environment of Uganda.

The 1994 drought that affected 16 out of the 39 districts in Uganda was a result of climate variability. Uganda's rangelands and drylands are particularly prone to severe climatic changes. Persistent drought and increased spread of arid and semi-arid areas are a big problem in Uganda though they are not yet taken seriously. Drought is a situation where there is protracted departure from normal water availability. It is exhibited by a water deficit over a long period of time that causes discomfort or harmful effects. Uganda has experienced such situations where, in some years, monthly rainfall amounts are below normal, leading to drought; and it is usually marked by poor rainfall and crop failures. In others, monthly averages exceed the long–term average values. This leads to excessive water supply, which may cause flooding, landslides or the washing away of roads and bridges, soil erosion and siltation of dams. This shows the importance of both the optimal amounts of rainfall as well as the soils moisture retention capabilities, which in turn are governed by potential evapotranspiration (PET). If PET exceeds the amount of rainfall received in the area, the soils then experience moisture deficit. Such a condition has been occurring in the areas known as the *"cattle corridor"* as well as in some districts of Uganda; for example, Hoima, Masindi, Lira, Soroti and Kasese.

Local moisture convergence zones that combine with surface temperatures to produce rainfall influence the climate of Uganda. As the Inter Tropical Convergence Zone (ITCZ) shifts eastwards, the western parts of Uganda are known to experience severe droughts. The converse is true for the eastern parts of the country. The dry areas of the Sudano-Sahelian region, which extend to the north-eastern parts of Uganda, are characterised by limited and irregular rainfall. These dryland areas have unpredictable rainfall and at times experience severe drought.

The term *El Nińo*, a Spanish word for "*The Christ Child*", is the Peruvian name for weather phenomenon that has been familiar to fisherfolk along the west coast of South America. Towards the end of the year like December, the fisherfolk always noticed a reduction in the fish catch but later, the catch returns to normal levels. This reduction is due to *El Nińo*, which is a seasonal change in weather patterns over the Pacific Ocean. The condition reverses the usual East-West direction of the Pacific currents.

In 1997, the global mean surface temperature anomaly was 0.43^0C above the 1961-1990 base period average compared to 0.38^0C in 1995. What contributed to this warmth was the very strong *El Nińo* in the Pacific Ocean. This resulted in very high rainfall in equatorial East Africa during the October to December rainy season. Severe flooding that ensued caused widespread property loss and mass migration of people.

The 1998 *El Nińo* phenomenon is also reported to have decelerated economic growth by cutting off access to markets especially for rural produce. During the Uganda Second Participatory Poverty Assessment (UPPAP 2) process, respondents in nine out of twelve districts surveyed reported that weather-related phenomena had negatively affected their livelihoods, especially in terms of nutrition, food security and diseases (UN System 2004). Overall, Uganda's geographical location and physical variability make it particularly vulnerable to natural disasters. The major natural disasters since the 1960s and their impact on the population are summarised in *Table 3.2*. Of the seven disasters, four were related to departures from normal climatic conditions.

Table 3.2. Major natural disasters in Uganda and their impacts (1966-2003)

Year	Nature of disaster	Impact
1966	Tooro Earthquake	157 people died, 1 320 people injured, 67 000 huts and houses damaged.
1993/1994	Drought	Over 1.8 million people affected and got impoverished. Inadequate pasture and water for livestock in 16 districts.
1994	Earthquakes in Kabarole, Bundibugyo and Kasese districts	50 000 people affected.
1994	Kisomoro earthquake	Eight people died.
1997/1999	El Nińo rains	43 people died, 2 000 people needed relocation. Roads, bridges and houses were destroyed.
1999	Drought	3.5 million people affected by famine and poverty and a large number of livestock in 28 districts.
Annually	Drought, floods, landslides and hailstorms	Destroy an average of 800 000 ha of crop.

Source: MFPED (2004).

Unlike *El Nińo*, during a typical *la Nińa* year the onset of the second rainy season occurs much earlier, during August or early September, and the rains are generally light to moderate. The cessation also occurs much earlier than usual, around October/November. This shift in the rainfall season leads to an earlier onset of the dry season, by late November/early December. The prolonged dry period, which can reach drought conditions over several areas of the country, persists up to late February / early March. Because the *La Nińa* second rain season is generally poor and ends early, crops which are not planted early enough stand a high risk of failing especially if they are caught up by the early dry season during their vegetative development. Such situation has often resulted in famine conditions and reduced pastures. It has further led to the reduction in levels of shallow surface and underground water. The resulting socio-economic costs and disruptions are usually quite signficant.

3.3 Vulnerability Assessment

According to MWLE (2002), all countries, rich and poor, are vulnerable to the adverse effects of climate change but the degree of impacts varies from country to country depending on its capacity to cope with disasters. However, what is definite is the fact that poorer countries suffer disproportionately more despite their little contribution to the build up of GHG emissions and hence climate change. In recognition of the foregoing, Article 4 Paragraph 1(a) of the UNFCCC commits Parties (States), taking into account their common but differentiated responsibilities and their specific national and regional development priorities, objectives and circumstances, to put in place measures to mitigate GHG emissions and reduce impacts of climate change (UN 1992).

A preliminary vulnerability and adaptation assessment was undertaken for Uganda in 1996. Unfortunately, the study did not include integrated vulnerability assessment which would have provided much better details. Nevertheless, the assessment did show that Uganda's agriculture, water resources, forests, natural ecosystems and wildlife, health, energy, transport, and local governance were vulnerable to adverse impacts of climate change (MWLE 2002). Uganda's high population growth rate coupled with a high level of poverty makes it difficult for the country to cope with the impacts of adverse effects of climate change (MWLE 2002). Furthermore, as a poor country, the country cannot adequately finance adaptation measures that would enable it to minimise the impacts of adverse effects of climate change (MWLE 2002). Some of the impacts of adverse effects on specific sectors include:

- *macroeconomic stability* – poor climate conditions reduce agricultural sector production triggering higher food prices, lower domestic revenues, and widening of the current account deficit due to lower export earnings leading to increase in inflation related to an expansion of the fiscal deficit, increase in external indebtedness, and a depreciation of the exchange rate;

- *health* – inadequate provision of medical/ health personnel and services due to increased demand, malnutrition triggered by reduced agricultural production; contaminated water supply as a result of floods, heavy rainfall leading to increase in waterborne diseases (malaria, cholera, typhoid and dysentery), and thunderstorms and high humidity contributing to respiratory and other cardio-vascular diseases;

- *energy and transport* – weak road infrastructure, weak and undeveloped energy sector, and reliance on fossil fuels and woodfuel for domestic use;

- *agricultural sector* – crop vulnerability to climate variability and change the extent of which depends on each ecological zone. Nonetheless, there is high uncertainty in the onset and cessation of the rains. This is coupled with high evaporation rates, particularly in northern Uganda, thereby adversely affecting agricultural production;

- *rangeland/livestock sector* – an increase in temperature is likely to reduce total optimum area where high yielding dairy cattle can be economically reared. For rangelands, higher biomass production in areas of increased precipitation. In the rangelands where cattle keepers are mostly nomadic, replenishment of soil organic matter is not adequate. Higher temperatures will cause an increase in the rate of nutrient up-take by the pastures while reducing their maturity period. This may result in reduced soil fertility; and

- *water resources sector* – the problems of flooding, droughts, soil erosion are expected to become more frequent and more severe with the impending climate change. The assessment indicated a 10-20% increase in runoff for most of the country. However, for arid areas, run-off may decrease instead. While urban and rural water supply is forecast to be adequate generally, spatial and temporal distribution constraints are anticipated (MWLE 2002).

3.4 Assessment of Adaptation Options

Although limited vulnerability assessment was carried out involving a few sectors, based on empirical data and indigenous knowledge, some adaptations were identified in the MWLE (2002) study. These options indicate that although Uganda is resource-constrained, certain actions can still be put in place to adapt to adverse impacts of climate change. The recommended strategies are presented in *Tables 3.3, 3.4, 3.5* and *3.6*.

Table 3.3 Adaptation options for crops

Adaptation Options	Changes in Practice	Government Action
Irrigation	▪ Develop capacity to tap water for irrigation ▪ Apply weather and climate information ▪ Encourage water harvesting ▪ Sensitise people to optimise water usage	▪ Develop initial irrigation infrastructure ▪ Construct water reservoirs ▪ Create incentives for water harvesting ▪ Re-enforce the implementation of the Water Statute (1995)
Diversification of crops	▪ Introduce drought resistant crops ▪ Remove cultural barriers ▪ Diversify crops grown in the locality	▪ Promote development and production of drought resistant varieties ▪ Strengthen capacity of research institutions
Improved farming methods	▪ Popularise mulching to conserve water ▪ Improve management and agricultural practices ▪ Training	▪ Strengthen extension services
Processing and storage facilities	▪ Engage in food processing ▪ Improve food storage technologies	▪ Create incentives for food processing industry ▪ Stimulate market for agriculture products

Source: MWLE (2002)

Table 3.4 Adaptation options for livestock

Adaptation Options	Changes in Practice	Government Action
Reduction of animal populations	▪ Encourage sale of surplus animals ▪ Meat processing plants ▪ Remove culture barriers ▪ Diversify economic activities for herdsmen ▪ Introduce high yielding breed ▪ Use weather and climate information	▪ Create market and incentives ▪ Encourage diversification of economic activities
Improve pasture and rangeland management	▪ Create paddocks to reduce soil degradation ▪ Supplement animal food with crop residue during drought ▪ Improve management of rangelands by planting shrubs and drought resistant pastures ▪ Reduce bush burning ▪ Use weather and climate information	▪ Promote research on rangeland management ▪ Reinforce implementation of relevant policies and legislation
Reduce silting of river banks and lake shores	▪ Reduce run-off into rivers and lakes through increase of vegetation cover along lakeshores and river banks	▪ Reinforce implementation of the Water Statute (1995) ▪ Enforce regulations on river banks, lakeshores and wetlands (2000)
Promote rainwater harvesting	▪ Construct permanent houses ▪ Harvest rainwater and run-offs during the wet season and preserve for dry period	▪ Create incentives for poor people to build permanent iron-roofed houses

Source: MWLE (2002)

Table 3.5 Adaptation options for Forestry sector

Adaptation Options	Changes in practice	Government Action
Develop drought resistant species	▪ Plant of drought resistant species ▪ Remove cultural barriers for new species.	▪ Encourage research into drought resistant species ▪ Promote sensitisation ▪ Promote use of products of new species
Improve management of forests	▪ Control outbreaks of wild fires ▪ Remove dead trees from forest reserves to reduce on outbreaks of wild fires	▪ Reinforce implementation of Forest Act and regulations ▪ Introduce incentives for private sector participation
Research into new pests and diseases	▪ Use appropriate pesticides to control new pests and diseases	▪ Promote research
Preserve indigenous germplasm	▪ Collect and preserve indigenous seeds	▪ Support collection and preservation of indigenous species

Source: MWLE (2002)

Table 3.6 Adaptation options for Water sector

Adaptation Options	Practice Changes	Government Action
Water Conservation	▪ Recycle waste water (Water re-use) ▪ Reduce water demand through efficient use ▪ Minimise water leakages and waste ▪ Encourage water harvesting and storage at all levels	▪ Strict implementation of the Water Act
Pollution Control	▪ Improve sanitation ▪ Encourage waste management ▪ Use better soil conservation methods to minimise erosion	▪ Encourage routine water quality monitoring ▪ Reinforce the polluter pays principle
Construction and maintenance of storage structures	▪ Develop new dam sites ▪ Limit settlement in potential dam sites for easy vacation when necessary	▪ Restrict development in potential dam sites
Water harvesting	▪ Construct permanent houses ▪ Harvest rainwater and run-offs during the wet season and preserve for dry periods	▪ Encourage building of permanent houses ▪ Create incentives for poor people to build iron-roofed houses
River Basin Planning	▪ Use both surface and ground water conjunctively	▪ Emphasize integrated river basin management
Wetlands and catchment protection	▪ Ensure that wetlands are well protected and an optimal level of forest cover is maintained within the catchment areas	▪ Reinforce both Wetlands and Forestry policies
Use of ground water	▪ Increase the number of boreholes in the areas where ground water resources exist (where water is safe)	▪ Reinforce implementation of the water action plan

Source: MWLE (2002)

3.5 Linkages

Most of the proposed strategies for coping with the impacts of adverse effects of climate change may also have beneficial effects on other sectors of the Ugandan economy, as a result of sectoral linkages.

For example, under forestry an adaptation option is to preserve indigenous species. If successful, the preservation of indigenous species (i.e. natural forests) would enhance the conservation of biodiversity; and biodiversity richness is one measure of the health of ecosystems. Preservation of the natural forests would also contribute to greater carbon sequestration, and help regulate microclimate. A forest cover in general should contribute to reduced soil erosion and hence land degradation thereby facilitating greater agricultural production, and reduced run-off, hence lesser siltation of wetlands, rivers and lakes.

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4.0 TERRESTRIAL RESOURCES

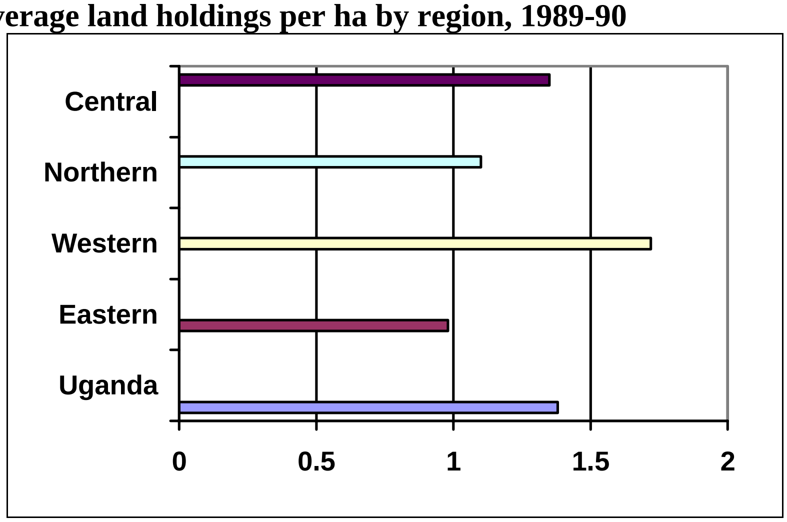
4.1 Land Resources and Agriculture

4.1.1 Land Resources

In economic terms, natural resources can be defined as assets that have been furnished by nature and can be exploited for human welfare and livelihoods. Land by far is the most important natural resource; and is finite, fragile and non-renewable. Land resources include soils, which are most important for agriculture; land cover which is another important component of the environment; and landscapes forming the main basis of human habitat and welfare (UNEP 2002).

Uganda's surface area is estimated at 241 500 km^2. This area includes open waterbodies, built-up areas, protected areas and cultivatable and cultivated land. Of the total surface area, 180 000 km^2 of land or 74.5% is considered arable. However, not all the arable land is available for cultivation or as rangelands. Some of these lands are held in forest and wildlife protected areas and seasonal wetlands. Therefore, if we assume that 30% of arable land area is unavailable for the foregoing reasons, then one is left with 126 000 km^2 of land available for cultivation and livestock production. By 1990, only 50 000 km^2 (or 40%) of the arable land was being cultivated (NEIC 1994). Based on a population figure of 16.9 million people and a national average of 5 people per household (1969 Housing and Population Census), only 3.7 ha of arable land was potentially available for each household. Yet by 1990, only 50 000 km^2 (5 million ha) of the arable land was under cultivation or an average of 1.5 ha per household. This estimate is close to the one of MFPED (1993) of 1.38 ha (*Figure 4.1*). In other words Ugandan households utilised about 40% of available arable land. The data also show that arable land availability is not the only limiting factor. It seems availability of labour is also an issue, hence the smaller holdings in the north despite the existence of extensive surplus arable land.

Figure 4.1 Average land holdings per ha by region, 1989-90



Source: MFPED 1993

The Housing and Population Census of 2002 reported a population of 24.7 million people, increasing at an average annual rate of 3.4% per annum (UBOS 2004). Consequently by 2005, Uganda's population was estimated to have increased to about 27.3 million people. As a result, potentially available arable land had shrunk to 2.3 ha per household, although still higher than the average holding of 1.4 to 1.5 ha of 1990, but representing 60% utilisation as of 2005.

Hence it is not surprising that the findings of the Uganda Second Participatory Poverty Assessment Project (UPPAP 2) in 2001/02 indicated that access to land is increasingly becoming a problem for poor people (MFPED 2003). In the 60 villages covered in the assessment, shortage of land was the second most frequently cited cause of poverty after health (MFPED 2003). Findings from the Village Census showed that households were not accumulating land; rather, this asset was diminishing in size (MFPED 2003). The result of a decreasing availability of land has to some extent meant degradation of the available resource. According to Pender *et al* (2002), land degradation is a major problem in Uganda, contributing to stagnant or declining agricultural productivity. Soil fertility depletion is a widespread problem, with evidence of declining soil fertility cited by farmers throughout Uganda.

Land degradation

According to IFPRI (2004), Ugandan households that are poorer in terms of access to land, use labour more intensively and are less likely to use several land management practices and inputs. Thus, access to land is a key factor affecting the intensity of land management.

The same IFPRI study concluded that households that are poorer in terms of ownership of physical assets are less apt to adopt most land management practices and non-labour inputs. Similarly households which are poorer in terms of males' access to education, invest less in most inputs and land management technologies, and obtain lower incomes. Also, households in which females lack education use labour more intensively in agriculture but also obtain lower incomes. These households may be locked into a similar cycle of low education leading to low investment in land management, hence low incomes culminating into land degradation and continued low assets (IFPRI 2004).

Further, households in communities with lower wage rates use labour more intensively in agriculture, but use several non-labour inputs less intensively, and obtain lower value of crop production and incomes. Thus lack of off-farm opportunities may contribute to keeping poor households in a poverty and land degradation trap.

Nonetheless, the study concludes, without access to extension services, and market information or credit, households are less apt to use several modern non-labour inputs thus leading to lower crop production. It is also important to note that households with poor access to roads use less organic or inorganic fertilisers, which directly contributes to land degradation. Poorer road access is also associated with lower value of crop production per acre in the eastern and western regions and lower income in the central region. Thus lack of access to infrastructure and services also may prevent households from exiting the poverty-land degradation trap, though the impacts may be location-specific.

The dynamics of land degradation in the intensive banana-coffee farming system in the Lake Victoria creascent is described in *Box 4.1*; while that of land use change and soil degradation in the southwestern highlands of Uganda is described in *Box 4.2.*

Box 4.1

Land degradation in the intensive banana-coffee farming system in the Lake Victoria crescent

The intensive banana-coffee farming system is found in the Lake Victoria crescent in the districts of Mukono, Mpigi, Wakiso, Luwero, Mubende, Kalangala, Rakai, Masaka, Iganga and Kamuli. The system supports about seven million people. This area receives sufficient rainfall to support perennial crop production (ranging between over 1,000 and 1,500 mm per annum for 10 to 12 months of the year) and has the most favourable access to infrastructure and markets compared to other regions in Uganda.

However, this farming system impacts on land management, productivity, and other resource and welfare outcomes. For example, in the lakeshore region, banana (*matooke*) yields have been declining for the past few decades, largely due to declining soil fertility and increasing pest and disease pressure, although off-farm opportunities and rising labour costs may also be important causal factors. It is estimated that *matooke* production in central Uganda fell by 14% of total food production and five percent of total cash crop production between 1970s and 1990s. The perennials (banana and coffee) are reportedly being replaced by annual crops (such as maize and beans), which leave the soil exposed to erosive forces and have caused a considerable increase in soil erosion, estimated to be above the tolerable rate of five tonnes per hectare per year.

Many factors are believed to have caused the decline in soil fertility, the most important ones being related to human activity such as the cultivation of fragile lands (steep slopes and swamps), continuous cultivation of land without fallowing or limited use of organic and inorganic fertilisers and limited investment in soil conservation. Estimates of soil erosion and other avenues of soil nutrient loss are 80 to 100 kg of NPK lost per hectare per year in the lakeshore region and other parts of central Uganda.

Proceeding along the above-described annual expansion pathway of development without investing in land improvement would result in a downward spiral of decreasing soil fertility and crop yields in the region, with serious implications for food security and poverty. On the other hand, adopting the intensive pathway (increasing investment in soil and water conservation and use of external inputs to replenish soil nutrients) could improve land conditions for current and future agricultural productivity and welfare outcomes. According to the findings of the study the average farm size declined from 1990 to 2000, whereas the proportion of cultivated land increased in comparison to other land use categories such as fallow, grazing areas, and natural forest/woodland which increased the vulnerability of the land to soil erosion.

Source: IFPRI (2004)

Box 4.2

Land use change and soil degradation in the southwestern highlands of Uganda

There is no doubt that human activities have profoundly changed land cover in the Kigezi* area during the last one or two centuries. Available data on land cover captured in the early 1990s showed that small scale farmland covered 57% and 68% of the land area in Kabale and Kisoro districts, respectively while natural forests (excluding woodlots and plantations) coverered only 2.0% of Kabale and 16.3% of Kisoro. Since then, people in the region have clearly expanded and intensified agricultural land use in response to increasing population densities and market opportunities, but it is much less certain how, where, and when intensification and expansion of land use have occurred, and what the consequences have been for soil quality and biodiversity. It is also important to note that changes in soil quality cannot be directly inferred from changes in land use and land cover; since no study has measured long-term changes in soil quality and social and economic effects of land use system changes in the area. What are known are the widespread belief that soils and vegetation are degrading in the Kigezi highlands. Only a few studies have actually attempted to measure the longer-term changes in land use and land cover in the area. Only two among those studies applied “objective” measurement methods: one aerial photography and ground truthing, the other a re-survey in 1996 of transects done in 1945. These studies have revealed interesting changes in the pattern of land use in Kabale District since the 1950s. The total size of farmland (fallow and cultivated) increased significantly in one of the three surveyed areas, while in the other two the expansion of upland farmland had stopped already by the 1950s due to lack of arable land. The most apparent change in land use was the conversion of papyrus swamps to agriculture.

Furthermore fallowing on the steepest slopes contributed to the reduction in soil erosion. The rhetoric on soil degradation in the Kigezi highlands almost invariably paints an image of imminent disaster, and has done so since the first colonial agricultural officers arrived in the 1940s, despite much scientific uncertainty on this issue. Many of the changes in land cover and land management since the 1950s cannot be said to promote or constitute instances of soil erosion or soil nutrient depletion. Some even suggest a positive change in land management. This is not to say that the conditions or productivity of natural resources has improved, or that low soil productivity is not a problem in the area. However, there is little if any hard evidence to support the widely held view that population growth during the last 50 years has caused farmers to degrade soils through the effects of diminishing fallow and inappropriate farm practices. Instead, one could argue that farmers have changed their land management practices in response to increased land scarcity in several positive ways, and/or intensified the use of existing practices.

There has been an increase in intercropping and in market-oriented tree cultivation on fragile lands. Population pressure has also induced the reclamation of papyrus swamps for year-round production of dairy and vegetables for the market, and sweet potatoes, which is important for food-security, thus increasing private economic benefits from wetlands (although at the cost of ecosystem services provided by the wetlands). Livestock rearing has declined due to diminishing upland grazing land.

This change is positive in environmental terms, but may have had negative effects on local livelihoods. There was a pronounced increase in fallowing, but the reasons for it are debated. Some believe that more fallow is a consequence of soil degradation that renders some lands unsuitable for cultivation; while some see the phenomenon as a positive adaptation to increased population pressure, whereby farmers re-allocate crop cultivation to less erosion prone lands while increasing yields on cultivated land through intercropping. It is also unclear whether “more fallow” is found outside the Kabale town area as well, or whether it is a localised phenomenon related to, as some think, favourable off-farm employment opportunities in Kabale town combined with land abundance among a few wealthier farmers, a higher rate of government and absentee land ownership, or other factors. Such knowledge gaps show a need to study land use dynamics at a smaller scale and in a regional socio-economic context.

Source: Nkonya, Sserunkuuma, & Pender. (2002)

* The Kigezi area consists of the districts of Kabale, Kisoro, Kanungu and Rukungiri.

What are the implications of the above discussions for policies and investment programmes that aimed at promoting sustainable development in the southwestern highlands of Uganda? In response Nkonya, Sserunkuuma, & Pender (2002) suggested that first, if soil degradation is less of a problem than first thought, and if farmers to a large extent are able to deal with that problem without expensive outside support, then it should be considered to allocate more of the scarce public funds to activities that more directly improve agricultural productivity and incomes. This in turn would provide farmers with both the means and incentives to invest in soil conservation. Second, when designing land management programmes and policies, it is essential to understand that the amount of labour and capital farmers are willing to invest in their land depends on their access to alternative economic opportunities, particularly off-farm employment.

Third, it is increasingly recognised that economic incentives are of key importance to the sustainable management of land resources. In the absence of tangible private benefits, regulation, persuasion and training are unlikely to produce significant results. In the Kigezi highlands the prospects for improving incentives based on market production and agro-processing seem promising as the area enjoys relatively good access to markets and (mainly male) labour resources. Fourth, Kigezi farmers' seemingly good track-record of adapting to pressures on land resources supports the increasingly accepted idea that land management research and development programmes are more likely to succeed if they integrate the knowledge, experience and innovative capacity of farmers into their activities. The improved technologies and practices developed during such an approach would also need to be sufficiently flexible to accommodate the great diversity of farmers' preferences, skills and access to land, labour and capital resources. There is also a remarkable spatial variability in land use and land degradation within the Kigezi highlands, which must be taken into account by programmes and policies. Finally, the study suggested that better and "harder" evidence on land management/use and land degradation in the Kigezi highlands are needed so as to design more effective programmes and policies aimed at raising rural incomes while conserving natural resources.

4.1.2 Soil Erosion

One of the contributing causes of land degradation is soil erosion. In 1991, Slade & Weitz (1991) estimated that soil erosion alone accounted for over 80% of the annual cost of environmental degradation representing as much as $300 million per year. By 2003, Yaron, Moyini & Others (2003) estimated the annual cost of soil nutrient loss due primarily to erosion at about $625 million per year. Notwithstanding the accuracy of the data used in the two studies, the evidence is clear: the problem of soil erosion is increasing with every passing year and little is being done at the policy level to significantly address the situation. A draft national soils policy was prepared almost a decade ago and awaits adoption by Cabinet.

According to Brunner *et al* (2002), the prevention of soil erosion is one of the most essential requirements for sustainable agriculture in developing countries. In Uganda, soil erosion is widely recognised as one of the major causes of land degradation; topography being one of the most important contributors to soil erosion (Brunner *et al* 2002). In Magada Village, Lake Victoria Basin, Brunner *et al* (2002) found soil erosion rates of 2 to 3 tonnes/ha on the shoulder position of a slope; and losses of up to 9 tonnes/ha at the lower backslope position.

The authors found that management practices also have an impact on soil erosion. For example, annual soil loss rates averaged over the entire hillslope were 2 tonnes/ha for minimum tillage, 0.3t/ha for residue management, 1.9t/ha for contouring and a whopping 47t/ha for what they referred to as high tech (otherwise mechanised) tillage. From the data, the authors concluded that soil conservation methods such as residue management and contouring can reduce soil loss rates compared to minimum tillage which the majority of Ugandans are engaged in, and high tech tillage which they invariably are aspiring to. Where there is scarcity of biomass for energy, unfortunately farmers need agricultural residues for cooking and heating leaving none for erosion control. Presented below are soil conservation practices and non-agricultural activities in south western highlands (SWH) of Uganda (*Box 4.3*) and stratification and resource mapping methodology for community-based analysis of soil erosion in Uganda as an intervention strategy.

Box 4.3

Soil conservation practices and non-agricultural activities in the southwestern highlands (SWH) of Uganda

Non-farm activities are important determinants of soil conservation since they influence land use in many respects. Farmers in Sub-Saharan Africa (SSA) have responded to declining *per capita* farm size and environmental stress by switching to non-farm activities. This implies that non-farm activities may contribute to reduction of land degradation resulting from increasing population. Income from non-farm activities may also be used to purchase fertiliser and other external inputs used for improving soil fertility.

The SWH region is among the richest ecological regions of Uganda in terms of biodiversity and endemism, and is therefore a significant attraction to tourists. The SWH region includes highlands of the districts of Bundibugyo, Bushenyi, Kabale, Kabarole, Kasese, Kisoro, Ntungamo, Kanungu and Rukungiri. The major ecological concerns in the region are threats to biodiversity and land degradation, especially with the current emphasis on commercialisation of agriculture. The data used to establish the conservation practices in this research were obtained from a survey covering 451 randomly selected households from the central, eastern, northern and western regions of Uganda. From each sampled household, a plot survey was conducted to determine the farm management practices of each plot. The study focused on households that were sampled in the SWH region (45 households). Univariate and multivariate data analysis was done using simple descriptive statistics and econometric models to determine the key factors that influence adoption of soil conservation methods and participation of household members in non-farm activities.

Only about 44% of sampled household used at least one of the three types of soil fertility management technologies, i.e. agroforestry, soil and water conservation (SWC) measures and application of fertilisers. About 11% of the respondents in Uganda used inorganic fertiliser. This rate is considerably higher than that reported in earlier studies. It appears that use of inorganic fertiliser among farmers has increased due to the improved input markets and extension efforts by government programmes and organisations. On the one hand, this is an encouraging sign, which shows that the input market reforms and extension efforts are having an impact. However, on the other hand, increased use of inorganic fertilisers has grave consequences of potential pollution of the soils and underground water resources. Since access to inorganic fertilisers remains low due to high prices and other marketing problems, the levels applied are still relatively low. This points to the need of encouraging farmers to use a combination of complementary soil conservation technologies.

Box 4.3 cont.

Agroforestry is the most common soil conservation improvement technology used by the respondents. It is also environmentally-friendly. Hence, agroforestry appears to be more feasible and compatible with the existing farming system than the other technologies considered. This suggests the need to increase efforts in promoting the use of improved agroforestry practices that have been developed by researchers but have not yet reached farmers. The results also suggest the need to continue investment in agroforestry research to generate new technologies.

However, there are very few well-established private traders or organisations that market agroforestry technologies such as seeds and planting materials of trees and shrubs. This may contribute to the low uptake of agroforestry technologies. There is a need to have concerted efforts to commercialise agroforestry research products since most government programmes and NGOs have directed their efforts towards generation and dissemination of agroforestry technologies only. A significantly higher proportion of farmers used bench terraces, grass strips, deep and minimum tillage and invested in drainage in the SWH region than in the Rest Of Uganda (ROU). These observations were expected due to the steep terrain in the SWH region that calls for soil conservation.

However, there is reason to worry about the 68% of households that do not use any form of SWC practices in the SWH region where lands are fragile. There is therefore a need to increase extension efforts of improved land management technologies since the soils in the SWH are fragile, hence easily degraded. There is reason for concern even among farmers who reported to have adopted bench terraces and other conservation structures, since such structures are poorly maintained and hence their effectiveness is low. In some cases, farmers have opened up the bench terraces to utilise the nutrients accumulated over time.

Land tenure, labour constraints, age and education of household heads and non-farm activities appear to be important factors that influence adoption of agroforestry practices in the SWH region. The customary land tenure system, which is the most common in the SWH region, is associated with higher adoption of agroforestry practices than the freehold system. The reason for low adoption of agroforestry practices under freehold tenure may be tenure insecurity due to weak land law enforcement institutions. Therefore, the government needs to strengthen the land tribunals at community and district level in order to ensure security and stability of land tenure systems. Family size is found to reduce the probability to adopt SWC and agroforestry technologies in the SWH region. The reason for this observation is likely to be related to land scarcity, which is more severe with larger families. Land shortage for the large families may not permit adoption of SWC and agroforestry technologies that compete for land with crops. Promotion of participation in non-farm activities may take some rural labour force out of agriculture, permitting adoption of soil conservation methods that compete for land with crops.

In both the SWH region and ROU, farmers with more education have lower probability of adopting SWC and agroforestry technologies than less educated farmers. This was not expected as educated farmers may be better informed about the improved soil conservation technologies and the adverse effects of land degradation. The explanation for these results may be related to higher opportunity cost of labour for more educated farmers, which reduces the probability to adopt labour-intensive soil conservation methods.

Source: Nkonya, Sserunkuuma & Pender (2002)

The policy implications of the above findings are that farmers may need to be given incentives for adopting labour-intensive technologies via tax breaks or non-monetary compensation such as personal recognition. Taxing people who harvest products from common resources like forests, wetlands, water, grazing lands, etc, may finance the loss of revenue due to tax breaks given to adopters of labour-intensive soil conservation technologies. There is also a need to use moral suasion by educating farmers about the short-term and long-term effects of land degradation.

Older farmers were found to be more likely to adopt agroforestry technologies than younger farmers in the SWH region, and elsewhere in Uganda. This may be related to differences in endowment of land between old and young farmers. Older farmers are likely to have larger farms than younger ones because older farmers acquired their land when population pressure was lower. This would seem to allow older farmers to adopt agroforestry technologies that compete for land with crops. It also may be that the cost of labour for younger farmers is higher than older farmers since younger farmers are often better educated and have non-farm opportunities to pursue. This makes them less likely to adopt labour-intensive agroforestry technologies.

Agricultural and environment-related programmes and organisations are predicted to increase the probability of farmers using organic fertilisers in the SWH region and of adopting SWC technologies in Uganda as a whole. This is expected as such programmes and organisations usually promote sustainable agricultural production practices. It points to the importance of institutional support in increasing the feasibility of adopting soil conservation methods. The institutions provide technical information, credit and other crucial support that is necessary for adopting new technologies (Nkonya, Sserunkuuma & Pender 2002). Non-farm activities are predicted to increase adoption of agroforestry in the SWH region. Non-farm activities are expected to increase income, speed production and price risks, and more importantly, they have the potential of reducing the pressure on land resulting from increase in population. All these factors may favour adoption of agroforestry practices that compete for land with crops or practices that involve considerable financial outlay. However, fewer than 10% of members of the sampled households in both the SWH region and ROU reported to have non-farm activities as their major primary or secondary activity. This implies there are few non-farm opportunities with comparative advantage over agriculture. There is a need, therefore, to increase the competitiveness of non-farm activities in order to increase their profitability and acceptability among farmers. This is likely to relieve pressure on land, which is too high in the SWH region. Increased participation of household members in non-farm activities could result in a win-win scenario where both environmental degradation and poverty are reduced (Nkonya, Sserunkuuma & Pender 2002).

The factors that significantly influence participation of household members in non-farm activities in Uganda are family size and presence of agriculture-related programmes and organisations. An increase in family size is predicted to increase participation of household members in non-farm activities. The results suggest that in rural Uganda, agriculture has a comparative advantage over non-farm activities. This is probably caused by the lack of market for non-farm products and/or the poor quality of the products that are made using minimum or no skills.

The general conclusion is that measures that need to be taken to increase adoption of soil conservation technologies call for a multi-sectoral approach since land degradation is a complex phenomenon. Both markets for inputs and outputs need to be improved to lower the transaction costs and hence the input prices. This would allow farmers to earn remunerative returns to their labour invested in soil conservation and other technologies. This means transportation and information infrastructure need further improvement. Efforts to increase farmers' vocational education would increase the competitiveness of non-farm products, which in turn would increase their participation in non-farm activities, reducing the population pressure on land. However, non-farm activities require rural electrification and other sources of energy. Further research is needed to understand the impact, costs and benefits of soil conservation technologies in the SWH region. It is also important to develop bio-economic models to help understand the adoptability and sustainability of the different soil conservation technologies in the SWH and other regions of Uganda.

Soil degradation problems, such as erosion and nutrient depletion have remained as the growing concern in Uganda. Due to the spatial complexity of factors influencing agricultural production including variability of soils, topography, rainfall, population density and market conditions, it is difficult for policymakers to assess soil degradation problems and target strategies for improved land management in specific areas. To allow researchers and policymakers to identify and understand soil degradation problems, geographic information systems (GIS), spatial statistics and community resource mapping can be integrated and used for analysing datasets at large scale and of high spatial complexity as described in *Box 4.4*.

Box 4.4

Intervention Strategy-stratification and resource mapping methodology for community based analysis of soil degradation in Uganda

Using agricultural datasets already available in digital format - spatial domains, which comprise combinations of variables that impact soil degradation, can be generated for a large region in a fast and cost-effective way. Examples of spatial domains are agricultural potential, population density and market access. Spatial correlation of domains can be used to stratify and classify complex agricultural regions such as Uganda. For example, a region of the country may have high agricultural potential but low population density and poor market access. The stratification can guide researchers and policymakers in formulating hypotheses about possible combinations of factors that may have an impact on soil degradation. Community surveys within each stratum are necessary to collect information about the site-specific variation of factors that determine soil degradation from one community to the next, e.g. variability in soil conditions or land management. Geo-referenced and participatory mapping of community resources, combined with soil sampling and semi- structured interviewing of farmers on land management and soil degradation problems provides GIS data at the community level which is nested to the stratification data for soil degradation assessment of regions.

The stratification and resource mapping strategy described above was applied to Uganda and implemented in the project on Policies for Improved Land Management. The correlation of spatial domains resulted in 20 different strata comprising different combinations of agro-climatic potential, population density, market access and elevation. Within the stratified project region, 108 communities were randomly selected. Participatory community surveys were carried out, including geo-referenced mapping of resources and soil degradation combined with the recording of farmers´ socio-economic conditions. From each community, 10 topsoil samples were collected during transect walks and respective global positioning systems (GPS) coordinates were collected. GIS maps on changes in land use and land management as well as maps showing soil degradation problems were generated from each community. Information about land use, land management and soil degradation was linked to the GIS maps. Soil samples were analysed for texture, pH, organic matter and bases. Spatial statistics and spatial modeling were to be applied to assess land quality and factors determining soil degradation under different environmental and socio-economic settings, to target policies for improved land management to the specific problems of the different regions in Uganda.

Source: Nkonya, Sserunkuuma, & Pender. 2002

4.1.3 Agriculture

Agriculture is the backbone of the Ugandan economy, and will continue to be in the medium term at least. Agriculture at the same time has been fingered as the main culprit contributing to environmental degradation. One way out of this quagmire is to promote sustainable agriculture. The other is to make sure that sufficient mitigation measures are in place while agricultural production is promoted. In order to identify mitigation measures for various agricultural activities, it will be useful to look at development pathways[1] over the years with projections to the future. According to Pender *et al* (2002), six dominant development pathways are apparent in Uganda. They are: expansion of

[1] Development pathways are defined as common patterns of change in livelihood strategies. The concept is similar to concepts of farming systems or livelihood strategies, but is more general than framing systems in that it incorporates non-farm activities, and unlike livelihood strategies is dynamic since it refers to changes in livelihood strategies over time (Pender *et al* 2002).

cereals production; expansion of banana-coffee production; non-farm development; expansion of horticulture; expansion of cotton; and stable coffee production.

Each of the above development pathways has implications for the environment. Hence the remainder of this section reports on the development pathways and land management practices in Uganda, their causes and implications, based upon household plot level data collected across the country. The section borrows heavily from the survey work carried out by Nkonya *et al* (2002). The main findings include the following.

Agricultural commercialisation and urban development

Agricultural commercialisation and urban development are on the increase in the wake of structural adjustment and market liberalisation policies. While the effect is positive on farmers' incomes both on and off-farm the trend is also contributing to soil nutrient depletion, as exported nutrients are not being adequately replenished. To further exacerbate the soil nutrient situation, the use o f inorganic fertilisers is very low, while organic practices such as manuring, composting, mulching, and use of leguminous crops for biological nitrogen fixation are still relatively limited.

Household strategies

Different livelihoods strategies and land management practices are pursued in different parts of the country, and these are substantially affected by differences in agricultural potential, market access, population pressure, and other factors.

Technical assistance

In general, technical assistance programmes are having substantial impact on increased adoption of improved land management practices, yields and incomes of some crops such as bananas, livestock incomes, incomes from other farm and non-farm activities, and in reducing soil erosion. While the foregoing broad outcomes suggest that win-win-win strategies contributing to increased agricultural productivity, reduced poverty and sustainable use of natural resources are possible, the technical assistance programmes are limited and the spatial coverage fairly restricted.

Use of fertilisers

Adoption of fertiliser was found to be associated with much higher yields of maize and coffee. However, inorganic fertiliser was applied mainly to maize, especially in the eastern highlands of Mt Elgon probably as a result of a 'neighbourhood' effect from the maize growing region of Kenya.

Use of animal traction

While oxen use would have less damaging effects on soil structure compared to mechanised farming, yet at the same time increasing productivity, its use is low. Where oxen use was prevalent in the Teso region of eastern Uganda this is no longer the case, as a result of insurgency and cattle rustling in the mid-1980s and early 1990s. Even where there has been no insurgency and cattle rustling in areas such as the high and low bimodal rainfall zones (Lake Victoria region and southwestern highlands), the use of oxen is virtually non-existent despite the abundance of cattle populations.

Better market access

Better market access contributes to some intensification of inputs, such as fertiliser, though this is still very limited. Market access was associated with higher yields and incomes from bananas, but lower yields of maize, perhaps as a result of land degradation. Efforts to intensify soil fertility management, especially in commercially oriented crop production in areas of good market access, are critically needed. Ease of access to markets is also associated with some livestock activities, such as pig production, while other livestock activities are more important further away from markets, such as extensive cattle ranching.

Population growth and farm size

Population growth and small farm sizes are serious concerns, especially in the densely populated areas of the highlands and the Lake Victoria region. While there is evidence that small farmers were adopting more intensive methods, the yields of several crops on the small farms are still low, suggesting that intensification does not appear to be overcoming the negative impacts of population pressure on small farm sizes regarding yields and incomes. Furthermore, there is also evidence indicating that soil erosion problems are greater on smaller farms, and some of the intensive practices used by smaller farms appear to increase soil erosion problems. Hence efforts to control population growth and land fragmentation in Uganda are needed to stem land degradation and declining land productivity.

Importance of maize and beans

The importance of maize and beans is spreading throughout the country encouraged by a livelihood strategy that seeks to diversify household incomes and also as a response to changing food habits and emerging markets. The impact of the spread of cereals and pulses for soil fertility is not clear. However, what is clear is the fact that if cereals and pulses are replacing perennial crops, which are usually associated with better soil cover and soil conservation including less tillage, land degradation may be accelerated.

Investments in livestock

Investments in livestock offer opportunities for significant economic returns and income diversification. However, it has been found that on average livestock contribution to household income only 5%. As expected the high market access areas reported the highest adoption of improved dairy cows; while the less densely populated areas reported higher number of cattle heads per household. Marginal rates of return were found to be highest for poultry and pigs (over 100%), and cattle less profitable. There is also evidence which suggests that livestock ownership contributes to intensification of crop production, as well as producing an important source of income.

Education

Improvements in education are also helping to increase rural households' opportunities and incomes. However, while education is seen as contributing to improved productivity of some crops and of livestock producers, in general it appears to be promoting increased off-farm activities. Consequently, more educated farmers are less prone to adopt intensive practices, hence contributing to less intensification in Uganda's agriculture.

Transportation

The majority, as much as 85%, of households surveyed reported owning bicycles, which are important for transportation. Unfortunately, bicycle payload is low while at the same time the estimated marketed agricultural surplus is only 20%. The use of ox-carts and other non-motorised means could ease the transportation problems of the farmers and at the same time help in environmental protection.

Communication

Over three quarters of households reported owning radios. Radios could be used to disseminate environmentally-friendly production technologies, market information, and soil and water conservation messages in rural areas, and therefore these would reach a wider audience.

Other factors

Other factors such as land tenure and access to credit were found to have mixed associations of land tenure rights and arrangements with land management practices and productivity. The researchers came up with two important observations. First, they did not find support for the common presumption that freehold tenure in Uganda is superior to other tenure in terms of promoting improved land productivity or sustainability. In many instances, the researchers found productivity to be higher and land degradation lower on customary or *mailo* land. Second, the researchers did not find convincing evidence to suggest that owner-operated plots are generally more productive than leased-in or borrowed plots. Any observations to the contrary may be due to greater soil mining on leased-in plots. These two important observations warrant further study; but in the words of the researchers 'the evidence in this study does not suggest a need for rapid conversion of *mailo* or customary land to freehold status, as envisioned by the Land Act 1998'(Nkonya *et al* 2002).

Policy implications

From the foregoing description of the environmental implications of the development pathways for agriculture, the following policy implications can be discerned (Nkonya *et al* 2002).

1. There are many opportunities to increase farmers' incomes and help ensure food security while improving land management. However, different comparative advantages exist in different parts of the country and these should be used to target technical assistance and public investment strategies.

2. The evidence of areas with high market access being associated with higher agricultural intensification but declining yields of crops suggests nutrient depletion in such areas is a major concern.

3. While in theory integrated soil fertility management (use of a variety of sources of nutrients and cultural practices that conserve) could add or increase availability of naturally occurring nutrients, unfortunately, the use of organic fertility sources has not led to significant increases in crop yields. This calls for increased research and extension efforts addressing more appropriate and affordable technologies.

4. The observation that high population density is associated with lower yields and soil erosion calls for the need to relieve land pressure by creating alternative non-land based activities and birth control campaigns to complement the agricultural intensification option that the farmers are already pursuing in densely populated areas.

5. The increasing importance of maize and beans in most farming systems, including the banana-coffee system, has not been accompanied by a major increase in fertiliser use or soil conservation measures. It is likely that the introduction of cereals and pulses may increase land degradation in the banana-coffee system. This suggests the need for a vigorous campaign of better soil fertility management and soil conservation for annual crops in order to stem the potential increased land degradation.

6. Technical assistance programmes need to be better distributed spatially. The capacity of NGOs in remote areas needs to be strengthened for effective delivery of conservation extension services.

7. Use of animals for farm mechanisation is quite limited yet it offers an environmentally-friendly technology for transportation and ploughing in rural areas. There is, therefore, a need to encourage and sensitise farmers to use animal power for transportation and ploughing.

8. The high proportion of radio ownership offers a chance of using them to disseminate environmental messages. However, to be more effective, local content and use of local languages in radio programmes is critical.

4.2 Forestry Resources

A forest is a type of vegetation dominated by trees most of which at maturity are tall. To be considered a forest and to distinguish it from woodlands, an area should have a tree cover of at least 20% or more and the area should not be less than 0.5 ha in size. This section focuses on forests primarily but due to administrative considerations woodlands are also included. Many forest reserves in the country have extensive areas of woodlands.

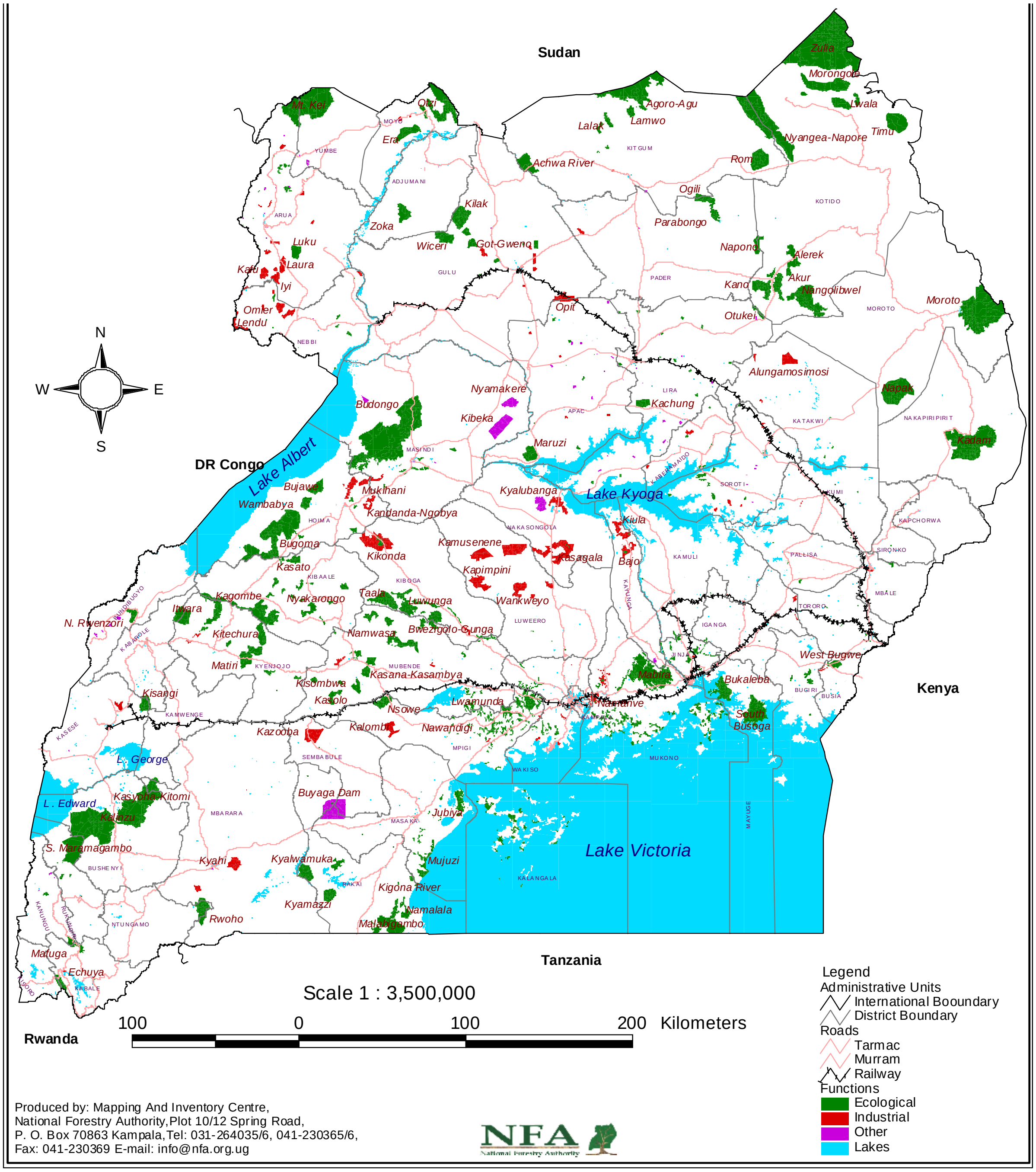
Forests and woodlands cover approximately 4.9 million hectares, about 20% of the total area of the country. The vast majority of this is woodland while the remainder is tropical high forest and forest plantations (MWLE 2001a). *Table 4.1* shows the relative sizes of the different categories of forests. A spatial distribution of forests is shown in *Figure 4.2,* and that of woodlands in *Figure 4.3.*

Table 4.1 Approximate areas (in hectares) of forest and woodland under different types, ownership and management

	Government land		**Private land**	**Total**
Type	Central and Local Forest Reserves (FD& Local Authority)	National Parks and Wildlife Reserves (UWA)	Private & customary land	
Tropical High Forest	306,000	267,000	351,000	924,000
Woodlands	411,000	462,000	3,102,000	3,975,000
Plantations	20,000	2,000	11,000	33,000
Total forest	**737,000**	**731,000**	**3,464,000**	**4,932,000**
Other cover types	414,000	1,167,000	13,901,000	15,482,000
Total land	1,151,000	1,898,000	17,365,000	20,414,000

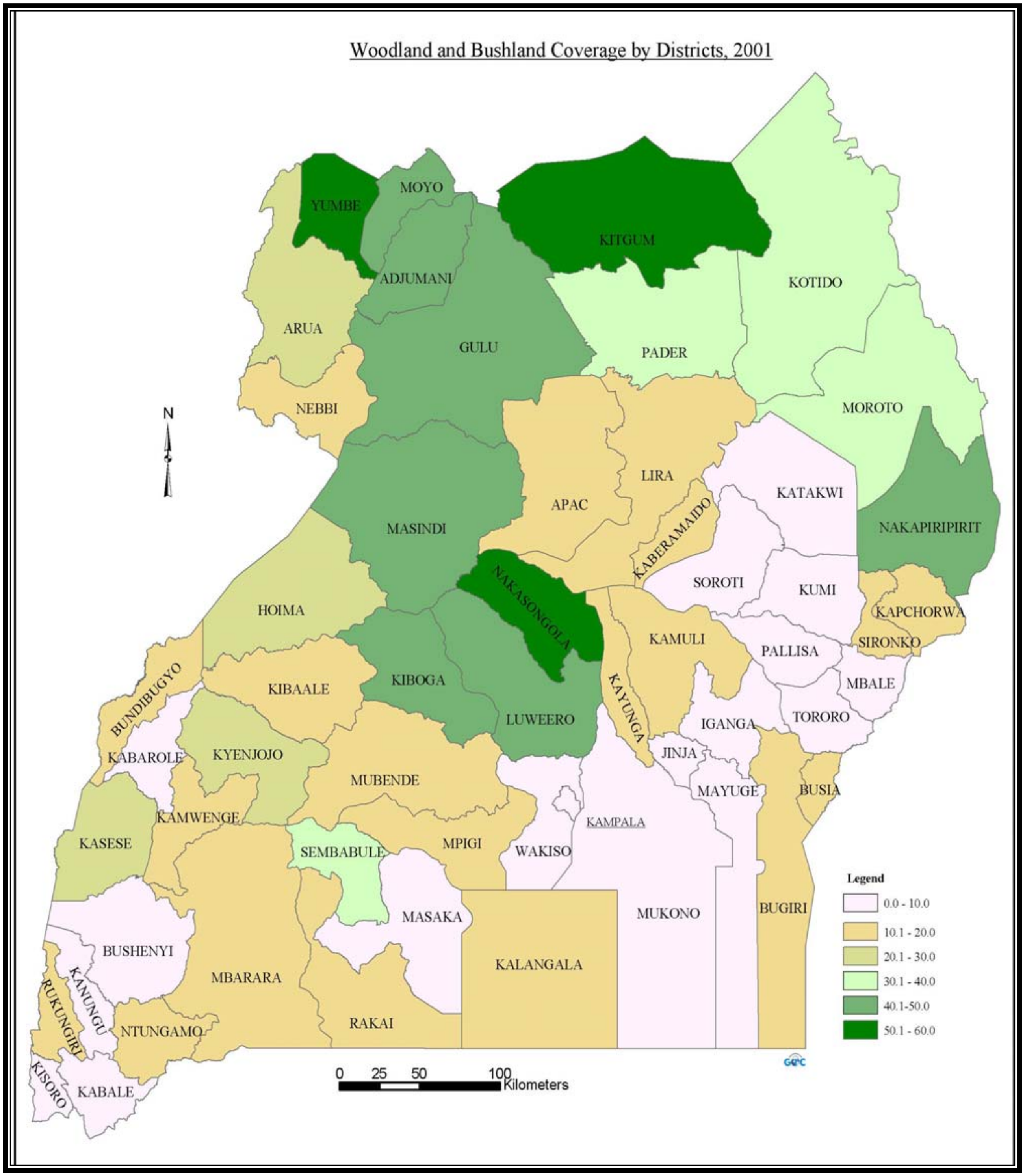
Source: MWLE (2001a)

Figure 4.2 Distribution of Central Forest Reserves in Uganda



Source: National Forestry Authority Databank

Figure 4.3 Spatial distribution of woodlands



Source: derived by GIC from a variety of sources including NFA and UBOS

A number of underlying factors are contributing to the decline of Uganda's forest resources. First, there are policy deficiencies relating to the private sector and local communities over land tenure, access rights and responsibilities for resource management (MWLE 2001a). Second, market failures (such as inappropriate royalty rates, poor market information, trade restrictions and hidden subsidies) which distort the markets for forest products have in the past affected the forest resource base. Third, although at the centre the regulatory environment has improved significantly, at local government level, the institutional structure is weak and lacks funding for operations and development. Fourth, the high rate of population growth and migration and the failure of government to provide alternative energy sources has increased the demand for agricultural land and firewood energy (MWLE 2001a). Fifth, rural poverty restricts the ability to invest in sustainable land use practices (MWLE 2001a). Also lack of alternative livelihood options has resulted in continued dependency on forest resources.

Sixth, and perhaps the overriding issue is the government policy of modernisation. This policy entails fast economic growth and rural transformation, hinging largely on agriculture. The desire for fast economic growth has seen forest areas which are recognised as gazetted reserves being degazetted and the land appropriated for increased agricultural production with little public debate or prior consultations. Examples include Butamira and a central forest reserve on Kalangala Islands. Sango Bay, Mabira and other central forest reserves are also at risk. The perceived notion, rightly or wrongly, is that forestry in the affected areas yields a lower social rate of return compared to agriculture. Paradoxically, in the Sango Bay area, there is extensive swamp forest which is unprotected and could be utilised for agriculture instead of degazetting the reserved forest areas.

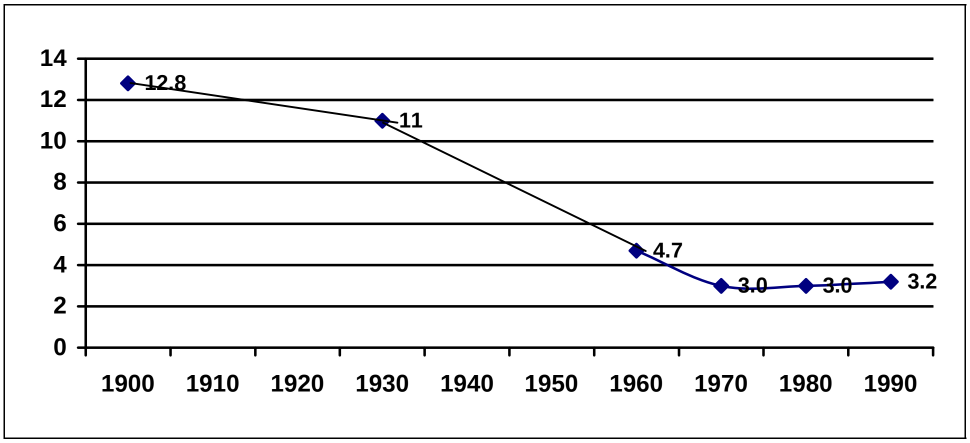
The drive to modernisation has also witnessed a dramatic increase in construction of residential, commercial and institutional buildings. Hence the demand for burnt bricks has translated into increased use of firewood. Timber for construction is also in high demand. Industrialisation is also closely linked with modernisation. The majority of the industries are agro-based and some, like tea processing, sugar production, tobacco curing, and the operations of bakeries and fish smoking require sizeable quantities of firewood.

In a nutshell, the forest estate in Uganda is under tremendous pressure – commercial, poverty-induced, industrial demand, etc. – which has contributed to a decline in the quality and extent of the resource.

Dwindling forest cover

Over the period 1900 to 1987 tropical high forest (THF) cover dwindled from about 12.5% of the total area of Uganda to 3% in 1987 (*Figure 4.4)*. It is quite telling that the decline was steepest from 1920 to 1970 when infact forest management standards were reportedly high. However, it is worth bearing in mind that the period coincided with the two World Wars which required significant amounts of material including timber. Furthermore, forest management focus was more on extraction compared to conservation today. Some forestland was also lost as a result of agricultural expansion, particularly between 1960 to 1970 when the post-independence government vigorously promoted agricultural expansion. Extensive woodlands were at the same time cleared for livestock production.

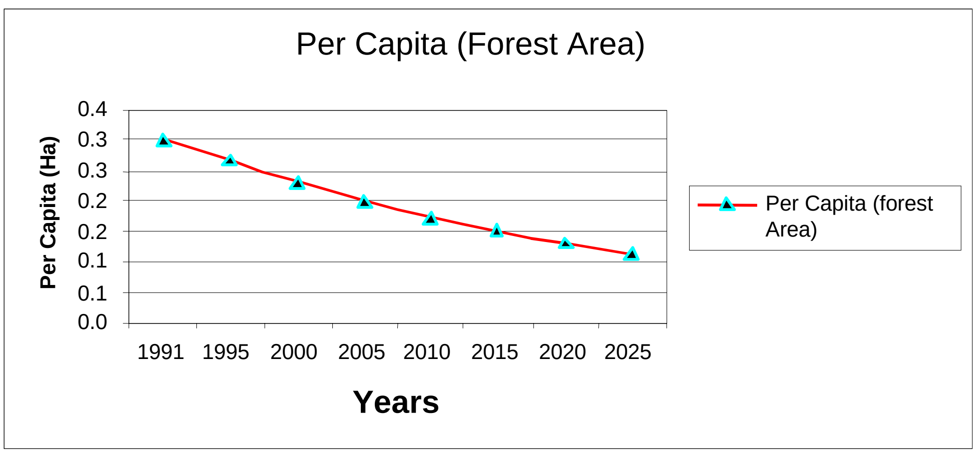
Figure 4.4 Decline in Uganda THF cover



Source: NEAP Secretariat (1992)

The NBS (2003) projected *per capita* forest area to decline from 0.3 ha in 1991 to 0.1 ha by 2025 (*Figure 4.5*) in the absence of any significant investments in forestry.

Figure 4.5 Per capita Forest area for Uganda



Source: NBS (2003)

What is left as of 2001 is 4.9 million hectares of which: THFs occupied 924 208 ha; forest plantations 35 066 ha; and woodlands 3 974 102 ha. Of the total area of forests, 30% are in protected areas (forest reserves, national parks and wildlife reserves) and 70% found on private and customary land. The protected areas contain the country's Permanent Forest Estate (PFE). The forests on private and customary lands are being extensively converted for agriculture, while those in national parks and wildlife reserves are generally not accessible for provision of forest products. Thus, CFRs, occupying some 1.26 million ha, constitute the only forestland that is largely available. Currently, while 50% of all the THF on private land is degraded, only 15% of the CFRs are degraded (MWLE 2001a), implying more stringent management of the latter, up to 2004 at least. Of recent, pressure is mounting to degazette some CFRs.

Table 4.2 shows the distribution of forest areas by regions in the year 2000. Of the total forest area: 20.1% occurs in the central region; 6.3% in the Eastern region; 44.6% in the Northern region; and 29.0% in the Western region. Over 80% of the forest cover of Uganda consists of woodlands. The percentages of forest plantations in the regional forest estates are as follows: Central 72.0%; Eastern 72.4%; Northern less than 1%; and Western 58.8%. On the other hand, THFs are largely found in Western region at 40.1% of all forest land, followed by Central 27.3%; Eastern 25.4%; and northern less than 1%. Another notable feature is that 50% of the THFs in Central region are depleted; 62% in Eastern; almost 0% in northern; and 16% in Western. Furthermore, virtually all the THFs in the west are located within protected areas and therefore largely inaccessible to the rural communities compared to a larger percentage of THFs on private and customary lands in central region.

Table 4.2 Forest distribution by region (ha)

Strata	Central	Eastern	Northern	Western	Total
Hard woods	4,370	4,856	2,628	6,827	18,682
Conifers plantations	2,746	2,140	3,238	8,259	16,384
THF (normal)	136,874	29,987	1,458	481,830	650,150
THF (depleted)	134,177	48,868	5	91,007	274,058
Woodlands	715,449	224,685	2,194,463	839,505	3,974,102
Total	**993,616**	**310,536**	**2,201,792**	**1,427,428**	**4,933,376**

Source: MWLE (2000a)

According to MWLE (2001a) the trend in Uganda was one of loss of forest cover and degradation of the remaining forest resource base as evidenced by:

- 280 000 ha of THFs degraded, representing at least a third of the country's valuable high forest;
- marked degradation and clearance of woodlands constituting the greatest loss of forest cover;
- less than 740 000 ha in government reserves of over 1 million ha, a loss of 35% of forest cover;
- as little as 6 000 ha of well-stocked softwood plantations remain standing out of a total area of 20 000 ha of plantations.

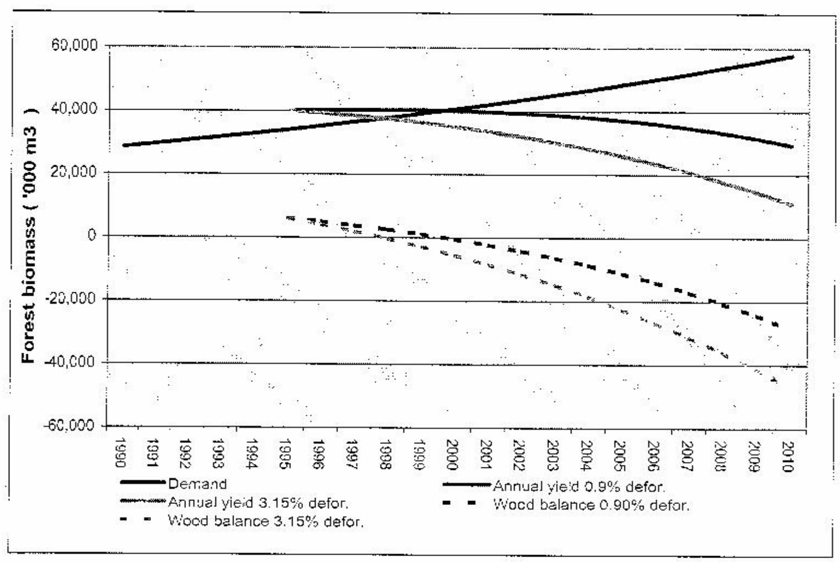
Bush *et al* (2004) attribute deforestation in Uganda to two key factors over the last century. They are: conversion of forest into agricultural and grazing land, due to population expansion and extensive pastoral systems; and over-harvesting (mining of the resource) for woodfuel, timber, non-timber forest products and charcoal due to high dependence by predominantly rural populations to maintain their livelihoods.

The authors further go on to suggest that even in the recent past, forest continues to be lost at an alarming rate. It is estimated that around 800 km^2 of forest has been lost in western Uganda since the mid 1980s (Bush *et al* 2004). The loss has occurred primarily outside the forest reserves and national parks but will lead to increased pressure on the latter in future (Plumptre 2002).

Increasing wood scarcity

The twin effects of deforestation and high consumption of forest resources are causing an increasing imbalance between national demand and supply of forest products. *Figure 4.6* shows the projected increase in demand for forest products and the growing shortfall in supply (based on investment levels pertaining then) under two scenarios: the higher (MFED) and lower (FAO) rates of deforestation. The result is a clear indication that Uganda has an unsustainable rate of consumption of its forest biomass due to the high rates of deforestation and harvesting (MWLE 2001b). The combined effects of deforestation, shrinking forest stock and high consumption are resulting in an escalating problem, which should be of a national concern (MWLE 2001b). On the other hand, the reduced supply of wood should eventually lead to increases in prices and should have a modifying effect on consumption, and as a result encourage increasing investment in forestry (MWLE 2001b).

Figure 4.6 Wood balance by deforestation scenario



Source: Falkenberg & Sepp (1999)

Similar to wood products, there is already a noticeable scarcity of some non-wood forest products. This is particularly so for rattan. The material used to be readily available in the natural forests of the Lake Victoria Basin. Today, rattan furniture makers in Kampala have to go as far as Masindi District (Budongo CFR) or alternatively import the raw material from the DRC.

Loss of ecological services

Forests provide a wealth of indirect environmental benefits as well as direct use benefits for many of the people surrounding them (Bush *et al* 2004) and beyond. The loss of forested areas upsets soil-water relations, creates soil erosion, and lowers water quality that, in turn, has an associated effect on human health (Bush *et al* 2004). In addition, people may gather medicinal plants and fuelwood, or derive food from the forests to support their livelihoods. The loss of these habitats leads to a lower quality of life (Bush *et al* 2004). The importance of forest ecosystems in conservation of biodiversity also has an international dimension; many species are of global value and their habitats of importance in the provision of global public goods such as carbon sequestration (Bush *et al* 2004). Tropical high forests are particularly important as they provide disproportionately high values of natural products and environmental services while supporting high levels of biodiversity (Bush *et al* 2004). The loss or degradation of THF cover is, therefore, of great concern.

The various impacts of a dwindling forest cover and the attendant outcomes of increasing scarcities of wood and non-wood forest products, and ecological services has triggered a number of policy responses. The key responses include: the increase in the nation's forest cover through higher levels of investment; improvements in forest management; promoting agroforestry; and a greater involvement of local communities in forest planning and management through Collaborative Forest Management (CFM).

1. *Increased investments*

Higher levels of investments are required for increasing Uganda's forest cover. Aware that government resources are to a large extent limiting, the NFA has embarked on attracting private capital into the forestry sub-sector. Examples include the Sawlog Production Grant Scheme (SPGS) and the issuance of licences to raise tree crops on degraded or unplanted areas in CFRs.

The SPGS is a special fund from the European Union aimed at attracting the private sector to establish commercial timber plantations in Uganda. It is part of the Forest Resources Management and Conservation Programme, which started in 2002 and runs until December 2006 (NFA 2005a).

This scheme encourages people to invest in tree plantations because of the following reasons:

1. Conditions for growing tree crops are generally good, with bi-modal rainfall over a large part of the country and fairly fertile soils too, for trees at least.
2. There are large areas of land suitable for tree plantations in Uganda – in Central Reserves and also on private and customary lands.
3. If well planned and managed, a commercial plantation operation in Uganda should yield a good rate of return on one's investment.

4. All indications are that demand for timber will grow. Existing plantations are nearly finished (<2,000 ha remaining) and these are all over-mature. In addition, there has been very little replanting over the last 20 years. With Uganda's rapidly growing population and fast developing economy there will undoubtedly be an excellent market for good general purpose timber in the near future. There are also good markets for peeler (veener) logs and transmission poles in Uganda.

Establishing good quality timber plantations requires a significant investment – most of which has to be made in the first few years, with the main revenue only coming later on. Because of the long-term nature of growing timber crops very few financial institutions are willing to fund such an investment. A state subsidy paid in the early years has been successful in a number of countries, attracting private growers to invest in tree growing. Uganda is likely to follow the same successful trend (NFA 2005a).

In the first two years of SPGS operation, the scheme has triggered a major interest in commercial tree planting in the country. By November 2005, some 2 500 ha had been established to the required standards by 32 contracted private sector 'clients' with over 6 000 ha contracted in total (NFA 2005a). However, the target for the current phase of the SPGS is 5 000 ha of timber plantations established to required standards by private planters.

2. *Improvements in timber pricing*

Historically, the value of the timber resource in the forest estate has been under-valued. Royalty rates were far much lower than what stumpage value or economic rent determinations would suggest. The result was a wasteful harvesting of timber resources. The NFA has responded to this challenge by introducing an auction system whereby the Authority establishes a reserve price for the standing volume of trees in a given area. Through the auction, timber buyers go through the bidding process. The highest bidder is granted a licence to harvest the timber. The auction price is progressively moving towards near parity with true economic rent values. Wood processors are also adopting a strategy of 'complete utilisation' of a tree as opposed to the previous wasteful harvesting and processing practices.

3. *Better level of enforcement*

Compared to the previous Forest Department (FD), the NFA has increased the level of enforcement. Although concrete data on improvements in enforcement are lacking, anecdotal evidence and observations of evictions of encroachers on forestland are testimonies of increased effectiveness in enforcement. While the improvements are noticeable in CFRs, the opposite is true in LFRs. The capacities of the newly created district forest offices are low and the offices are under-funded, although qualified foresters have been hired to manage the LFRs.

4. Promotion of agroforestry

Furthermore, there is the agroforestry research and development project, which operates under the agroforestry program of the Forestry Resources Research Institute (FORRI) of the National Agricultural Research Organisation (NARO). The project aims at improving land productivity, tree products and services to small-scale farmers. This is through identification of tand the supply of ree species suitable for incorporation on farms; development of appropriate management techniques for trees in agroforestry systems; dissemination of agroforestry technologies in the various agro-ecological zones of the country; and assessing adoption rates and impacts of the agroforestry technologies and practices.

The funding for the agroforestry programme is from the European Union and it started in 2002 as a four-year bilaterally-funded project with the Government of Uganda through NARO and implemented by FORRI. The project activities cover four zones namely: eastern lowlands (Tororo, Iganga and Kumi districts), eastern highlands (Mbale and Sironko districts) and southern rangelands (Ntungamo and Mbarara districts). Technologies have been developed and promoted in tree growing on farms in line with the Plan for Modernisation of Agriculture. These are in the following areas.

***a. Wood and energy production*:** Various technologies have been developed and promoted which include boundary tree planting, scattered on farm tree planting and home gardens, using tree species like *Grevillea robusta* (Silk Oak), *Alnus acuminata* (Alder), *Cedrella odorata* (Spanish Cedar), *Markhamia lutea* (Musambya), *Casuarina equisetefolia* (Casuarina) and *Maesopsis eminii* (Musizi) which provide fuelwood, poles and timber to an equivalent of 25 to 30 m³ of wood per ha. Such trees grow along with annual crops such as maize and beans and further act as windbreaks in the cropland if properly managed.

***b. Soil fertility improvement*:** Cost-effective and farmer-friendly improved fallow technologies have been developed using *Calliandra calothyrsus, Crtalaria grahamiana, Crotalaria paulina, Crotalaria ochloreuca, Tephrosia vogelii, Tephrosia candida, Cajanus, Sesbania sesban, Acanthus pubescens and Alnus acuminata* and have proved to be effective. Fallowing with these legumes/shrubs fixes nitrogen, increases soil organic matter and improves the soil physical properties leading to increased crop yields by 80 to 120% compared to continuous cropping. In addition, these shrubs provide an equivalent of 7 to 29 tonnes of firewood per ha (FORRI 2004).

***c. Improved fruit tree production*:** Improved fruit trees are a potential alternative income source for small-scale farmers. Varieties of both tropical and temperate fruits have been screened and tested on-farm in the various agro-ecological zones of Uganda. The tropical fruits include 7 mango cultivars, 8 avocado cultivars and 3 citrus varieties. Also, temperate fruits that have been evaluated on farms and were found successful in the highlands areas include: 5 apple varieties, 5 peach varieties, 4 pear cultivars and 5 plum varieties (FORRI 2004).

***d. Fodder production*:** Due to the inability of sustaining a stable supply of animal feed throughout the year on small land holdings, fodder bank technologies have been developed using *Calliandra calothyrsus*, *Leucaena diversifolia*, *L. trichandra* and *L. pallida* and *Gliricidia sepium* in combination with grasses like *Napier, Setaria* and *Cloris guyana*. Calliandra for instance has been found to increase milk yields by 3 litres per cow per day for exotics. In addition these shrubs are easy to establish and maintain and are compatible with companion crops (FORRI 2004).

***e. Soil and water conservation*:** Legume shrubs like *Calliandra calothyrsus*, *Leucaena diversifolia, L. trichandra* and *L. pallida* have been tested and proved as contour hedge rows to reduce soil and water movement by 70 to 80% resulting in 50 to 70% increase in crop yields, compared to areas without hedge rows (FORRI 2004).

***f. Pest and disease management*:** Termites pose a serious threat to tree growing on farms, especially in the drier areas of Uganda. Besides being environmentally unfriendly, chemical methods of control are not affordable to most farmers. On-farm evaluation of the efficacy of selected indigenous termite control methods has been carried out using red pepper, cow urine, wood ash and a combination of the three. Red pepper and cow urine have been effective in different areas of eastern Uganda (FORRI 2004).

g. *Organisational challenges*

There is need to build capacity for the staff to develop competitive funding proposals, strengthen the linkages among stakeholders, ensure sustainability and scale up the agroforestry activities in place. Despite the above challenges, the project is making significant positive contribution to agroforestry research and development (FORRI, 2004).

5. *Collaborative Forest Management*

During the formulation of the National Forest Policy, it was recognised that 'local communities comprise a range of interested parties, a number of whom may be good business entrepreneurs, but many of whom are also poor and marginalised groups' (MWLE 2001a). Subsequently, the focus of collaborative forest management (CFM) is specifically on the poorer and more vulnerable groups in society, who are also dependent on forest resources for their livelihoods; and they generally do not have a voice, and are often driven by poverty into poor land management practices (MWLE 2001a). The National Forestry Policy, therefore, has *Policy Statement No. 5* on CFM which provides for the development of collaborative partnerships with rural communities for the sustainable management of forests (MWLE 2001a), which is expected to define the rights, roles and responsibilities of partners and the basis for equitable sharing of benefits. The strategies for the implementation of the policy statement are shown in *Box 4.5*.

Box 4.5

Strategies for the implementation of collaborative forest management

- *Harmonise approaches and legislation* relating to collaborative forest management between lead government agencies, and with NGOs/CBOs.
- Develop a supportive legal basis for *devolved decision-making*, enforcing regulations, arbitration and accountability.
- Develop a supportive legal basis for *tree tenure, access rights* and *sharing of benefits* from wood and non-wood forest products.
- Develop security of *land tenure* for collaborative management of private forests.
- Develop both the *capacity and attitude changes* in government and non-government agencies to create genuine partnerships for collaboration with local community groups.
- Develop *robust community institutions* to ensure transparent decision-making, adequate representation and participation of women, men and vulnerable groups and equitable sharing of forest benefits and responsibilities.
- Strengthen the *role of NGOs/CBOs* in mobilising communities and building capacity for implementing collaborative forest management.
- Develop *technical approaches* to collaborative forest management that are consistent with the principles of sustainable forest management.
- Ensure resolution of conflicts relating to *problem animals*.

Source: MWLE (2001a)

Collaborative forest management started under the Forest Department on pilot basis. Also, the UNDP/GEF East African Cross Border Biodiversity Project piloted CFM in the Sango Bay CFR. These pilots were successful: communities (villages) formed resource user committees and drafted memoranda of understanding with the institution responsible for forestry. Armed with the lessons learnt from the pilots, the NFA is continuing to promote CFM in the CFRs where its mandate lies. Opportunities exist for additional promotion of CFM arrangements in the LFRs.

Policing forest reserves has not been effective in reducing illegal activities and has not favoured local communities in sharing the benefits from protected Central Forest Reserves. It has been a source of conflict between the lead agencies and communities. Conflicts have arisen for a number of reasons, including denial of access to forest resources for local communities, insensitive management styles before NFA, failure to deal with vermin and problem animals, and a lack of opportunity for communities to voice their concerns. The NFA, therefore, is engaged in collaborative forest management that enhances community participation and development of partnerships for the management of forest resources.

Collaborative management agreements have been developed between the NFA and community groups, to stimulate well-managed economic activities. Over 6 498 hectares are managed under collaborative initiatives and 1 757 households are engaged in collaborative initiatives.

It is expected that a sense of ownership of the resources will be created among the communities, and this should build community support in the management of the resources. NFA is committed to simplify the approach in order to enable it to cover far bigger areas and a greater number of communities.

4.3 Rangelands and Livestock Production

4.3.1 Rangelands

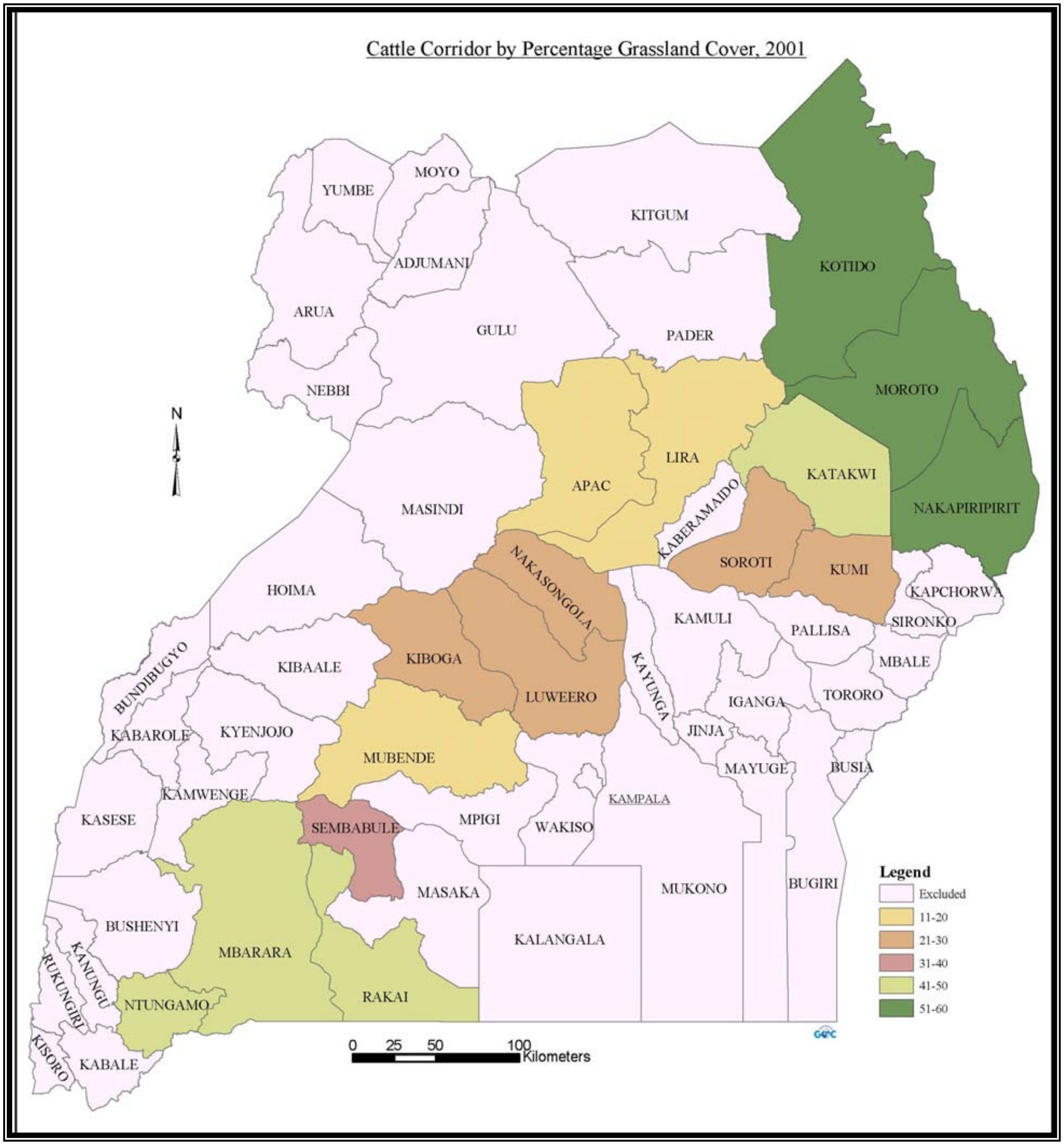
The term 'rangeland', used in livestock production in its widest sense, refers to broad areas of natural vegetation with no or little artificial seeding in which none or only limited investments have been made allowing for free movement of livestock. Rangelands are distinguishable from improved or maintained grazing lands, sown pastures or forage crops and forests in that they consist of predominantly woody species. Thus, a rangeland can simply be taken as uncultivated land carrying natural or semi-natural vegetation, which provides a habitat suitable for supporting grazing and browsing domestic and wild animals. Rangelands are primarily arid and semi-arid lands where other land uses, such as cultivation, are not economically viable. However, rangelands may also include some higher rainfall areas where, for cultural reasons, livestock production dominates despite the potential of the land to support cultivation agriculture.

Rangeland cover

Rangelands occupy a significant proportion of approximately 107 000 km^2 (44%) of Uganda's total land area. They form an area commonly referred to as the "*cattle corridor*" which stretches from the south through the districts of Ankole and northern parts of Buganda to the north central part of Uganda covering parts of Apac, Lira, and Soroti districts; up to Kotido, Kaabong, Nakapiripirit, and Moroto districts in the northeast (*Figure 4.7)*. Kaabong District was carved out of Kotido District in 2005. The area is generally between 1 000 m and 1 500 m above sea level. In the southwest, it forms part of the lower levels of the Uganda section of the interior high plateau and is generally a plain landscape with a few isolated hills. In the northeast, the area consists of a plain of 1 000 to 1 200 m above sea level and belongs to the drought prone region of northeastern Africa which covers parts of Sudan, Ethiopia, Kenya, and Uganda.

Rangelands have primarily been used for grazing whereby domestic and wild animals graze the native vegetation. This form of rangeland use provides the cheapest source of nutrients for ruminant and non-ruminant herbivores in Uganda. Low rainfall, high temperatures and evaporation rates, shallow, rocky and/or sandy soils that often have high contents of sand and clay and steep terrain, generally characterise the rangeland areas. Rangelands are not favourable for rain-fed agriculture although some parts in localised high potential areas attract various land use systems including crop cultivation.

Figure 4.7. Map of rangeland areas (Cattle Corridor)



Source: derived by GIC from various sources including NEMA, MAAIF and UBOS

Carrying capacity

Carrying capacity is defined as the potential of a rangeland or pastureland to maintain herbivores at a specific density throughout the year. It is calculated by matching the feed demands of any given species to the estimated biomass production per unit area. Usually this is affected by several factors such as sustainable off-take, accessibility, range condition and erosion hazard. The estimated biomass production on unimproved natural pastures from annual or seasonal rainfall figures for Uganda is presented in *Table 4.3*. The carrying capacities of Uganda's grazing lands have never been assessed with any degree of accuracy. The determination of carrying capacities is further complicated by the various species grazing at different vegetation heights or levels. Consequently, statements of over-grazing are at best nebulous. Generally, it is assumed that the safe or sustainable carrying capacity of any rangeland should not exceed 75% of its potential. Each of the 9 agro-ecological zones of Uganda has a different production potential. The quantity of feed produced in the herb layer is highly dependent on the rainfall pattern and the vegetation cover.

Table 4.3 Estimated biomass production and respective carrying capacity in Uganda rangelands

Rainfall (mm)	Biomass Production (kg/ha/year)		CC (ha/TLU)*
	Herb layer	Shrub layer	
300	1,710	890	2.7
500	2,970	1,630	1.6
700	4,230	2,370	1.1
900	5,490	3,110	0.9
1100	6,760	3,850	0.7

Source: Schwartz (2000).

Optimum utilisation of rangelands

Range management is a land management discipline that skillfully applies organised knowledge to renewable natural resources systems for two purposes:

- protection, improvement and continued integrity of the basic range resource which includes soils, vegetation and animals; and

- optimum production of goods and services in combinations needed by humankind. The major objective of range management is to manage land in a way that produces sufficient pasture for domestic and wild animals, and this includes agronomic practices such as bush or weed control, seeding of grasses and legumes and fertilisation.

Livestock farmers in the rangelands of Uganda have little modern knowledge of animal nutrition, what pasture species to use, how to manage them, and how to integrate the various feeds available. They also lack an appreciation of the value of pasture management systems and the benefits that can accrue from them. Labour availability can also limit any initiatives that the farmers may wish to make, although it is a common practice to hire labour for various tasks on the farm, e.g. carrying water and fodder, milking, herding cattle and planting and growing crops. Any change to the farming system should be done with the minimum of risk and disturbance to the other components of the system.

Rangeland condition and monitoring

Rangeland condition refers to the state of the range. It is judged by gross characteristics of the soil surface reflecting erosion processes and moisture infiltration, botanical composition (desirable and undesirable species) of the herb and the shrub layers, and plant health, density and vigour. Rangeland degradation is considered to have occurred if there has been a measurable decline in the condition of the range. From a study carried out recently, it was observed that there is no extensive rangeland degradation in Uganda, though it occurs in localised foci depending on the existence of pre-disposing factors. Strategies for increasing livestock, especially ruminants production, with the major objective of cheaply and sustainably meeting the nutritional requirements of ruminants, includes sustainable rangeland use through management and monitoring and increasing biomass production. The range monitoring program for Uganda would involve detailed rangeland surveys to quantify the state of rangelands, vegetation patterns and production systems. It would also entail a continuous process of monitoring and development to ensure increased and sustainable development. When assessing and monitoring the range condition, the following aspects must be taken into account:

- stocking the range should be on the basis of forage availability rather than a rigid stocking rate of so many hectares per tropical livestock unit;
- the condition of the grass crop should be checked regularly rather than livestock condition. Animals can live on poor quality and low palatability forage for some time before their physical look deteriorates; and
- a regular check for signs of range improvement or deterioration.

Constraints to rangeland development in Uganda

The issues pertaining to rangeland use and their apparent decline in productivity, and the slow development of the livestock sub-sector include: socio-economic factors and land use conflicts; land degradation; reduced quality and quantity of pastures; inadequate water supply; low genetic animals; poor marketing infrastructure; and lack of credit to invest in rangeland/livestock development.

Field visits by researcher the identified visible changes in botanical composition in various grazing areas, although available data cannot be used to quantify the extent of this change. An obvious widespread and severe problem is pasture weeds. Bush encroachment is evident in most of the ranching areas of south and southwestern Uganda. The areas in the former Ankole - Masaka ranching scheme covering the pastoral zone of Mbarara, Rakai, Sembabule, Masaka and Mpigi districts are faced with a problem of invading bushes. The main bushes are dominated by *Acacia hockii* and to a lesser extent *Vernonia sp*. However, these species are a valuable browse resource for goats. Therefore, the browsing habits of goats can be exploited in bush control and opening up of thick bushes, resulting in increased accessibility and utilisation of understorey vegetation by other livestock. This would lead to higher carrying capacities and off-take rates, while protecting the environment. There is need for adaptive research to be conducted in this area to establish the best way to utilise goats in mixed grazing for sustainable utilisation of the rangelands.

The pastoral rangelands of the north and northeastern Uganda have also recorded increased prominence of woody species in the formerly open grazing land. The districts of Kotido, Kaabong, Nakapiripirit and Moroto are particularly affected giving a high potential for browsers such as goats. In these districts, the present methods of pasture management and heavy livestock concentration in limited grazing areas due to limited water supplies and tsetse infestation, have resulted in overstocking, thus diminishing the vegetation in the herb layer leaving a pronounced scrubland. There is high prevalence of unpalatable species in the herb layer, dominated by the grass *Cymbopogon afronardus* in the former Ankole - Masaka ranching scheme. The causes for the change in botanical composition are largely attributed to changes in livestock population, uncontrolled use of fire and heavy grazing pressure. The rangelands in eastern Uganda are generally rated as being in good condition largely due to the low stocking rates over the last decade.

4.3.2 Livestock Production

The livestock sub-sector contributes about 10% of the total GDP of Uganda. More than 90% of the livestock in the country is owned by traditional herders and the rest by commercial ranchers. The numbers of livestock have been increasing over the years (*Table 4.4*), and this is of concern because it puts pressure on environmental resources. The Zebu account for about 30% of the cattle; The Sanga (Ankole) 50%, Nganda 18%, and cross-breeds and exotic breeds 2%. Uganda has a high potential for a profitable livestock industry. Unlike in the years 2001 and 2002, when the growth rates in the numbers of cattle was constant at 3.0%, that of 2003 was 3.6%. The growth rates for sheep and goats increased from 3.0% to 4.5% and 14.1%, respectively over the same period. On the other hand, the growth rate for the number of pigs and poultry decreased from 4.0% and 10.0% to negative 28.3% and negative 29.4%, respectively in the same period. Generally, cattle and goats have been increasing while pigs and poultry have been decreasing. Looking at cattle numbers for the last ten years, it is clear that there has been an increase. For instance, in 1992, the number of cattle was 4 500 000 while in 2003 it had increased to 6 558 000 (UBOS 2004). This increase is expected to continue. Apart from an increase of pressure on forage resources, an increase in the ruminant population means greater emission of greenhouse gases, especially methane.

Table 4.4 Livestock numbers (thousand animals), 1999 – 2003

	1999	2000	2001	2002	2003
Cattle	5,820	5,966	6,144	6,328	6,558
Sheep	1,044	1,081	1,108	1,141	1,603
Goats	6,180	6,396	6,620	6,852	7,821
Pigs	1,520	1,573	1,644	1,710	1,226
Poultry	24,622	26,974	29,671	32,639	23,031

Source: UBOS/ MAAIF (2004)

However in some districts such as Busia, there was a decrease in the number of cattle in the year 1997. This was due to bad weather and diseases like *Trypanosomiasis* and tick-bone. Currently, the animal population is steady because farmers are sensitised on diseases control. In addition, over 60 acres of improved pasture has been established (Busia District Local Government 2004).

Another district of potential for livestock farming is Apac. However, due to insecurity and cattle rustling in the region, this potential has not been realised. Currently, as shown in *Table 4.5,* there are about 160 390 cattle, 171 599 goats, 39 984 sheep, 756 715 poultry, 1 879 rabbit (Apac District Local Government 2004). Also in the Karamoja region, there is a lot of cattle and over-grazing due to over-stocking in the area.

Table 4.5 Livestock populations in Apac District by breeds

Animal type	Exotic	Crosses	Local breeds	Total
Cattle	1430	921	158,039	160,390
Goats	25	315	171,259	171,599
Sheep	-	-	39,984	39,984
Pigs	-	-	12,051	12,051
Poultry	5318	814	7,555,583	7,561,715

Source: Apac District Local Government (2004)

There are a number of problems affecting the livestock sector. Some of them are diseases such as *Trypanosomiasis* (*Nagana*), tick borne diseases, foot and mouth (common in Masindi District), lumpskin diseases, as well as worm infestation.

4.4 Wildlife Resources

Conservation[2] or resistance to it, are the driving forces influencing Uganda's wildlife resources. The conservation of biological resources in specially selected sites in Africa began many years ago, and arose from many motivations, including: the desire of colonial authorities to preserve game populations for (white) hunters; and misunderstanding of traditional African patterns of hunting and resource use (BSP 1993). The alienation of land for national parks and hunting reserves was part of a larger pattern of colonial restructuring of African landuse traditions; and over time, as the conservation ethic grew in the developed world, concerns to set aside land for protection of endangered species and habitats were also transferred to Africa (BSP 1993).

Rural African people throughout most cultures and societies (including those in Uganda) have been practitioners of complex environmental processes designed to conserve, and in some instances nurture, their environment (BSP 1993). Northern or developed country conservation efforts were introduced during the colonial period, when 'specially-selected sites' were set aside and most human exploitation within them was prohibited (BSP 1993). Rather than being an integral component of the existing social system, these national parks and reserves were imposed from outside (BSP 1993). Given the historical antecedents of today's protected area system in Sub-Saharan Africa, it is perhaps not surprising that the attitudes of local people living near national parks and reserves often reflect suspicion and mistrust of conservation policies (BSP 1993). This legacy is one of the reasons that new approaches toward people-oriented conservation have been introduced in recent years, and must be fostered in the future (BSP 1993). Uganda has continued to create national parks well after independence, some as fulfillment of the national obligations under the Convention on Biological Diversity (CBD); and others the result of conditionalities of the country's development partners.

Wildlife constitutes an important resource for Uganda – as source of food and material, recreation, tourism, nature study and scientific research. Uganda's wildlife occurs in both protected areas and outside protected areas. As of 1994, protected wildlife areas consisted of: national parks, game reserves., controlled hunting areas and game sanctuaries (*Table 4.6).* In all, there were 39 protected areas managed by the Uganda National Parks and the Game Department.

[2] Conservation is defined as the management of human use of the biosphere so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet needs and aspirations of future generations. Thus conservation embraces preservation, maintenance, sustainable utilisation and restoration, and enhancement of the natural environment (IUCN, UNEP & WWF 1980).

Table 4.6 Protected wildlife areas as of 1994

Status/Name	Year Established	Area (Km^2)
A. National Parks		
1. Queen Elizabeth	1952	1,978
2. Murchison Falls	1952	3,860
3. Kidepo Valley	1962	1,442
4. Lake Mburo	1982	260
5. Rwenzori Mountains	1991	996
6. Mgahinga Gorilla	1991	25
7. Bwindi Impenetrable	1991	330
8. Semliki Forest	1993	220
9. Mt. Elgon	1993	1,146
10. Kibale Forest	1993	766
Sub Total		**11,023**
B. Game Reserves		
1. Ajai's	-	58
2. Bokora Corridor	-	2,056
3. Bugungu	-	520
4. Karuma	-	820
5. Katonga	-	208
6. Kibale Forest Corridor	-	560
7. Kigezi	-	330
8. Kyambura	-	157
9. Matheniko	-	1,604
10. Pian-Upe	-	2,314
11. Toro	-	554.88
Sub Total Game Reserves		**9,281.88**
C. Controlled Hunting Areas		
1. Buhaka	-	17.73
2. East Madi	-	1,749.40
3. Kaiso Tonya	-	226.56
4. Kanema	-	240.61
5. Katonga	-	2,272.97
6. Lipan	-	898.56
7. Napak	-	224.51
8. North Karamoja	-	1,676.04
9. Sebei	-	2530.84
10. Semliki	-	503.19
11. South Karamoja	-	8971.64
12. West Madi	-	831.23
Sub Total Controlled Hunting Areas		**35,143.28**
D. Game Sanctuaries		
1. Dufile, Otze& Mt. Kei	-	489
2. Entebbe	-	52
3. Jinja	-	8
4. Kazinga	-	207
5. Malaba	-	31
6. Zoka Forest	-	207
Sub Total	**-**	**966**
E. GRAND TOTAL		**56,414.16**

Source: NEIC (1994)

After the merger of Uganda National Parks and the Game Department, the wildlife protected areas were rationalised and are now made up of 10 national parks, 13 wildlife reserves, 5 community wildlife areas and 10 wildlife sanctuaries as shown in *Table 4.7.*

'Game reserves' became 'wildlife reserves'; while the term 'controlled hunting area' was abandoned altogether. The protected area system was rationalised to make management more effective and to excise areas which were no longer wildlife habitats due to encroachment or heavy poaching which decimated the wildlife populations.

Table 4.7 System of Wildlife Protected Areas in Uganda, 2005

National Parks	Wildlife Reserves	Community Wildlife Areas	Wildlife Sanctuaries
BINP Bwindi Impenetrable	**AWR** Ajais's	**ACWA** Amudat	**EAS** Entebbe
KINP Kibale	**BKWR** Bokora Corridor	**ICWA** Iriri	**JAS** Jinja
KVNP Kidepo Valley	**BUWR** Bugungu	**KCWA** Karenga	**MKS** Mt. Kei
LMNP Lake Mburo	**EMWR** East Madi	**KTCWA** Kaiso-Tonya	**OFS** Otze Forest
MENP Mount Elgon	**KAWR** Katonga	**RCWA** Rwengara	
MFNP Murchison Falls	**KBWR** Kabwoya		**Sanctuaries in**
QENP Queen Elizabeth	**KWR** Karuma		**QENP/Kyambura**
RNP Rwenzori	**KIWR** Kigezi		Kahendero
SNP Semuliki	**KYWR** Kyambura		Kashaka
MGNP Mgahinga Gorilla	**LOWR** Lomunga		Kayanja
	MWR Matheniko		Kazinga
	PUWR Pian Upe		Kisenyi
	TSWR Toro-Semliki		Rwenshama

Source: UWA (2005)

Wildlife conservation was strengthened by the coming into force of the 1995 Uganda Constitution with, *Section 27* which specifically states, " *the state shall create and develop parks and reserves to protect the biodiversity of Uganda"*. Generally, wildlife is found in Protected Areas (PAs) as well as areas outside PAs. Within the wildlife PAs there are two classifications that include Wildlife Reserves and National Parks (NP). The wildlife management areas have three divisions and these are the Wildlife Sanctuaries; Wildlife Use Right Areas; and Community Wildlife Areas (CWA).

Although there has been a lot of effort both from international development partners and at the national level to ensure efficient management of wildlife resources, many challenges still remain. For instance, high levels of poverty and population pressure have contributed to encroachment into protected wildlife areas. Indiscriminate commercial poaching poses major challenges. Perhaps minor but significant are issues of inadequate funding, conflicting government policies, and very little public awareness towards sustained conservation of wildlife resources in Uganda.

As mentioned earlier, wildlife is an important resource for Uganda. Some of this importance lies in its role as a source of food and materials, nature study, scientific research, recreation and tourism. In addition, wildlife also has religious and ethical values. Of the 49 880 km^2 that was gazetted as wildlife PAs dating back to the 1950s and 1960s only about half currently remains protected while the rest is unprotected. Great diversity of wildlife is supported by the unprotected habitats, which therefore necessitates an effective programme to ensure sustainable management of these habitats (UWA 2002).

The wildlife reserves and NPs in Uganda constitute Wildlife PAs as stipulated by the *Wildlife Policy 1999* (MTWA 1996). The PAs have five major purposes that include water catchment conservation; preservation of selected biotic communities and their physical environments; preservation of populations of rare, endemic and endangered species of wild animals and plants; and protection of areas of aesthetic beauty and special interest.

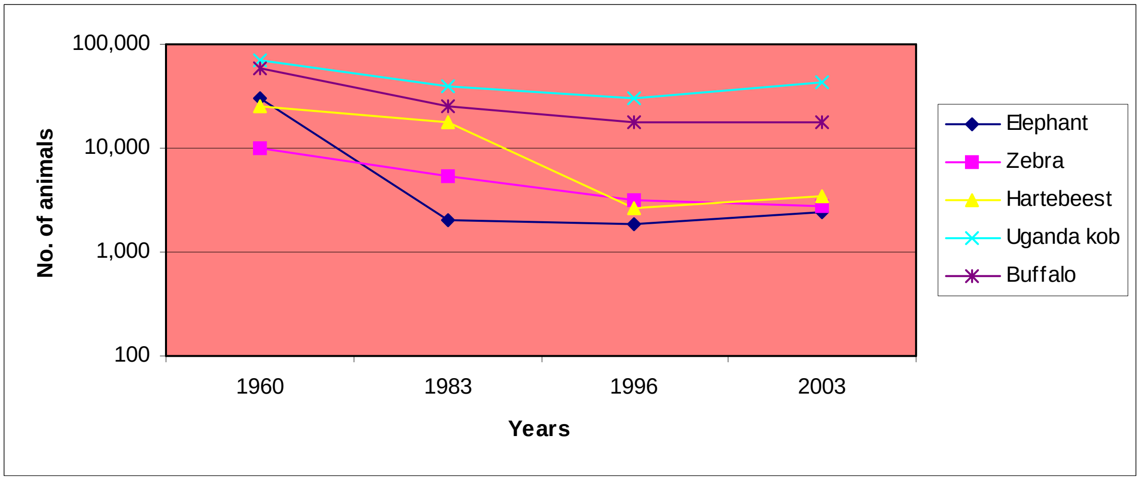
Due to the various cross-cutting importance of both wildlife as a resource and wildlife PAs, the *National Forestry and Tree Planting Act 2003*, the *Land Act 1998*, the *Wildlife Act* (GoU 1996), and the *Local Governments Act 1997* provide a broad legal framework for the conservation of natural resources including the management of wildlife. Following the basic principles of sustainability underlying the management of natural resources and wildlife, the Uganda Wildlife Authority (UWA) is legally mandated to manage the wildlife resources in Uganda.

Status and trend

Uganda is one of the few African countries that enjoys a variety of wild animal and plant species due mainly to its unique geographical location in the world. In the past up to the late 1980s, wildlife resource was seen as having potential commercial and recreational value unlike today where the focus is on conservation of this resource. In 1994, there were 10 National parks occupying an area of 11 023 Km^2. Today, additional community wildlife management areas have been created and the issue of conservation is emphasized.

While Uganda's wildlife population declined drastically in the 1970s and 1980s from their previous levels caused by 'heavy commercial poaching' exacerbated by the breakdown of law and order, there is now a recovery in wildlife numbers since the late 1980s as a result of improved environmental and natural resources governance and the restoration of law and order. *Figure 4.8* shows trends in populations of large mammals in the wildlife protected areas of Uganda. The data show trends in the populations of the Uganda Kob, Hartebeest, zebra, buffalo and elephant. Trends of the populations from 1960s to 2003 together with their status are further elaborated in *Table 4.8*. The data show the population of Burchell's Zebra still decreasing; Roan antelope being very rare and precarious; eland population low and still decreasing; while Derby's Eland considered extinct.

Figure 4.8 Trends in populations of some selected large mammal species in Uganda, 1960s to 2003.



Source: UWA (2005)

Table 4.8 shows changes in the populations of some selected large mammal species in Uganda (mostly in wildlife protected areas from 1960 to 2003), together with their status as of 2003. *Table 4.9* shows populations of selected large mammals in the wildlife protected areas over the period 2000 to 2004.

Table 4.8 Changes in the populations of some selected large mammal species in Uganda from the 1960s to 2003

Species	1960s	1982/3	1995-96	1999-2003	Status in Uganda
Elephant	30,000	2,000	1,900	2,400	Population low, but slowly increasing
Black rhino	400	150?	0	0	Extinct in Uganda
White rhino	300	20?	0	0	Extinct in Uganda
Burchell's Zebra	10,000	5,500	3,200	2,800	Population low, possibly still decreasing
Hippopotamus	26,000	13,000	4,500	5,300	Population increasing slowly
Rothschild's giraffe	2,500	350	250	240	Population low but stable
Buffalo	60,000	25,000	18,000	17,800	Population stable, decline in QENP offset by increases in MFNP
Hartebeest	25,000	18,000	2,600	3,400	Population increasing slowly
Topi	15,000	6,000	600	450	Population decreasing
Impala	*	19,000	6,000	3,000	Population low, may now be increasing slowly
Waterbuck	10,000	8,000	3,500	6,000	Population increasing
Uganda kob	70,000	40,000	30,000	44,000	Population increasing
Bright's gazelle	1,800	1,400	100	50?	Very rare
Roan	700	300	15	7	Very rare, precarious
Oryx	2,000	200	0	0	Extinct in Uganda
Eland	4,500	1,500	500	450	Population low, may still be decreasing
Derby's eland	300	?	0	0	Extinct in Uganda

Note: Game Department reports and aerial surveys 1996, 2000, 2002, 2004, 2005. These are species for which reliable previous estimates are available, from which to determine trends. Numbers are approximate.
Source: UWA (2005)

Table 4.9 Large mammals species in Wildlife Protected Areas (Data from 2000-2004)

Protected Areas	Species	Recent Estimates (where available)
Queen Elizabeth (includes Kyambura and Kigezi WRs)	Elephant	1000
	Buffalo	6,807
	Hippo	3,400
	Topi	157
	Uganda kob	32,000
	Waterbuck	4,500
	Warthog	2,400
	Giant Forest Hog	-
	Bushbucks	-
	Reedbucks	-
	Lion	100
	Leopard	-
	Spotted hyena	-
	Chimpanzee	-
	Baboon	-
	Black and white colobus	-
Murchison Falls Conservation Area (also includes Karuma and Bugungu WRs)	Elephant	692
	Giraffe	229
	Hippo	1,792
	Buffalo	8,200
	Uganda kob	7,458
	Hartebeest	2,903
	Oribi	-
	Bushbucks	-
	Waterbuck	792
	Warthog	1,639
	Lion	100
	Leopard	-
	Hyena	-
	Chimpanzee	-
	Baboon	-
Kidepo Valley National Park	Elephant	420
	Buffalo	1,800
	Eland	15
	Giraffe	12
	Zebra	150
	Hartebeest	250
	Diki diki	-
	Bright's gazelle	-
	Lesser kudu	10
	Greater kudu	10
	Oribi	1000
	Reedbuck	300
	Lion	25
	Cheetah	10
Lake Mburo National Park	Zebra	4,280
	Impala	3,300
	Eland	606
	Topi	162
	Buffalo	946

	Waterbuck	548
	Warthog	560
	Bushbuck	76
	Reedbuck	200
	Sitatunga	-
	Oribi	-
	Klipspringer	-
	Hippo	213
	Leopard	-
	Hyena	-
Bwindi Impenetrable National Park	Gorilla	326
	Chimpanzee	-
	Elephant	40
	Duiker	-
	Baboon	-
	Monkey (various spp)	-
Mgahinga Gorilla	Gorilla	45
	Buffalo	-
	Golden monkey	-
	Elephant	-
	Duiker	-
	Bushbuck	-
	Giant forest Hog	-
Rwenzori Mountains National Park	Elephant	-
	Chimpanzee	-
	Buffalo	-
	Giant forest Hog	-
	Monkeys (various spp)	-
Kibale National Park	Chimpanzee	1429
	Elephant	45
	Buffalo	-
	Giant forest hog	-
	Hippo	-
	Monkeys	-
Semliki National Park	Elephant	-
	Buffalo	-
	Chimpanzee	50
	Monkeys	-
Mt. Elgon National Park	Bongo	-
	Buffalo	-
	Giant forest hog	-
	Elephant (occasionally)	-
Toro/ Semliki WR	Buffalo	260
	Elephant	211
	Uganda kob	1,063
	Waterbuck	58
	Bushbuck	-
	Lion	-
	Leopard	-
	Hyena	-
	Hippo	-
Pian Upe Wildlife Reserve	Topi	3
	Hartebeest	108

	Eland	74
	Roan antelope	7
	Zebra	3
	Buffalo	20
	Waterbuck	9
	Reedbuck	41
	Oribi	10
	Duiker	3
	Warthog	6
	Baboon	32

- means not available
Source: UWA (2005)

Whereas in the protected areas the status of wildlife is known to a large extent, it is the reverse outside PAs. For this reason, a background study was conducted in the Kafu Basin to ascertain wildlife status outside PAs in 2001. The data collected indicated Hartebeest having become extinct while Uganda Kob and Waterbuck populations were decreasing at a high rate. This was mainly due to unsustained activities of surrounding communities who mainly engage in charcoal burning hence affecting wildlife habitats. They are also engaged in hunting to supply smoked game meat for sale as far away as Kampala.

In 1991, Uganda's population was 16.7 million people and the population was growing at the rate of 2.5 per cent. The growth rate has since risen to 3.4% per annum and by 2002 the population was 24.7 million, thus exerting greater pressure on the wildlife protected areas. For example, the population of Kotido District grew by 9.7% per annum over the 1991 to 2002 period. Kotido District is home to Kidepo Valley National Park.

The increased human population implies greater demand for food, other resources and agriculture. Wildlife populations have been affected by uncontrolled hunting for commercial and subsistence purposes and mass destruction of habitats. This is evident in the south and north of Karamoja pastoral community and Bokora corridor, where illegal hunting of leopards and lions was carried out extensively in order to protect livestock. In Murchison Falls National Park, the number of elephants has reduced to about 500 compared to the approximately over 12 000 elephants in the 1960s. Outside PAs, over-stocking of livestock and seasonal fires degrade wildlife habitats thereby leading to population decline. It is due to illegal hunting that Katonga Wildlife Reserve like other reserves is left with few animals.

Political conflict and high population growth rate have largely contributed to decline in wildlife populations. The high population pressure has resulted in decreased wildlife ranges as forest areas and rangelands are converted into industrial and urban areas, and farmlands. There was loss of some gorillas and destruction as a result of the Rwanda war, which was launched in the Virunga volcano area in 1994. However, the Mountain gorilla population was stabilised and has now even increased.

Encroachment onto wildlife-protected areas has also adversely affected the growth of tourism industry. For instance, in wildlife reserves over 150 000 cattle and 100 000 goats and sheep are grazed. An estimated 8 000 people are settled in the PAs of the Karamoja region. This has led to evidence of water scarcity and degeneration of pastures whose availability is crucial for wildlife survival. The human population of approximately 15 000 in the Queen Elizabeth National Park fishing villages has contributed to depletion of forest cover and loss of habitat and food for wild animals due to encroachment on park resources particularly for woodfuel.

4.5 Mineral Resources

Mining is the extraction from earth of materials or minerals useful to humans. Various tools, chemicals and processes are used to achieve this extraction. The processes depend on the nature of the mineral ore, its geological location and the scale of the undertaking. Correspondingly, the methods have their efficiencies and inefficiencies. For example, miners of gold, lime, clay, and sand, employ opencast production, which does not involve heavy machinery, chemicals, transport and recovery of minerals.

The drive to identify and exploit Uganda's mineral resources was one of the need to obtain foreign exchange earnings and increase opportunities for non-farm employment. Kilembe Copper Mines, Lake Katwe Salt Works and limestone mining in Tororo and Kasese were the major investments in this regard. Then there were mining operations (wolfram, tin, beryllium, etc) scattered throughout southwestern Uganda. At present the Kilembe Mines and Katwe Salt Works and most of the mining operations in southwestern Uganda are closed leaving visible scars on the landscape. Kilembe is to a large extent now a ghost town. A much more durable mining operation is stone quarrying and the extraction of clay from wetlands for brickmaking and sand for use in the building industry. These latter activities have grown over the years attributed to the boom in the construction industry countrywide. Extraction of limestone for the manufacture of cement which stalled during the 1970s and early 1980s re-started with both Hima and Tororo cement works producing larger quantities than before. Lime production is also moving from artisanal production to large-scale operations.

Mining in Uganda began as far back as 1907 and has contributed a great deal to Uganda's economy. In 1970, mineral exports accounted for 8.5% of total export earnings. However by 1987 mining had almost stopped altogether. In spite of the wide range of mineral resources, in the country, their exploitation has been limited to copper, phosphates and lime. Other minerals such as tin, wolfram, gold, gypsum, asbestos, iron and lead among others have been exploited in small amounts. Their extraction has left considerable environmental degradation due to poor and inefficient methods and technologies. Deep pits which are often left uncovered as well as toxic chemicals like mercury that are used in some of the extraction processes pose great potential danger to the environment if abused.

Inadequate knowledge of mineral resources

The geological framework of Uganda is said to comprise five main categories that include crystalline basements; sedimentary cover sequences; carbonatite intrusives; volcanics; and quaternary sediments. For purposes of evaluating the mineral potential of the country, each of the five categories is considered as a distinct domain containing characteristics and predictable sites of minerals. Knowledge of the actual occurrence of minerals in Uganda is therefore lacking. The available information reveals high concentrations in the southwestern, eastern and northeastern parts of the country. Of particular interest are the limestone reserves and iron ore, estimated respectively, at 200 million and over 50 million metric tonnes. None of the iron ore is presently being signficantly exploited.

Extraction methods

The little mining done in Uganda is characterised by poor mining methods, such as lime extraction which is done by the burning of limestone. Most of the kilns are inefficient and of poor quality, leading to consumption of significant quantities of fuelwood that has resulted in some localised deforestation. Gold mining that started in 1933 on a small scale had used techniques such as hand panning, machinery and cyanidation. Currently, gold mining in Uganda is done through an opencast system that leaves behind large gaping pits as well as huge tracts of land cleared of vegetation.

Minerals like wolfram, copper, and petroleum are mined by drilling activities. Since drilling cuts deep into the earth, the mining of these minerals provides for safe measures of waste disposal. Some of the waste by-products are further processed to produce other materials such as cobalt. Currently, EIA studies are done prior to the mining activities in order to ensure that environmentally friendly technologies are used and appropriate mitigation measures are put in place to overcome potentially adverse impacts. The Ministry of Energy and Mineral Development has produced *EIA Guidelines for the Mining Sector to augment the generic national EIA guidelines.*

Mineral policy and law in Uganda

Uganda has two principal laws governing mining activities and these are the *Mining Act 2003* and the *Petroleum (Exploration and Production) Act 1985*. The *Petroleum Act* concentrates on rights, procedures and environmental standards in the production and drilling activities, including offshore operations, pollution prevention, control of explosives and environmental health and safety. The *Mining Act* provides for the ownership, prospecting and extraction of minerals. It reserves rights over all minerals in Uganda to the government and regulates the granting of permits, licenses and leases.

Licensing

In 1996, a total of 133 prospecting licenses had been granted for mining establishments. Thirteen mining leases and 58 location licenses had been issued. As a result, the area under exploration increased 16 fold from about 3 910 km^2 during the 1994 to 1995 period to 63 318 km^2 in 1995 to 1996. In view of the above, all mining activities in Uganda are controlled by the Geological Surveys and Mines Department (GSMD) and the Petroleum Exploration and Production Department (PEPD), both of which are under the Ministry of Energy and Mineral Development. Private sector interests are represented by the Uganda Chamber of Mines.

Mineral production and export

The mining sector forms an important potential source of tax revenue, employment and foreign exchange earnings and is essential for the recovery of Uganda's economy. Though Uganda is known to have substantial deposits of various minerals, the industry has not made much impact on the *GDP* even with the liberalised investment opportunity. The bulk of mineral output is exported to international markets but the proceeds still account for a small part of the monetary economy. Mining's share fell from 5.4% of GDP in 1970 to less than 1% in 1988. At its peak in 1969, 16 500 tonnes of blister copper earned US$ 27 million. Due to negative factors like falling world prices for minerals such as copper, lack of spare parts and other inputs, lack of technical know-how, political instability and mismanagement, the glory of the mineral wealth has gradually waned. Currently, mineral production and exports are as given in *Table 4.10*.

On a base case scenario, the annual value of mineral production is expected to rise from the current $12 million to over $100 million; while on a best case scenario basis the annual value is expected to increase to over $200 million (MEMD 2003). The formal mining sector employs about 15 000 people at the moment (MEMD 2003).

Mining could become a key engine for poverty reduction. Tanzania's successful development of gold mining is an example, earning the country well over $500 million/year. However, for Uganda's mining potential to be realised, strict environmental safeguards should be adhered to. For example, there will be need for less-polluting technologies to be procured. The evidence todate suggests most mining licence or lease owners do not have access to venture capital and low-cost loans. This is one area where public investment could earn decent social rates of return. Pollution from mining which is already being felt (*Box 4.6*) needs to be controlled also.

Box 4.6

Mining and environmental decline

During UPPAP2, environmental decline resulting from mining was reported in Butungama in Bundibugyo District, and Lorukumo, in Moroto District. The local people involved in mining barely earn a living from selling the ore because it fetches very little. They have no control over the price of the ore, which is determined by the buyers. Those involved in the mining expose themselves to several dangers. Huge craters are formed from the ore removed from the ground by the mining process; these craters, in due course, become a health hazard.

Source: MFPED (2002)

Table 4.10 Mineral production and values, 2000-2003

Mineral	Quantity (in tons)				Value (in million Shs.)			
	2000	2001	2002	2003	2000	2001	2002	2003
Limestone	253,032	173,825	140,023	226,408	20,242.6	13,906	11,201.8	18,112.7
Pozzolana materials	35,602	22,782	12,388	65,587	658.7	478.4	260.1	1,377.3
Cobalt	410.8	512.0	Nil	Nil	21,552.3	25,600.0	-	-
Columbite-Tantalite	2,712	2.0	6.5	16.2	21,560.4	30.3	96.9	243.6
Gold	0.06	Nil	0.03	0.04	758.4	2.5	44.4	846.5
Wolfram	Nil	26.7	24.8	2.2	-	32.0	29.8	2.4
Iron ore	2,400	1,097	Nil	Nil	84.0	22.0	-	-
Kaolin	14.0	90	178	Nil	0.7	9.0	17.8	-
Vermiculite	Nil	Nil	644	1,724	-	-	225.8	586.2
Gypsum	Nil	Nil	5.1	42.8	-	-	0.6	4.3
Total					**64,857.1**	**40,080**	**11,877.2**	**21,173**

Source: MEMD (2004)

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5.0 AQUATIC RESOURCES

5.1 Wetland Resources

Up to the mid 1980s, the official position of the government of Uganda was that wetlands were wastelands. Government policies encouraged the draining of wetlands and converting the areas into farmlands. *Eucalyptus spp* were planted to drain swamps and hence deny breeding grounds for mosquitoes and avert malaria in urban areas. The word 'swamp' is now losing favour with the Ugandan public and instead these areas are referred to as 'wetlands' and sometimes 'wealthlands'. There is an improved understanding of the roles and functions of wetlands.

According to the *Ramsar Convention*, wetlands are areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salty, including areas of marine water whose depth at low tide does not exceed six metres. However, the National Wetlands Programme (NWP) defines wetlands as *"an area that stays wet long enough for only certain plants and animals to grow even when there is no rain".* Wetlands are one of the most valuable ecosystems Uganda has. Their most valuable attribute is their capacity to store, filter, distribute and gradually release large quantities of Uganda's fresh water stock.

By 1988, through support from NORAD, a project was initiated to come up with a policy framework for the conservation and sustainable management of wetland areas. Even then, by 1994, there was no institution responsible for the country's wetland resources despite the fact that Uganda was a signatory to the RAMSAR Convention. However, the National Wetlands Management Programme, the predecessor of the National Wetlands Programme, was in existence having started around 1988. Furthermore, the value and functions of wetlands were just beginning to be better understood.

In 1992, a survey was conducted to try and better understand the uses to which reclaimed wetland areas were allocated by smallholder farmers in selected districts and the results shown in *Table 5.1.*

Table 5.1 Uses of reclaimed wetlands by the smallholder farmers of Uganda by 1992

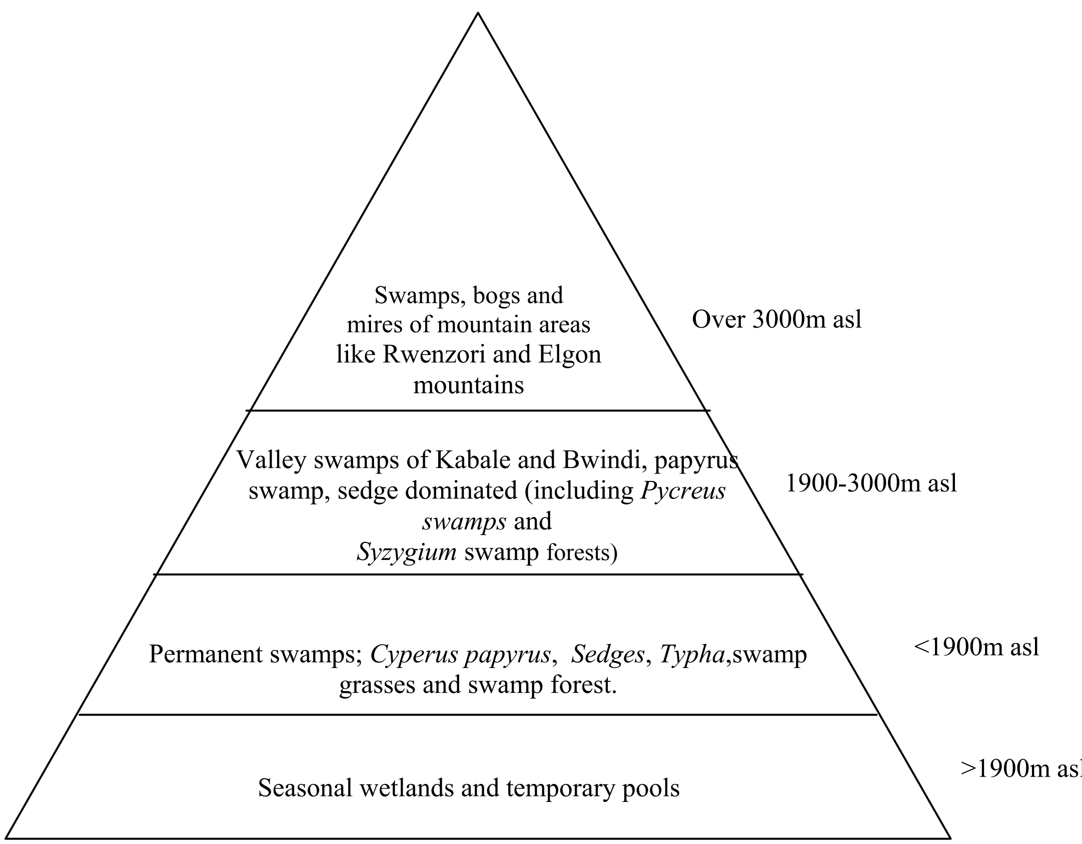
	Root crops (%)	Vegetable (%)	Livestock (%)	Rice (%)	Bananas (%)
National	41	33	25	15	8
Kabale	99	99	0	0	0
Rukungiri	24	9	69	0	0
Ntungamo-Kajara	91	61	80	3	3
Bushenyi-Rubinda	97	10	74	1	0
Nebbi	10	14	3	0	27
Gulu	48	56	1	35	44
Mpigi	6	5	0	0	1
Iganga	0	45	0	85	0

*Totals across may exceed 100% due to respondents' choice of more than one use.
Source: MUIENR, 1992

Size and distribution

From the National Biomass Study (NBS) carried out between 1993 and 1994 using remote sensing and GIS technology, wetlands cover about 30 105 km^2, which is 13 % of the total area of Uganda. The areas under permanent and seasonal wetlands are currently estimated at 7 296 km^2 and 22 809 km^2, respectively (NEMA 1999). At least 69 % of the total area under wetlands comprise of impeded drainage, while swamps and swamp forests constitute, respectively, 30 % and 1 %. Wetlands can be categorised as those, which are associated with lakes (lacustrine) or rivers (riverine). Those associated with lakes include the Kyoga complex, those of lakes George, Edward and Albert, Victoria and Bunyonyi swamp complex and the ones associated with other minor lakes. An example of the riverine swamps is the Kafu system. Further, wetlands can be differentiated based on altitudinal variations as shown in *Figure 5.1*.

Figure 5.1 Characterisation of wetland types at different altitudes



Some wetlands often have distinct trees, shrubs and grasses. Soils that form these types of wetlands are unique and are usually under low oxygen conditions. These soils contain clay and large amounts of plant material. Wetlands are found throughout Uganda, with Soroti District having the largest size while Kampala District has the smallest cover. *Table 5.2* shows the regional distribution of wetlands in Uganda and the proportion by which they have been converted into various uses.

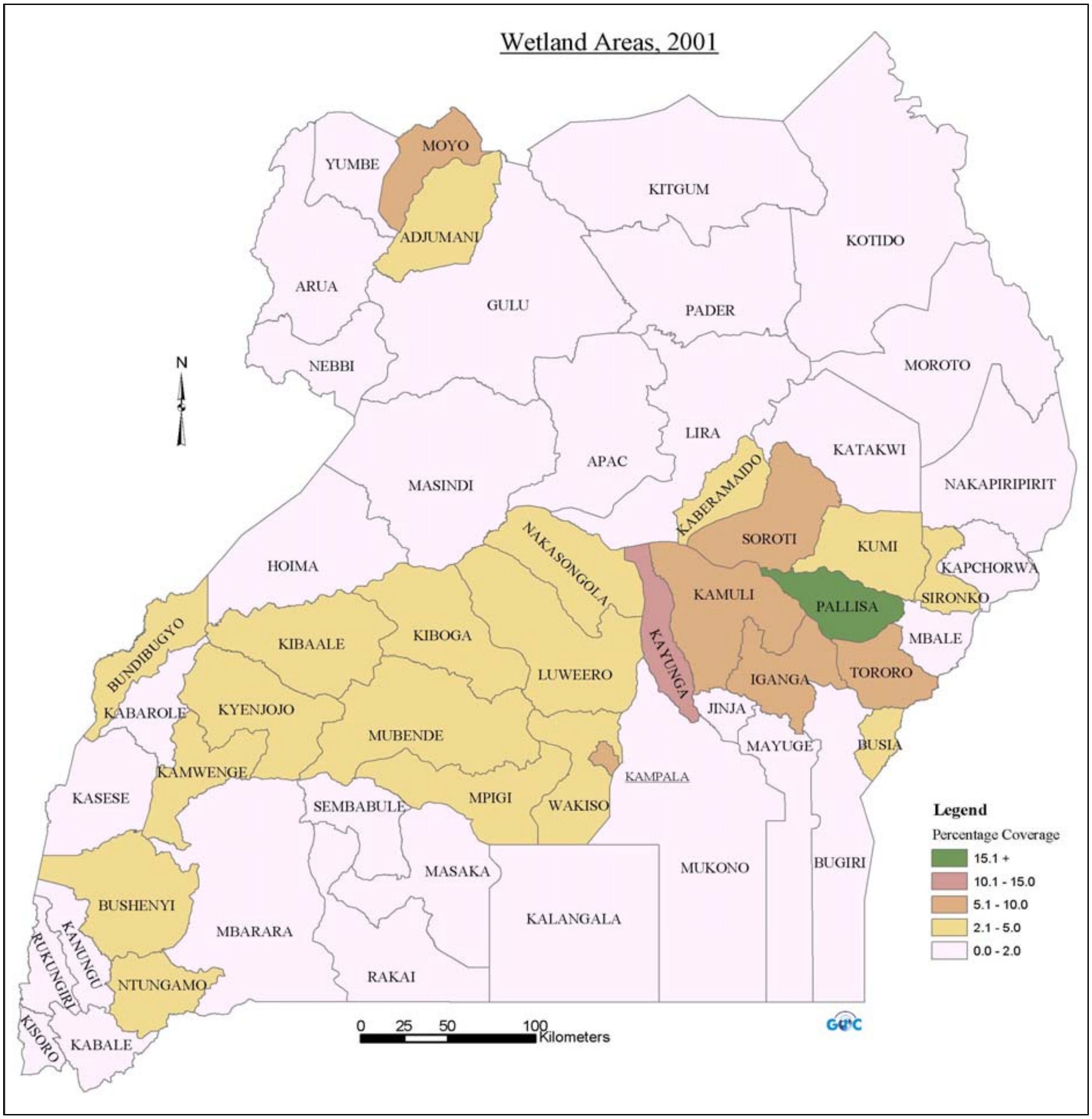
Table 5.2 Regional distribution of area coverage of wetlands in Uganda

	Total area of Region	Present total Region wetland area	Total original wetland area in the Region	Converted as % total original Region wetland	% Region contribution to converted wetland area in Uganda	Wetland as of total Regional area
Central Region	61,354	8,840	9,086	2.7	10.59	14.4
Eastern Region	39,526	8,547	10,299	17.0	73.80	21.6
Northern Region	85,393	7,065	7,237	2.4	7.25	8.3
Western Region	55,282	5,654	5,856	3.4	8.47	10.2

Source: NEMA (2002)

A spatial distribution of wetlands by districts is shown in *Figure 5.2*. It shows Pallisa, Kayunga and Moyo as having the most extensive cover of wetlands.

Figure 5.2 Map of Wetland areas



Source: developed by GIC Ltd with data from different sources including DWD, WID and UBOS

Values and functions of wetlands

Wetlands have many uses that include hunting, fishing, rice growing, brick making, harvesting of raw materials (such as clay and poles) for building houses. Other uses include stabilisation of the hydrological cycle, biological diversity (habitat) and species richness, biomass production (reeds and papyrus) and the trapping of sediments and nutrient (*Box 5.1*). It is difficult to attach monetary figures to these values but attempts have been made to value some of the services they provide. For example, the services that Nakivubo wetland in Kampala provides is estimated at US $ 17 million per year, (Emerton *et al* 1999). As for rural areas, people involved in papyrus harvesting derive about US $ 200 per household per year from wetlands (MWLE 2000).

Box 5.1

Major functions and values of wetlands in Uganda

Goods/products: Water, food, forage and grazing resources, land for farming, wood fuel, building and craft materials, sand, gravel, clay and medicines.
Services/functions: Flood impact reduction, flow regulation and drought alleviation. Ground water recharge, water quality protection, purification of drinking water supply and storage, erosion and sediment control, wastewater treatment, carbon retention, climate modification, wildlife and habitat function, biomass export, recreation, eco-tourism and transport.
Attributes: Biodiversity, genetic resources conservation, landscape aesthetics and cultural heritage

Source: NWP (2000)

As much as wetlands are of great value to the population and the environment and perform several functions, there are other human activities that end up destroying the wetlands. They include the following.

1. Draining wetlands for agricultural purposes. Wetlands especially those with shallow water have been put under intensive cultivation for crops like sugar cane, yams and eucalyptus. In most cases, these wetlands have been poorly managed. Due to the aforementioned activities wetland areas in Iganga and Pallisa have diminished.

2. Excavation for sand mining and extraction of clay for brick making. The pits left behind accumulate water, which remains stagnant. These offer breeding grounds for mosquitoes that spread malaria.

3. Dumping of solid wastes. This is occurring on some isolated wetlands and some of these wetlands could be near large waterbodies. For example, Gaba market garbage site and the dumping site near Luzira Prisons in Kampala City are at the Lake Victoria shoreline.

4. Deforestation of swamp forests for wood and other craft products. This has happened especially in the wetlands of Mukono and Mpigi districts and Sango

Bay in Rakai District. Rattan and Phoenix palm are some of the raw materials harvested for making crafts.

5. Rampant swamp fires. This is a major hazard to the biodiversity of wetlands since some species are intolerant to fire. Swamp fires are common in Mpigi, Lira and Apac districts where they are deliberately started by hunters or done to encourage regeneration of new papyrus. *Box 5.2* shows categories of the values of wetlands, presented in a framework of total economic value (TEV) valuation.

Box 5.2

Categories of values of wetlands resources

Direct values	**Indirect values**	**Option values**	**Non-use values**
Production and Ecosystem functions Premium placed on Consumption and services possible future uses Goods and services	Ecosystem function and services	Premium possible future uses and applications	**In terms of….**
Such as….	**Such as….**	**Such as….**	
Fish	water quality	pharmaceuticals	cultural value
Fuel-wood	water flow	agricultural	aesthetic Value
Building poles	water storage	industrial	heritage value
Sand, gravel, clay	water purification	leisure	bequest value
Thatch	water recharge	water use	existence value
Water	flood control		
Wild foods	storm protection		
Medicines	nutrient retention		
Agriculture/cultivation	micro-climate regulation		
Pasture/grazing	shore stabilization		
Recreation			

Source: MWLE (2000)

Degradation and conversion

Wetlands have long been known to provide a buffering capacity against pollution, flooding and siltation. They are also known to provide seasonal pastures as the water table recedes during the dry season. In addition, they also provide critical ecological services that include offering sanctuary to migratory birds and as breeding grounds for fish. Ugandan wetlands have been exposed to increasing industrial pollution and alien invasive weeds. They are undergoing rapid conversion to other uses while some are being over-harvested. There is excessive sedimentation, dumping of solid wastes and discharge of huge amounts of sewerage. All these lead to loss of biodiversity and the functional integrity of wetlands.

During the 1960s, Government policies encouraged the drainage of wetlands by way of reclaiming them for agriculture and other uses. It is estimated that during that time, a total of 1 620 ha (16.2 km^2) of swamp area was reclaimed through drainage (Kamugisha 1993). The Water Resources Survey of Uganda (1954/1955) concluded that Kigezi had 4 328 ha (43.28 km^2) of peat swampland suitable for reclamation while for the rest of the country, clay swampland constituting 86 000 ha (860 km^2) were available for reclamation (UNEP 1988). In Kabale (part of Kigezi), vast areas of wetlands were leased to dairy farmers who in turn have replaced the natural vegetation with pastures for dairy operations. Also wetlands have for long been associated with diseases like malaria. This could be one of the reasons why they have been degraded. In the 1950s, a campaign against malaria eradication contributed to the draining of many urban swamps, while in the 1970s large-scale drainage of wetlands took place for agricultural and industrial purposes. Looking back at the situation in 1994, which is our baseline, the issue of wetland degradation had not been looked at seriously. The laws on wetland management had not been emphasized and specific departments for wetland management had not been set up. Currently, thirty percent of Kamwenge District wetlands have been encroached on and turned into agricultural fields and farmlands in parts of Kahunge Subcounty, Kicheche, Nyara and other areas in Mayyoro and Nkoma (Kamwenge District Local Government 2004). Wetlands get degraded through a number of ways. These include:

- Pollution. This may originate from agricultural land, urban sewage and industries. For example, when the Kilembe Mines were still in operation in the 1960s and 70s, wastes from the mines were dumped or deposited in heaps on hillsides just near River Nyamwamba. Samples taken from this river still show traces of heavy metals. Contaminated water from the river feeding into Lake George has rendered the surrounding areas of the lake almost devoid of vegetation with few stunted plants growing. Kasese Cobalt Company discharges effluents into R. Rukoki a site where all the water from potential pollution sources along R. Nyamwamba flow into L. George. The constructed wetland put in place by Kasese Cobalt Company is helping to remove pollutants before water is discharged into Lake George. Currently, significant amounts of heavy metals may be entering the aquatic system of Lake George and the extent and distribution of the copper element in the surrounding areas was still unknown (UNEP 1988). This kind of pollution has serious implications on human health and animal population in the area. Elsewhere, there are heavy pollution loads from domestic, industrial and sewerage discharges. A big portion of pollutants enters untreated into Nakivubo channel, which drains into the Nakivubo wetlands before entering Murchison Bay of Lake Victoria.

- Conversion of wetland areas for other uses e.g. agriculture, particularly rice growing, the growing of eucalyptus and for industrial purposes. For example the Gitundwe wetland in Nyundo and Nyakabande sub-counties of Kisoro District (Kisoro District Local Government 2004).

- Human settlements by the building of homes in wetlands. For Example the Batwa and also both the urban rich and poor in Kampala although from different motivations.

- Over harvesting. Wetlands provide a great deal of products both for domestic use and sale. Due to population pressure, the demand for these products is so high resulting in over-harvesting yet the capacity of wetlands to provide them has declined.

Recently, the issue of wetlands drainage has reached critical levels especially in eastern Uganda. A total of 2376.4 km^2 of wetland areas has been reclaimed in Uganda. In eastern Uganda alone so far 20 % of wetlands have been destroyed. Elsewhere in the central region 2.8%, northern 2.4 % and western 3.6 % of wetlands have been destroyed (NEMA 2001). The districts most affected are Jinja, Iganga and Pallisa. Jinja District, for example, has the highest percentage of modified wetlands in Uganda. It has 10 325 ha of wetlands (14 % of the land area of the district) but almost 80 % of this has been modified within just a period of 15 years. This is much higher than that of Kabale with 74% (NEMA 2002). In Kampala District, Nakivubo swamp currently faces severe threats from cultivation, brick making and residential housing and commercial and industrial construction. On the other hand, agricultural encroachment for mainly sugar cane, yams, sweet potatoes and bananas in the Upper Murchison Bay has already claimed more than 60 % of the original wetland area (MNR 1995). Presently, the wetland has been reduced and is estimated at 0.69 km^2.

Ownership of Wetlands

Ownership of and the right to use or have access to wetlands are two distinct issues. Lack of ownership does not mean lack of access or right to harvest wetland resources or use wetlands for approved income generating activities. Nor does ownership mean the 'owner' can do anything that he/she wants with the wetland. Wetlands are not and cannot be owned by any person or individual. No one in Uganda can lay claim to ownership of any wetland or part of a wetland if that claim was made after the coming into force of the Constitution in 1995.

For people whose land already had wetlands before the coming into force of the Constitution they are under a legal obligation to observe the provisions of Section 44 of the Land Act 1998 that stipulates "Utilisation of land according to various statutes; A person who owns or occupies land shall manage and utilise the land in accordance with the Forest Act, the Mining Act, the National Environment Act, the Water Act, and any other law". Wetlands are "held in trust" by the Central Government and local governments for the good of all citizens of Uganda in accordance with the Constitution. Even in '*mailo*' lands the wetland is *not* included in the ownership and remains as land held in trust by the Government for the citizens of Uganda (the 1900 Uganda Agreement). The Constitution has not changed this aspect of ownership.

- Government or local governments cannot lease out or otherwise alienate any specific natural resource; and that includes wetlands (see the Land Act 1998).

- If landowners and others offer to sell or lease wetland to an individual, the individual should be advised that most likely they do not own the wetland. They may own the right to access and use of the wetland but the wetland cannot be sold. A legitimate leaseholder in a wetland can sell the lease rights but the lessee will be bound by the current legislation with respect to what to do with the new land. The lessee should beware that construction on a wetland is not allowed no matter what the lease may say.

- Where a wetland was converted before the coming into force of the 1995 Constitution such conversion shall be subject to an environment assessment in accordance with Section 23 of the National Environment Act. The Environmental assessment is intended to determine the extent of the impact and whether the former wetland can be restored (see the wetland policy).

- Landowners with titled dry land adjacent to the wetland are not correct in thinking that they can extend their boundaries in the wetland and lay claim to it and assume ownership of that area of the wetland. They do not own or have any special rights over that section of the wetland.

- Nor can such land owners lease the wetland over which they incorrectly assume ownership to others. Leasing of the wetlands by someone to anyone is now not permitted and all such leases have no validity in law.

Use and management of wetlands

- Although wetlands cannot be owned by any person, the lack of ownership of an area of the wetland does not mean a person or community cannot use the wetland to obtain goods and services or benefits (Land Act 1998 Section 44).

- People using wetlands in any way are bound by the National Environment Act, the Land Act and the Wetland Resources Regulations to do so in a sustainable manner. Wetland resource users and even those who believe that they legally own a wetland cannot do what they want or please in or with a wetland.

- Sustainable use of wetlands may be permitted under closely defined conditions and restrictions; guidelines are in preparation to assist developers remain within the law.

- Any person intending to develop an area of more than 0.25 hectares (50 x 50 metres) in a wetland is not permitted to do so unless the person has carried out an EIA and this has been approved by NEMA. All developers are advised to consult with NEMA/Wetlands Inspection Division of MWLE, and their Local District Wetland and Environment Officers, before investing time or money in any development to be located in a wetland where the area of development exceeds 0.25 hectares. Any such activity is illegal without an EIA whether or not there is a title to the wetland.

Access to Wetlands

- To protect an interest in using wetland resources the Land Act provides for the formation of communal land (or wetland) associations; these give user rights to the associations including the right to exclude other intending users from access to resources within the Association's registered area of wetland. Before a communal wetland association can be registered, members agree to a management plan for the area (Section 16 and 25 of the Land Act).

- Landowners with land adjacent to wetlands should not deny access by other local residents to the adjacent wetlands when they wish to pursue traditional uses of the wetland such as livestock watering and grazing, fishing, and grass and papyrus harvesting (MWLE 2000).

However, there are Constitutional penalties for those who abuse wetlands. *Table 5.3* clearly indicates the offenses and their corresponding penalties.

Table 5.3 Penalties for wetland abuse

Relevant section of the National Environment Act	Offense relating to:	Fine (Uganda shillings)	Jail sentence
97	Failing to carryout an Environment Impact Assessment.	180,000-18,000,000	Up to 18 months
101	Causing pollution without the necessary permits	180,000-18,000,000	At least 18 months
102	Failing to fulfill restoration orders and easements	120,000-12,000,000	Up to 18 months
103	General penalties	30,000-3,000,000	At 3 months

N.B: The fine or jail or both may be imposed.
Source: National Environment Act Part XIII-offences.

Buffering capacity

The buffering capacity of wetlands refers to the rate and volume of pollutants such as nutrients, feacal coliforms and chemicals that a wetland is able to remove at a time from wastewater or alternatively, the wetlands ability to filter wastewater. It is necessary to investigate the ability of the wetland to buffer in-coming pollutants and to protect the quality of the water flowing out of the wetland.

Inventory and monitoring

The inventory of wetlands started in 1993 and was completed in 2000. The data were analysed and should provide useful information for future updates. Uganda has always had wetlands and the people around these wetlands know them by names. Before the NBS mapped wetlands in 1994, there was no database that one could use to readily determine the status of wetlands in Uganda. The main objective of the study was therefore to survey, describe, quantify and map wetlands in 28 districts. The reports of the study are ready and can be accessed from the Wetlands Inspectorate Division (WID).

The National Environment Management Authority has the overall responsibility for coordinating, monitoring and supervising environmental matters in Uganda. This extends to providing technical support and supervision to kick-start the management of wetlands (NEMA 1999). The NWP has developed guidelines for Compliance Monitoring of Wetlands (MWLE 2000). These guidelines contain laws related to wetlands including regulations, implications and the penalties. Districts remain major targets of these laws. District officials have the mandate to execute the laws and regulations. One of the priorities of the District Wetlands Action Plan (DWAP) is capacity building, which begins with the training of District Environment and Wetland Officers (DEOs) who in turn train the other lower district officials. This training has been completed in most districts in Uganda. The Ministry of Public Service has approved the establishment of the department or directorate of natural resources which includes the office of a District Wetlands Officer. Some districts have already appointed their respective officers; while others are in the process. The District Wetlands Officers are direct employees of the respective local governments; but they relate vertically with WID and NEMA on technical matters.

The government has, in recent years, allocated a sum of US $ 0.45 million to ensure that guidelines for compliance monitoring of wetlands are implemented. The major focus is on sensitisation and awareness creation through training. The WID is responsible for monitoring wetlands by conducting field trips and holding community meetings. The main purpose of field trips and community meetings is to verify the status of wetlands. The information obtained is used as an input in the preparation of DSOERs, among others. Wetland monitoring goes hand in hand with ecological monitoring. During the process of developing a National Ecological Monitoring Programme, WID will determine the overall status and ecological trends of wetlands in Uganda (MWLE 2002). WID maintains a National Wetlands Information System (NWIS).

Sustainable use of wetland products

There is still a mistaken view held by some sections of the community that wetlands are wastelands. However, through an effective means of information dissemination on the benefits and values of wetlands to the environment, this public view is expected to change. One of the top 15 priority areas in President Museveni's manifesto in 2001 was to prioritise the environment in Uganda's political agenda. The PEAP of May 2000 clearly stipulates the role of natural resources of which wetlands are part. The policy states that the aim of natural resources management should not be to stop the use or conversion altogether but rather to bring the *speed*, *location* and *manner* of natural resources conversion under control.

Speed
The process of wetland conversion can be slowed down considerably by improving the use of already converted areas through appropriate planning.

Location

There are some wetlands that are termed '*critical*' wetlands. These are not to converted at all since the services and products they provide to the economy cannot be replaced by any other means. On the other hand, there are wetlands that are *valuable* but less vital. Some form of modification can be allowed on the valuable wetlands. However, there are some wetlands that will have to be *destroyed* to make way for infrastructure and industrial development. Therefore, the way forward is not to resist conversion as such but rather to carefully choose locations where conversion can and cannot take place.

Manner

The manner in which wetlands are converted can be improved to make them more sustainable. For instance, converting a whole wetland into a field of rice has more damage to the buffering and recharging capacities than edge cultivation. The bottom line should be to harvest or use sustainably and to give wetlands time to recover for the future needs. *Box 5.3* highlights some of the major regulations regarding wetlands in Uganda.

Box 5.3

Major wetland management rules according to the National Wetlands Management Policy

- No drainage of wetlands unless more important environmental management requirements supersede.
- Sustainable use to ensure that the benefits of wetlands are maintained for the foreseeable future.
- Environmentally sound management of wetlands to ensure that other aspects of the environment are not adversely affected.
- Equitable distribution of wetlands benefits to all people of Uganda.
- Implementation of EIA procedure on all development activities sited in wetlands. EIA's will be carried out to ensure that wetland development is appropriate, and well planned and managed for long term sustainability.

Source: NWP (2000)

Uganda's response to the issue of wetland degradation

Uganda is one of the countries in Africa that has gone a step ahead as far as wetland management is concerned. The following has been the response to the issue of wetland degradation in Uganda.

- Uganda is a signatory to the Ramsar Convention, which addresses issues of loss and degradation of wetlands. The country became a signatory in 1987. This Convention designates sites of international importance and stipulates wise use of wetlands. The Convention is being made effective to address wetland issues both at national policy level and individual Ramsar sites, for example, Lake George through the National Wetland Policy.

- The government through the WID has gazetted some critical wetlands. These include Nabajuzzi wetlands in Masaka municipality for its water supply functions as well as its important role as habitat to wildlife, in particular, the Sitatunga; and Nakivubo and Kirinya swamps for their effluent water purification roles, etc (NEMA 2002).

- Legislations and policies have been put in place to address issues pertaining to ownership and access to wetlands. For example, the policy seeks to regulate the use of wetlands.

- Wetlands Inspection Division was put in place to carry out the monitoring and assessment of these wetlands in order to know from time to time their current status. The desire is to upgrade WID from a Division to a full Department; or better still to establish an Authority responsible for wetlands management.

- Wetlands Inspection Division also carries out education and awareness programmes through training. This is aimed at making the public aware of the values of these wetlands.

- There has been decentralised wetland management involving local people. Several districts now have District Wetland Officers.

- Uganda hosted COP 9 of the Ramsar Convention in November 2005, the first time a Conference of the Parties of any Convention related to the environment was held in the country.

- A ten-year Wetlands Sector Strategic Plan (WSSP) was put in place in 2001 and runs until the year 2011.

- Within government budgeting system, the implementation of the WSSP is financed from the Poverty Action Fund, thus according it a high priority status.

5.2 Water Resources

A popular slogan by institutions responsible for water delivery in Uganda that says, *"Water is life – Cherish it"*, confirms and reinforces that water is a vital commodity for the well-being of both the human population and the environment. Uganda is among the few fortunate countries with sizeable fresh water resources. Water is a major factor in socio-economic fabric of the Ugandan society and a major determinant of development of the country. The various uses of water and the way it is managed have implications on the state of Uganda's environment. Clean and safe water is particularly inaccessible to the poor, yet it is one of the most crucial natural resources and according to several authors, "*free, safe and clean water is a fundamental right of the people*". Access to clean safe water is covered in Chapter 7.0.

Water supply

As the saying goes, water is life, and in absolute quantities Uganda is relatively well endowed with it. The country's lakes, rivers and underground aquifers are sources of drinking water, fisheries resources, transportation and security. *Table 5.4* shows the major lakes of Uganda. Statistics on selected major rivers in Uganda, including mean discharge rates are presented in *Table 5.5.* While water may have been adequate in most parts of Uganda, the sources now face new pressures mainly due to increased population, industrialisation and to some extent the internationalisation or rationalisation of water politics. Apart from surface water resources, Uganda has sizeable ground water resources.

Table 5.4 Major Lakes of Uganda

Lakes (major)	Total area	Area in m^2	Height above sea level	Depth (m)
Victoria	68457	28655	1134	82
Mobutu Albert	5335	2913	621	51
Edward	2203	645	913	117
Kyoga and Kwania	2047	2047	1033	7
Salisbury (Bisinia)	308	308	1047	-
George	246	246	914	3

Source: NEAP Secretariat (1992)

Table 5.5 Statistics on selected major rivers in Uganda, including mean discharge rates

Name of river	Distance (km)	Mean flow (m^3/sec)	Period of record
Victoria Nile	426	808	1900-1972
Aswa	357	37.5	1949-2968
Dupeth Okok	314		
Pager	232		
Albert Nile	257	900	1905-1977
Mayanja Kato	182		
Katonga	175	0.62	1965-1980
Mpologoma	173	19.50	1949-1979
Kyoga Nile		787	1912-1972
Kagera		185	1958-1968
Semliki		135	1940-1968
Kafu		32.72	1962-1968
Mutuiki		13.60	1958-1968
Ruizi		8.61	1954-1979
Nyamagasani		8.35	1954-1967
Kibale		6.14	1958-1960
Nkusi		5.07	1970-1978
Muzizi		5.02	1956-1980
Mpanga		4.52	1955-1981
Toeli		3.44	1970-1978
Sebwe		2.05	1953-1968
Namalu		0.376	1959-1976

Source: NEAP Secretariat (1992) & UNEP (1988).

Lakes, rivers and shallow basins form the main sources of water for human use in Uganda. Lake Victoria, which is the second largest fresh waterbody in the world and also the source of River Nile, is shared by Uganda, Kenya and Tanzania. Apart from providing water to the population of the three countries, Lake Victoria also supports a livelihood of many people living around it in terms of fish, tourism, recreation and transport. Lakes Albert, Kyoga, George and Edward are other sources of fresh water in Uganda. The rapidly growing population of Uganda places increased demand for fresh water.

The principal water supply problems are drought and floods. Rangelands, popularly known as the "*cattle corridor*" are the drought prone areas. The rangelands have low and erratic precipitation, high temperatures and high rates of evapotranspiration. The rangelands experience severe water shortages during the dry season. Uganda encountered a moderate long drought in the late 1960s and early 1970s. On the other hand, floods wrecked havoc in the early 1960s when several parts of the country were declared disaster areas. While droughts increase scarcity due to insufficient water, floods do so because the abundant water is polluted.

Today, in Uganda, there are three major factors causing increasing water demand: population growth; economic development; and to a lesser extent, the expansion of irrigated agriculture. By 2010, water use is expected to increase by 40%, but 17% more water will still be required for food production to meet the needs of the growing population all over the world (WCWQ, 2000). In economic terms, it is argued that water is a free good but in reality, it is not because once polluted, the costs of its purification are very high.

Water demand

Water is needed in all aspects of life. The overall policy of the government is to manage and develop the water resources of the country in a sustainable manner to ensure that there is adequate quantity and good quality water for both people and all other living creatures. The *Water Act* and the *Water Action Plan* are the cornerstones of sustainable water resources management.

Uganda's population is rapidly growing and the demand for fresh water is increasing. There is need for improved access and planning for further increases in availability of safe water if the people's quality of life has to improve. This subject is further elaborated in section 7.2.2.

Water for livestock constitutes a significant form of water use. It is of particular importance in semi-arid and arid areas where long dry periods are common and often result in scarcity of surface water resources. By 1994, the livestock (i.e., cattle, sheep and goats) population in Uganda was estimated at more than 4.5 million with a corresponding water demand of about 81 million m^3/year. Projections (*Table 5.6*) indicate that water demand will reach 255m m^3/year by the year 2010 (DWD 1995). The problems associated with such an increasing livestock population are over-stocking, depletion of drinking water sources, and massive degradation of vegetation that renders soil bare and exposed to soil erosion by wind and water.

Although the construction of valley dams could ease livestock water problems, these dams have some negative impacts on the environment. Prior to their construction, environmental impact assessments (EIAs) have to be conducted. These are very costly processes for local communities. Secondly, the cost of sustaining the finished dams may prove too high for the very people who are supposed to be beneficiaries. *Box 5.4* gives some likely effects of valley dams in Karamoja and suggests an alternative to the dams basing on costs and maintenance.

Uganda is both an upper and lower riparian state with a dependency of 41% on waters originating from outside its borders. Peaceful co-existence between communities is largely linked to the availability of sufficient water resources, among others. As established by resource-based conflicts studies, such as the ones done by Famine Early Warning Systems Network (FEWSNET) in the Karamoja cluster of Kenya and Uganda, poor pasture conditions and scarcity of water are among the leading causes of tension and conflict between pastoralists in that part of the world.

Box 5.4

Effects of valley dams in Karamoja

Construction of dams encourages settlement around the site. The Kraals (*awi)* are usually sited near to the dam and they stay longer. The over concentration of kraal around the dams causes problems of disease transfer, reduction in available grazing land, destruction of wildlife and overall environmental degradation. However, vegetation within a distance of 0.65 km^2 is completely destroyed due to over concentration of livestock around dams in Karamoja. It is also evident that provision of water to the Karimojong through dam construction is not very sustainable. Apart from environmental degradation, siltation is also a major problem. The siltation rate of new dams in Karamoja is estimated at 30 cm and 5 cm, respectively, of mud level increment per rainy and dry seasons. The average maximum depth of the deepest point of dam is 2 m. This implies that after 6 years, the dam will silt up completely and will no longer hold water.

The average cost of constructing a valley dam is US $ 300,000. Desilting costs up to 30% of the construction cost. Other alternatives to valley dams in Karamoja therefore have to be seriously examined. These include windmills and boreholes. A windmill that can pump up to 20 m^3 of water per day only costs US $ 16,000.

Source: East African Cross-Border Biodiversity Project

Demand of water for irrigation

Previously in Uganda, the few irrigation practices that existed were restricted to state-run schemes. Recently, the inauguration of the *PMA* paved the way for the emergence of small-scale privately owned irrigation schemes. At present, it is estimated that about 207 million cubic metres of water is used annually for irrigation (NEMA 2001). There is great potential for increased agricultural production using irrigation water. Nearly 247 230 ha of farmland, requiring an estimated water volume of 2 472.6 million m^3, could be irrigated per year.

Water balance

One critical issue regarding Uganda's water resources is the water balance i.e. the available water versus water demand. In Africa, 14 countries including Uganda are currently facing water stress and scarcity and by 2025, 11 more countries will be in a similar situation (Seckler *et al* 1998). *Table 5.7* shows the water balance for Uganda modelled for the year 2025. According to Seckler *et al* (1998), Uganda was ranked in "group 2" which means Uganda and the countries in this group must plan and secure more than twice the amount of water they currently use in order to meet reasonable future requirements.

Table 5.6 Past and future livestock water demand by district

District	Livestock equivalent		Water demand (000 m^3/yr)	
	1989 (000)	2010 (000)	1989	2010
Kalangala	5	25	89	464
Kampala	185	781	3,370	14,254
Kiboga	31	50	558	934
Luwero	97	181	1,775	3,309
Masaka	180	493	3,293	8,999
Mpigi	203	590	3,706	10,768
Mubende	106	295	1,962	5386
Mukono	181	458	3,309	8,351
Rakai	79	230	1,442	4195
Bundibugyo	40	68	730	1,241
Bushenyi	257	763	4,692	13,917
Hoima	112	195	1,496	3,564
Kabala	162	392	2,953	7,151
Kabarole	303	934	5,527	17,046
Kasese	126	295	2,308	5,388
Kibale	91	288	1,663	5,250
Kisoro	80	258	1,457	4,708
Masindi	99	231	1,814	4,217
Mbarara	338	943	6,169	17,198
Rukungiri	141	369	2,567	6,738
Apac	97	350	1,767	6,396
Arua	103	299	1,873	5,463
Gulu	68	180	1,245	3,276
Kitgum	70	155	1,278	2,821
Kotido	33	58	600	1,052
Lira	110	325	2,003	5,930
Moroto	34	59	629	1,083
Moyo	36	162	650	2,951
Nebbi	58	178	1,060	3,248
Iganga	236	756	4,299	13,789
Jinja	77	183	3,408	3,337
Kamuli	122	348	2,228	6,359
Kapchorwa	29	107	5,521	1,945
Kumi	57	87	1037	1,591
Mbale	196	484	3,574	8,838
Palisa	82	233	1,488	4,258
Soroti	132	147	2,045	2,582
Tororo	344	427	2,628	7,785
Total	**4,450**	**12,376**	**81,217**	**225,862**

N.B: At the time of the report there were 39 districts. By December 2005, the number of districts has increased to 69. However, the increase is due to administrative adjustments and should not influence accuracy of the projections.

Source: DWD (1995)

Table 5.7 Modeled water balance for Uganda for 2025

Baseline data 1990	
1990 population	18 million
Population growth from 1990 to 2025	267%
Annual water resources	66km^3
Total withdrawal in 1990	0.4km^3
Per capita domestic withdrawals 1990	6m^3
Per capita industrial withdrawals 1990	2m^3
Per capita irrigation withdrawals 1990	12m^3
Net irrigation area in 1990	900ha
Total irrigation withdrawal in 1990	0.2km3
Annual irrigation intensity	200%
Irrigation withdrawal as a depth of gross irrigated area	1.18m
Net evapotranspiration as a depth of gross irrigated area	0.13m
Estimated irrigation effectiveness 1990	11%
Assumed irrigation effectiveness	22%

Source: Seckler *et al* (1998)

Projected data 2025	
Total irrigation withdrawal in 2025 under scenario 1 (S1)	0.6km
Total irrigation withdrawal in 2025 under scenario 2 (S2)	0.3
S2; % change from 1990 irrigation withdrawal	34%
S2 as a % of S1	50%
Total savings from S@	0.3km^3
Per capita domestic withdrawal in 2025	13m^3
Per capita industrial withdrawal in 2025	3m^3
Total domestic and industrial withdrawal in 2025	0.8km^3
% Change from 1990 D and I withdrawal	435%
Total withdrawal in 2025	1.1km^3
Total additional withdrawal in 2025	0.7km^3
Per capita internal renewable water supply in 2025	1,373m^3
SI: % change from 1990 total withdrawal	274%
S2: % change from 1990 total withdrawal	194%
2025 total withdrawal as % of IRWR	2%

Water quality

The quality of any waterbody is influenced by both natural and man-made factors. Over the last two decades, the quality of Uganda's surface water has been steadily deteriorating. Although water quality problems can often be as severe as those of water availability, these problems have so far drawn less attention in Uganda. According to the 1999 World Commission report on Water Quality (WCWQ), more than half of the world's major rivers and lakes are *"seriously depleted and polluted; degrading and poisoning the surrounding ecosystems and threatening the health and livelihoods of the people who depend on them"* (WCWQ 1999). Meybeck, Chapman & Helmer (1990), revealed that new efforts, as early as the 1990s, were being advanced towards the monitoring of water quality; and as well, better policies and programmes had been instituted to accomplish water quality maintenance and management. For example, water quality monitoring programmes have been established for many international rivers including the Nile whose source is Lake Victoria in Uganda. However, domestic wastes, industrial discharges as well as agricultural runoff from upstream riparian countries remain major sources of pollutants that enter Lake Victoria.

Water pollution is the physical, biological or chemical changes in the water quality that adversely affect living organisms or make water less suitable for the desired use. Since some lakes and rivers are shared among nations, management becomes the main issue and at times proves problematic. For instance, Lake Victoria is shared among Kenya, Uganda and Tanzania and thus, there is need for cooperation in its management. Lake

Victoria also receives water from Rwanda and Burundi and pollution from these upstream riparian states has to be monitored and managed too.

Like many developing countries, Uganda is currently pursuing a policy of rapid industrialisation. The industries that have come up have been found to be major sources of water pollution. Leading polluting industries include, among others, the breweries, sugar factories and soft drink industries. All these industries are located along the shores of Lake Victoria and the River Nile.

A large portion of the rural population depends entirely on ground water. So far ground water use has received less attention yet over-drawing and its contamination could be of serious problem in the near future. For example, groundwater easily gets polluted through on-site siltation; improper waste disposal and seepage of mineral or chemical wastes deep into the ground. Areas that are likely to have this kind of pollution are Kampala, Iganga and Kasese. However, there are efforts by the Ugandan Government to reform its water sector and introduce an enabling legislative framework to better meet the emerging challenges.

A study carried out by NEMA in 1996 on River Musambya, revealed that the river was heavily polluted with hydrogen sulphide (H_2S) discharged from the nearby sugar factory. The river was described as “dead” since it had no evidence of any animal or plant life (NEMA 1998). Similar studies on water samples from River Nyamwamba found unusually high metal concentrations.

Water scarcity

According to Ohlsson & Applegren (1998), water scarcity is increasingly being perceived as the limiting factor for both agriculture and industry in many developing countries; as the most probable source of conflict between countries over a renewable natural resource; and as a source of increasing competition between rural agricultural areas and the urban industrial sector. It is conventionally perceived as a natural resource scarcity, often as an absolute shortage, and thus also as an absolute limit for development. Managing water scarcity by definition entails dealing with scarcity with the intention of overcoming it, either by supply-side increases or demand-side regulation. Often regarded as the solution to potential conflicts over the natural resource, such regulation in fact contains the seeds of a new kind of conflicts, best described as second-order conflicts, incurred by the very attempt to overcome the source of the potential first-order conflict, water scarcity. Water scarcity, when dealt with by societies and states, thus very quickly surfaces as a scarcity of social adaptive capacity, which is what merits an attempt to delineate and delimit a concept of social resource scarcity. The heuristic value of such a concept would be to indicate where the need for institutional capacity building is greatest in order to pre-empt outbreaks of internal conflicts, and consequently the need for a shift in development partners' attention to these sectors.

Uganda is one of the countries that belongs to the Nile Basin and below is its comparison to other countries. Given a perception that focuses on the risk for internal tensions due to difficulties to adapt to water scarcity, a vital task is to get a handle on the order of magnitude of this risk as compared to the risk for tension between countries over access to the resource *per se*.

Such an index would have to be based on the adaptive capacity of a society. Adaptive capacity is a most general and multi-facetted concept, however, intuitively comprising general socioeconomic development, education, human rights (including and stressing women's rights), and general institutional capacity, among others. For water issues, it certainly ought to include some measure of water legislation, and water resources management capabilities (Ohlsson & Applegren 1998).

In the absence of a general and well worked-out consensus on how such an index should be constructed, it is suggested that the UNDP Human Development Index (HDI) could be used as a proxy, since it is generally accepted and at least contains the three important factors of life expectancy (as a proxy for general level of development), educational attainment (as a proxy for institutional capacity) and real GDP per capita. Combined with standard indicators for water scarcity, a social water stress index was constructed for the Nile Basin (Ohlsson & Applegren 1998) and presented in *Table 5.8*.

It is worth noting how the application of a social water stress index changes the picture dramatically compared to conventional measurements of water stress. As it is seen from the column "WSI Water Stress Index", Burundi and Egypt are the two most water-stressed countries in the Nile Basin according to standard hydrological indicators (number of persons per flow unit); with Burundi roughly 50 percent more water-stressed. However, according to the social water stress index (SWSI) suggested here, Burundi is fully four times more socially water-stressed (Ohlsson & Applegren 1998). This is due to its low social adaptive capacity, as measured by the HDI (Human Development Index). Burundi thus ranks as the most socially water stressed country in the Nile Basin, with Egypt taking merely the fifth place, after Kenya, Rwanda and Ethiopia, although Egypt is more water-stressed than these countries according to standard hydrological indicators (WSI). Egypt's low rank on the list of socially water-stressed countries is due to its comparatively higher social adaptive capacity, measured by the HDI (Ohlsson & Applegren 1998).

Table 5.8 Comparing Water Stress Index (SWI) and Social Water Stress Index (SWSI) for the Nile Basin states

Country:	Available renewable water	Available water per capita	WSI Water Stress Index	HDI Human Development Index	Social resource scarcity (rank)	SWSI Social Water Stress Index	WSI (rank)	SWSI (rank)	SWSI rank minus WSI rank
Egypt	58.10	936	11	0.614	65	17	17	20	3
Sudan	154.00	5,766	2	0.333	19	5	82	57	-25
Ethiopia	110.00	1,950	5	0.244	7	21	34	16	-18
Kenya	30.20	1,112	9	0.463	43	19	18	18	0
Uganda	66.00	3,352	3	0.328	18	9	58	36	-22
Tanzania	89.00	2,964	3	0.357	28	9	50	33	-17
Rwanda	6.30	1,215	8	0.187	2	44	22	10	-12
Burundi	3.60	594	17	0.247	8	68	13	6	-7
	Standard hydrological indicators			HDI taken to indicate social adaptive capacity			Comparison between water stress and social water stress		

Source: *Ohlsson and Applegren (1998)*

Taking two countries, Kenya and Rwanda, which appear to be on the same level of water stress according to standard hydrological indicators, Rwanda in fact appears more than twice as socially water-stressed as Kenya, due to its lower social adaptive capacity. Uganda, Tanzania and Sudan compared to the other Nile basin countries are not water stressed.

The difference between the two ways of looking at water stress/scarcity may be clearer by listing in which category the Basin states belong, according to hydrological indicators, as compared to the social water stress/scarcity categories suggested in *Table 5.9*.

Table 5.9 Comparing categorisations; Nile Basin states

Country	Hydrological water stress/scarcity category	Social water stress/scarcity category
Burundi	Water-scarce	Water-scarce "beyond the barrier"
Rwanda	Water-stressed	Water-scarce "beyond the barrier"
Ethiopia	Relative sufficiency	Water-scarce
Kenya	Water-stressed	Water-stressed
Egypt	Water-scarce	Water-stressed
Uganda	Relative sufficiency	Relative sufficiency
Tanzania	Relative sufficiency	Relative sufficiency
Sudan	Relative sufficiency	Relative sufficiency

Source: Ohlsson & Applegren (1998)

Applying the Social Water Stress/Scarcity Index thus moves Burundi and Rwanda towards one category of more serious social water stress, as compared to hydrological indicators (Ethiopia is even moved two categories!), while Egypt is moved to one category of less serious social water stress. Other countries retain their hydrological categories (Ohlsson & Applegren 1998).

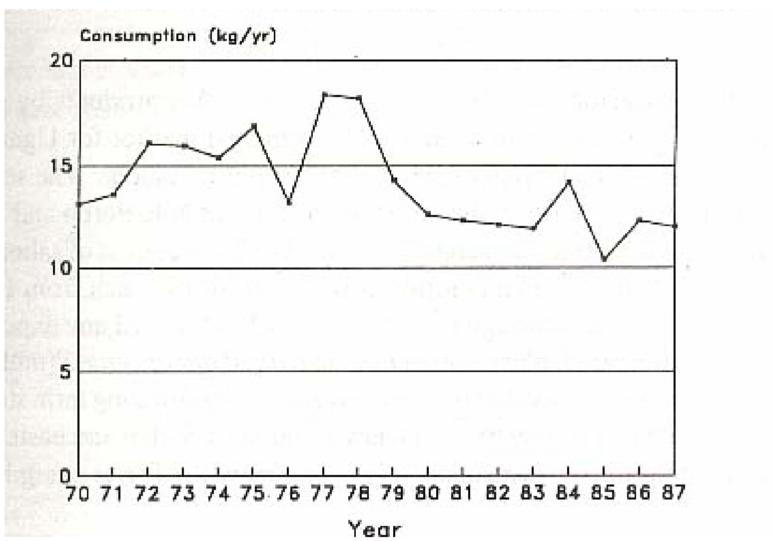
The result seems to be consistent with qualitative judgments made by water resources management experts. The water scarcity of Egypt is compensated for by their relatively higher social adaptive capacity, while the lower social adaptive capacity of Ethiopia, Burundi and Rwanda certainly merits that their water stress is categorised more seriously than captured by merely hydrological indices. The lesson for Uganda in all this is to enhance its social adaptive capacity so as to ensure that it is not socially water stressed over the medium term at least, and perhaps beyond.

5.3 Fisheries Resources

Uganda's extensive open waterbodies contain significant fisheries resources that have been an important source of high quality solid animal protein, rural livelihoods and other economic benefits.

The baseline situation of fisheries of Uganda in 1994, consisted almost entirely of capture fisheries, which constituted an important economic resource hence did contribute to the nutritional welfare of the people. Fish contributed more than 50 percent of the total solid animal protein consumed by Ugandans (NEIC 1994). On average, Ugandans consumed 13 kg / year of fish per person (*Figure 5.3*). However, two things should be kept in mind. First, the data indicate a declining trend in national *per capita* fish consumption. Second, annual *per capita* fish consumption of people living in Kampala and fisherfolk communities around the lakes and main rivers was found to be of the order of 50-60 kg / year, almost four to five times the national average (MPED 1990).

Figure 5.3 Per capita fish consumption in Uganda, 1970-87.

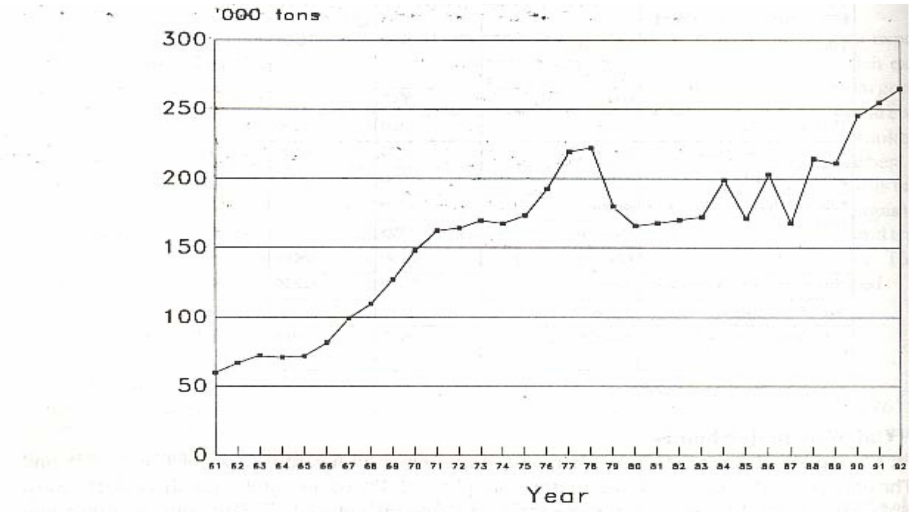


Source: NEIC (1994)

5.3.1 Capture Fisheries

Figure 5.4 shows the annual quantity of fish caught in Ugandan waters for the period 1961 to 1992. The general trend is that of an increase over the period.

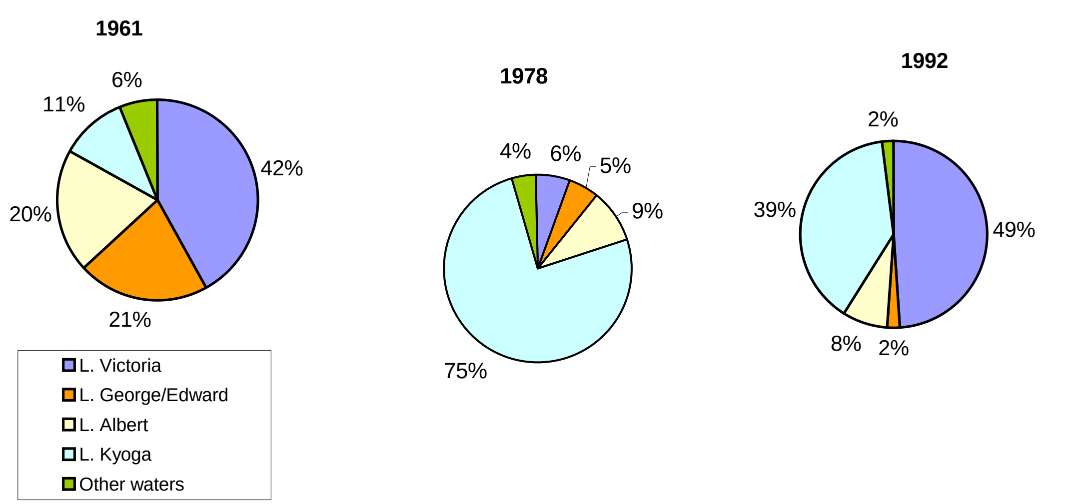
Figure 5.4 Annual trends in quantities of fish caught in Uganda's waters, 1961-92



Source: NEIC (1994)

Figure 5.5 compares the annual catch for selected years 1961, 1978 and 1992 from the different waterbodies. The data showed that while in 1961 Lake Victoria accounted for 42.1% of the catch, this share increased to almost half of the annual catch in 1992. On the other hand, the share of the catch accounted for by Lakes Edward and George declined.

Figure 5.5 Composition of annual catches by major water bodies of Uganda, selected years



Source: NEIC (1994)

As shown in *Table 5.10*, in 1988, two species, namely the Nile Perch (*Lates niloticus*) and Tilapia (*Oreochromis spp*) jointly accounted for about 90% and 88% of the quantities and values of the annual national catch, respectively.

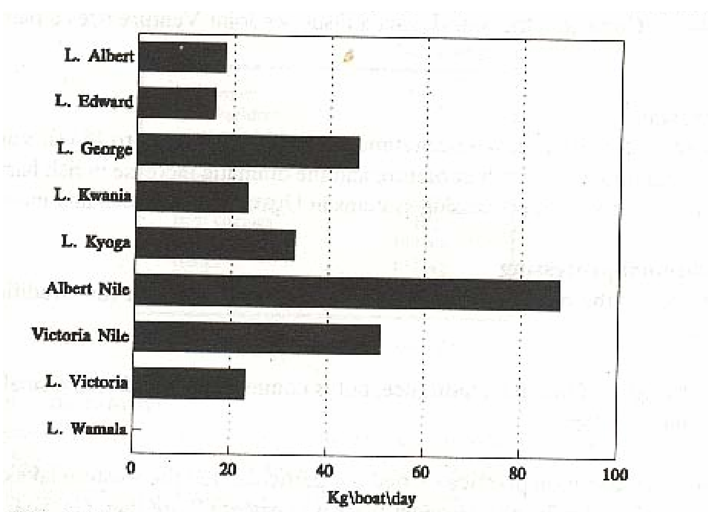
Table 5.10 Estimated percent share of the quantity and value of fish harvested in Uganda by species, 1988.

Species	Percent Shares	
	Quantity	Value
Lates sp	51.05	49.43
Oreochromis spp	39.02	38.87
Hydrocynus	1.90	1.90
Alestes	0.31	0.45
Bogrus	1.26	1.45
Barbus	0.31	0.13
Clarias	1.61	2.86
Protopterus	3.00	3.46
Others	1.71	1.46
TOTAL	100.00	100.00

Source: NEIC (1994).

The greater demand for fish in turn led to increasing fishing intensity. *Figure 5.6* shows fishing efforts by major waterbodies in 1988. The data indicate low catches for lakes George, Edward and Albert at 16-18kg per boat per day compared to Albert Nile at 88kg/day thus indicating declining stocks in the three lakes.

Figure 5.6 Fish catch efforts (kg/boat/day) by major water bodies



Source: NEIC (1994)

While there is some anecdotal evidence and to some extent supported by fish-catch-effort data, in reality there is no comprehensive empirical data on the sustainability of catch levels in the waters of Uganda. More detailed stock assessments are needed together with a more accurate recording of fish harvesting results. The issue is further complicated by the fact that even if the required data are obtained for all Ugandan waters, changes in the ecology of a waterbody can profoundly affect the level of sustainable supply of fish over a relatively short period of time.

To further illustrate the point, in 1983, the sustainable annual supply from the Ugandan portion of Lake Victoria was estimated at 45 000 tonnes (FAO 1990). However, in 1992 the contribution from the lake was 129 700 tonnes (NEIC 1994). When the catch from other waterbodies were factored in, by 1983 fish catch represented 53% of the potential yield.

The current status of the fisheries resources

Fisheries resources contribute about 2.2% of Uganda's *GDP*. Ugandans are estimated to harvest about 320 000 tonnes of fish each year. This is close to the estimated maximum sustainable yield. The biggest catch of *Nile perch* and *Tilapia* comes from Lakes Victoria and Kyoga. Lake Victoria alone used to have about 350 fish species. A big percentage (80 %) of the fish is sold fresh, while 40% is sold processed. There are traditional methods of processing fish like sun drying, smoking, salting and frying. However, some of the methods, for example smoking, promote deforestation. Above all, the hygiene at these processing plants is usually very poor posing significant health problems. These traditional processing methods, to some extent, contribute to post-harvest losses amounting to 20 to 30%. Otherwise, an increasing quantity of Uganda's fish harvest is processed in modern plants.

Fisheries resources have been affected by pollution from a number of sources such as the water hyacinth and eutrophication of waterbodies by nutrients due to agricultural, industrial as well as domestic effluent discharges. Other issues of concern under the fisheries resources include:

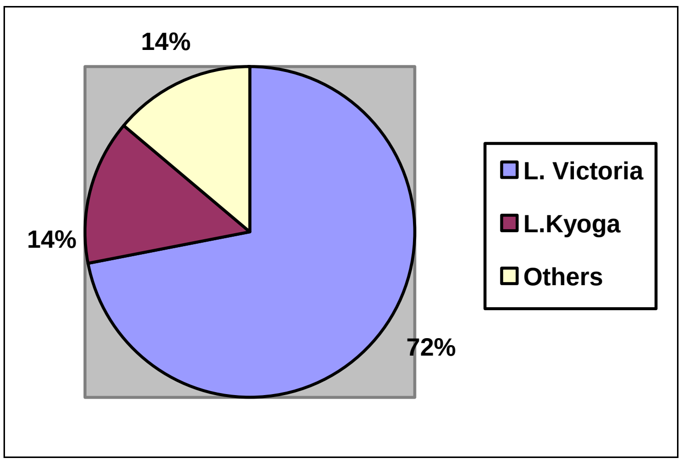
- the introduction of alien species like the *Nile perch,* into lakes Kyoga, Victoria and Nabugabo which has led to the decline of some of the indigenous species due to predation. However, the National Environment Act has now mandated NEMA to regulate the introduction of these alien species;
- the under-utilisation of some fish species;
- over-fishing and indiscriminate harvesting. Both activities have led to a sharp reduction in overall fish population; and
- poor conditions e.g. poor sanitation of the fish landing sites resulting in the prevalence of diseases such as malaria and other waterborne diseases.

However, as a management response, fisheries management has been decentralised a positive step. However, local governments still lack the required management capacity. Also fish farming has been introduced in the country, but it is still in its infancy.

Harvesting and harvesting methods

The amount of fish that can be sustainably harvested annually from the waterbodies of Uganda may be referred to as exploitable stock. Changes in the ecology of the waterbody can greatly affect the level of sustainable harvesting. Over 80% of the fish catch is from L. Victoria and L. Kyoga. By far, the most important water body in the country is Lake Victoria whose share of total catch was 61.3% in 2002 and 72.4% in 2003 compared to 42% in 1961 and 49% in 1992. Lake Kyoga followed with a share of 25% and 13.6% in 2002 and 2003, respectively. Fish harvests from the other lakes and the River Nile (at 14%) indicated in are also *Figure 5.7* and *Table 5.11*. Comparing it to 1961 when Lake Victoria and L. Kyoga contributed about 53%, this contribution now is over 87% of the national catch, presumably due to increased availability of Nile Perch.

Figure 5.7 Proportion of fish catch by waterbody, 2003



Source: UBOS, 2004

Table 5.11 Fish catch by water body (thousand tonnes), 1999-2003

	1999	2000	2001	2002	2003
Lake Victoria	104.2	133.4	131.8	136.1	175.3
Lake Albert	29.1	19.4	19.6	19.4	19.5
Albert Nile	3.7	n.a	n.a	n.a	n.a
Lake Kyoga	81.1	55.9	58.4	55.6	32.9
Lake Edward	7.4	5.2	6.4	5.2	5.9
Lakes Edward, Kyoga and Kazinga Channel	4.3	5.6	4.5	5.6	8.3
Total	**230**	**220**	**221**	**222**	**242**

Source: MAAIF (2003)

In Uganda, there are several harvesting methods. Some methods are recommended while others are illegal. Gill-nets and boat seines, which are the common fishing gears used on the lakes, are improperly used. Gill-nets are operated actively by casting several of them into the water and the fishermen then pound the water using a club locally called "tycoon" to drive the fish into these nets. This kind of method is not only non-selective but also disturbs fish breeding and resting areas. Some species like the tilapia that tend to keep their young ones in the mouth to protect them from predators are forced to spit them out thereby exposing them to danger.

Boat seining that is operated in the open water of the lakes also involves the use of a "tycoon" to drive the fish into the nets. This is a very dangerous method especially in shallow lakes such as Lake Kyoga because when the net is spread into the water, it covers all the way from top to bottom of the lake thus sweeping every creature in the entire water column. Many gill-nets and boat seines used by these fishermen are of illegal size. Fishermen tend to use smaller mesh nets than those legally allowed. Smaller mesh nets give them bigger catch irrespective of the fish sizes. For example, instead of the 5-inch gill net that is recommended to catch *Nile perch* in Lake Victoria, the fishermen use 3.5-inch or 2.5-inch mesh nets. Both methods were widely used on Lakes Victoria and Kyoga. However increased enforcement, facilitated in part by the creation of the Beach Management Units, is addressing this problem.

Another dangerous method, beach seining has been banned in Uganda because it had already contributed to the decline of mainly *Tilapia* and *Nile perch* populations. The method destroys the breeding nests of both species. Interestingly, in some districts of Uganda, illegal seining still goes on. The ban was introduced because the method does not protect the young and immature fish from being caught.

Other traditional methods that include basket harvesting are still in use especially on lakes Kyoga and Edward. The method is illegal and not allowed by law. Basket fishing involves the use of larger wicker baskets, which are placed in suitable locations especially along rivers. This method is harmful because it targets the fish moving upstream to breed. On the other hand, isolated cases of the use of poisons in fishing had been reported in the districts of Jinja, Mukono and Nakasongola. Poisons are illegal and their use is not only detrimental to fish but to humans as well as other marine creatures. The European Union at one time placed a ban on imports of Ugandan fish on the grounds that poison had been used in harvesting.

It is good to note that most fishermen today are aware of the dangers of using destructive fishing gears and methods. Many, currently, are making good use of the recommended methods. However, there are some fishermen who are still stuck to the use of the aforementioned illegal methods. The bottom line is that there should be a lakewide approach involving all districts around the lakes to ensure that the recommended gears are adopted countrywide. More institutions such as the Lake George Management Organisation and Lake Kyoga Management Organisation need to be established to cover other lakes and other waterbodies so that much of the responsibilies for monitoring are placed in the hands of fisherfolk communities and local government.

Fish productivity

Over-fishing on most lakes of Uganda reduces fish species composition. For instance, the total fishery yield increased from 11 000 tonnes in 1977 to 120 000 tonnes in the early 1990s. This was largely due to the increased catch of the *Nile perch*. Although the 1990s data are considered unreliable without any discernible trends, landings in 2000, when catch data were collected were of the order of 175 000 tonnes and close to 200 000 tonnes in 2001 (Muhoozi 2003). This is a clear reflection of over-fishing situation. Another example is from Masaka District where in the year 2000, the total fish catch from lake fisheries was estimated at 9 063 tonnes. That of 2003 was estimated at 4 899 tonnes (Masaka District Local Government 2004). The *Table 5.12* shows fish catches for Lake Mulehe in Kisoro District. Generally, there is over-fishing in almost all the lakes in Uganda.

Table 5.12 Fish catches for the period 2003-2004 for lake Mulehe in Kisoro district

Month	**Catches / year (kgs)**	
	2003	**2004**
JAN	-	688
FEB	-	688
MAR	-	287
APR	-	-
MAY	548	-
JUN	643	-
JUL	633	-
AUG	1664	-
SEPT	3030	-
OCT	2256	-
NOV	1319	-
DEC	987	-
Total	**13,588 Kg (13.6 tons)**	**-**

Source: Kisoro District Local Government (2004)

The increase in fishing, particularly that of the *Nile perch,* has attracted at least in part a very large number of fishermen. According to Balirwa *et al* (2003), the steady growth in the number of boats on the lakes from around 12 000 in 1983 to 22 700 in 1990 and over 52 000 in 2002 is indicative of heavy fishing. Consequently, by the mid 1990's, *Nile perch* population had shown signs of decline.

Although changes towards efficient fishing methods have lately been observed in order to boost and maintain fish production, decreasing catch per unit effort and mean size per fish caught is reported to be continuing to prevail.

Under utilisation of some fish species

In most waterbodies, there is under-utilisation of some fish species. Although each fish species has a specific mesh net or fishing gear to be used, most fishermen tend to use nets that are not recommended. For example, the current mesh nets fishermen use to catch the *Nile perch* in Lake Victoria is 3.5 inch, which is smaller than the recommended 5-inch mesh. Consequently, some fish species are caught more often than the others leading to a sharp decline in their populations (NEMA 2000). Other fish species, however, are not harvested due to lack of markets for them.

State of landing sites

The surrounding conditions of almost all fishing communities in Uganda are extremely very poor. In 1994, 65% of all the landing sites reported poor conditions. Due to poor sanitation, there is high likelihood of prevalence of a number of diseases such as malaria and other waterborne diseases e.g., dysentery, bilharzia, diarrhoea and some times cholera and typhoid. Just like their counterparts in the rest of the world, the fishermen in Uganda are, generally, very poor people. Although the fishermen are assured of a daily income, they still remain below the poverty line. One of the methods such as smoking that they use to preserve the fish not only poses a health hazard but also, to some extent, is the major cause of localised deforestation in these areas since fuelwood constitutes the principal source of energy. An additional feature that characterises the fishing communities is the practice of subsistence farming for domestic food requirements. Women and children are the ones predominantly engaged in the farming activities.

However, government in a participatory manner with the private sector aims to improve the infrastructure at fish landing sites and within the communities in terms of access roads and communication facilities (MAAIF 2000). A number of projects aimed at improving the water and sanitation situations within these communities have been identified and some already implemented. For example, ECO-SCAN toilets have been constructed in places like Butiaba on the shores of Lake Albert (Moyini *et. al* 2002). Similar projects have also been geared towards the drilling of boreholes in order to provide safe water for the communities.

To improve, the management of lake fisheries further, some districts have finalised the formation of Beach Management Units (BMUs) at various landing sites. These BMUs are made up of members from the community sharing responsibilities with government fisheries institutions to improve their landing sites. This kind of management is generally improving health conditions at landing sites. *Box 5.5* shows the management of the lake fisheries in Mpigi.

Box 5.5

Management of the lake fisheries in Mpigi.

The district fisheries sub sector is finalising plans for the formation of Beach Management Units (BMUs) at various landing sites. A BMU has been completed for Ggolo landing site in Nkozi Sub-county, the busiest landing site in the District, and this BMU has 295 members. All indicators of progress at the landing site show an improvement of the site following the above management arrangement.

Source: Mpigi District Local Government (2004)

Pollution

Although the water hyacinth is on the decline in the Ugandan waters, particularly Lake Victoria, it still remains a major pollutant. Suspended decaying matter from the weed as well as changes in water colour and the unpleasant odour that remain eminent are not suitable for many fish species (NEMA 1997). Water hyacinth affects fisheries resources in the following ways:

- it causes a reduction in production;
- reduces the number of species caught;
- nurtures poor quality fish; and
- raises the costs of operations, which leads to lower incomes for the fishermen and/or higher prices for fish and their products.

The government's response as far as the water hyacinth is concerned was very effective. A combination of manual, mechanical and biological methods saw the weed threat averted with minimum environmental impacts. Two weevil species from Benin, *Neochetina eichiniae* and *Neochetina bruchi* were used for the biological control option. Consequently, 80% reduction of water hyacinth from Lake Victoria has been achieved. However, establishments of these weevils in riverine environments have been poor. As a result, the spread of the weed from River Kagera, especially during the rainy season, continues to be signficant. The Lake Victoria Environmental Management Programme (LVEMP) is considering introducing pathogens and mites in the riverine systems.

Other major sources of pollution of the waterbodies are from rural and urban discharges, agricultural and industrial activities and acid rain. These mainly are responsible for eutrophication due to increased nutrient loads into the waterbodies. Examples are given in *Tables 5.13* and *5.14.*

Table 5.13 Nutrient input in Lake Victoria at Murchison Bay 2001

Source	Biological Oxygen Demand (BOD) tons/year	Total Nitrogen tons/year	Total phosphorous tons/year
Industrial	781	53	45
Municipal	1,512	389	267
Total load	2,293	442	312
Nutritional load industries	860	57	46

Source: COWI (2002)

Table 5.14 Total pollutant load into Lake Victoria, 2003

Source	BOD tons/year	Total nitrogen tons / year	Total phosphorous tons/year
Catchments	-	49,510	5,690
Atmosphere	-	102,150	24,460
Industries	15, 610	410	340
Municipal	17,940	3,510	1,620
Total	23,550	155,500	32,060

Source: COWI (2002) & Kampala District Local Government (2004)

From the above tables, it can be noted that agricultural activities are the main sources of nitrogen and phosphorous entering into Lake Victoria.

Introduction of alien/exotic species

The commercial catch in the 1950s comprised mainly of what were then highly desirable food fishes such as tilapines commonly known as the *ngege (Oreochromis esculentus* and *O. variabilis) and Labeo victorianus (ningu),* all endemic to Lake Victoria, Kyoga and satellite lakes that contribute to commercial catches (NEMA 1996).

Due to over-fishing however, the stock of the native tilapines and other larger species had reduced. At the same time, Nile perch was introduced from L. Albert and the Albert Nile into Lake Kyoga, as an experiment, from where it was introduced into Lake Victoria. At the moment, Lake Victoria accounts for over 40% of the fish catch in Uganda and out of this, Nile perch catch constitutes over 80%. However, the introduction of the Nile perch has altered the ecology of Lake Victoria. According to LVEMP (2004), the haplochromine population has dropped from about 80% of fish biomass in the lake in the 1970s to less than 1% in the 1980s. The National Environment Act, Section 43 (1) provides that NEMA, in consultation with lead agencies, controls the introduction of alien species as a means of ensuring the conservation of biodiversity *in situ.* The National Fisheries Policy 2004 also took note of the declining biodiversity in Uganda's waterbodies.

5.3.2 Aquaculture

Up to the present, Uganda fisheries is dominated by capture fisheries, and very little of aquaculture. There are a number of reasons that suggest that the country must invest in aquaculture if the fisheries resources are to be sustained. For one, domestic consumption is on the rise propelled by increasing population. Second, the international demand for Ugandan fish (especially tilapia and Nile perch) and fish products is also on the increase. Balanced against the increases, the long-run sustainable yield (LRSY) from capture fisheries is estimated at about 330 000 metric tonnes per year. Aquaculture would, therefore, ease the pressure on the natural fisheries stock. To illustrate, it is worth looking at the following baseline scenario:

- *per capita* domestic fish consumption (DC) was 13 kg/person/year in 1991 but the trend saw a decline. Let's assume consumption has stabilised at 10 kg/person per year up to 2030; and
- Uganda's population in 1991 was reported at 16.9 million people, and 24.7 million in 2002, growing at an average rate of 3.4% per annum up to 2030 at least.

Based on the foregoing assumptions, in the absence of any significant investment in aquaculture, the LRSY of fish from capture fisheries would be exceeded by the year 2011 simply to satisfy domestic consumption (*Table 5.15*) excluding exports. In pure economic terms, without any interventions on the supply side, the price of fish will rise dramatically from 2010 onwards reflecting increasing scarcity. By the year 2015, there would be a shortfall of 52 000 metric tonnes (mt).

Table 5.15 Long-run sustainable yield, domestic consumption and Potentially exportable surplus projections for capture fisheries only 1991-2030.

YEAR	Long-run sustainable yield – Capture fisheries (mt)	Domestic consumption (mt)	Potentially exportable surplus (mt)
1991	330 000	219 700	+110 300
2002	330 000	247 000	+83 000
2005	330 000	273 000	+57 000
2010	330 000	323 000	+7 000
2015	330 000	382 000	-52 000
2020	330 000	452 000	-122 000
2025	330 000	534 000	-204 000
2030	330 000	631 000	-301 000

Source: Consultants' Estimates

Domestic consumptions is only one of the factors influencing demand sustainability. Uganda's fish is well received in European and other export markets. Policy Statement No. 22 of the National Fisheries Policy 2004 is committed to fish marketing and trade. The statement calls for measures to be taken to achieve sustainable increases in the value and volume of fish marketed for national consumption and export (MAAIF 2004).

It is partly for the above reason that Policy Statement No. 9 of the National Fisheries Policy 2004 is dedicated to aquaculture. The statement calls for increasing aquaculture fish production so as to reduce the gap between fish supply and the increasing demand for food fish. It is expected that the aquaculture industry will grow from an estimated 2 000 mt annual production currently to an estimate of 100 000 mt in the next ten years (MAAIF 2004). *Table 5.16* shows that by 2010 aquaculture is expected to increase the LRSY to 430 000 mt/year from 2010 onwards, thus pushing the time domestic consumption exceeds it to 2020 instead of 2011 without aquaculture.

Table 5.16 Long-run sustainable yield, domestic consumption and exportable surplus projections for combined capture fisheries and aquaculture, 1991-2030

Long-run sustainable yield				Domestic Consumption	Potentially exportable Surplus
Year	Capture Fisheries (CF)	Aquaculture Supply (AS)	Total		
1991	330 000	-	330 000	219 700	+110 300
2002	330 000	-	300 000	247 000	+83 000
2005	330 000	2 000	332 000	273 000	+59 000
2010	330 000	100 000	430 000	323 000	+107 000
2015	330 000	100 000	430 000	382 000	+48 000
2020	330 000	100 000	430 000	452 000	-22 000
2025	330 000	100 000	430 000	534 000	-104 000
2030	330 000	100 000	430 000	631 000	-201 000

Source: Consultants Estimates

Both expanded capture fisheries and aquaculture operations aimed at meeting the increasing domestic and international demand for fish and fish products will have some potentially adverse environmental consequences. Policy Statement No. 8 of the National Fisheries Policy 2004 deals with environment and fisheries. It advocates for the minimisation of adverse impacts and the establishment of mechanisms at the appropriate levels to deal with the potentially adverse impacts (MAAIF 2004). The policy strategies include, among others, Government to:

- subject sector policies and plans as well as consents for developments that may have adverse impacts on fisheries to environmental impact assessments (EIAs), in accordance with EIA guidelines and regulations, and to ensure that potential adverse impacts on fisheries and aquatic ecosystems are specifically considered; and
- set binding minimum standards for the protection of the environment from fisheries and aquaculture activities (MAAIF 2004).

The increased interest and the expected large-scale of operations in aquaculture suggests that the generic national guidelines for EIAs may not be sufficient. It may be necessary to have two sector-specific EIA guidelines – one for capture fisheries and the other for aquaculture.

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6.0 CROSS-SECTORAL RESOURCES

6.1 Energy Resources

The need to promote the development of energy for sustainable development in Uganda is now more urgent than before, both at the national level, and even more so at the local level as a result of increases in overall demand. Uganda is progressively moving from a low-intensity-energy-user position towards higher levels of clean energy intensity, partly as a result of the shift towards modernisation. The challenge is to develop a sustainable energy economy, which will ensure its security, availability and affordability, while sustaining the diversity of both the resources and systems.

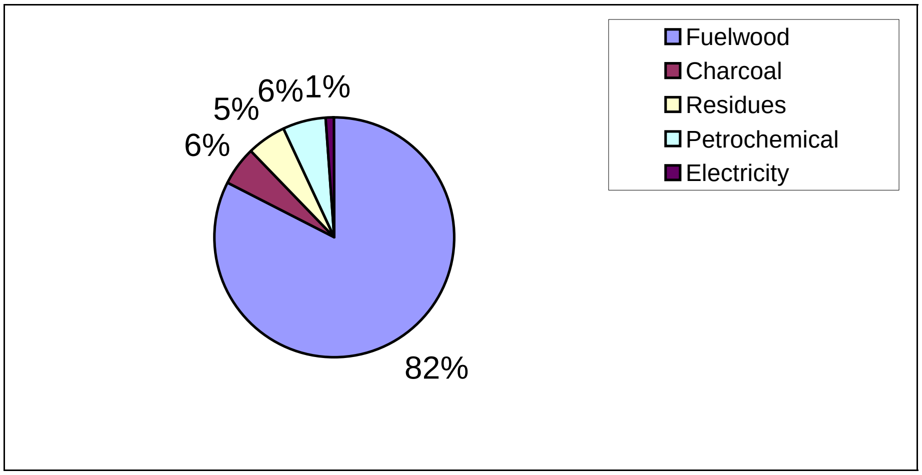
Energy resources and consumption

Uganda has a variety of energy resources that include predominantly biomass, and petroleum products and electricity (mainly hydro electricity) representing consumptions of 93%, 6% and 1%, respectively. Consumption of other forms of energy is at present negligible. Biomass, principally firewood and charcoal continues to be, in quantitative terms, the most important energy source in Uganda. The hydropower potential of Uganda is over 2 000 MW of which only 10% has been developed. The total energy consumption in 2003 was eight million Tonnes of Oil Equivalent (TOE), up from five million in 1996. The energy consumption *per capita* is 0.315 TOE. Commercial energy consumption *per capita* is 23.1 kg of oil equivalent (*Figure 6.1*), representing only 7.3% of total *per capita* consumption.

Currently, in Uganda with a population of approximately 24.7 million, an estimated 4.5 million households or 96% out of a total of about 4.7 million remain without access to electricity. The greatest proportion of these un-served households are in rural areas. Out of the above figure, only 5% of the total population and (less than 1% of the rural population) has access to grid supplied electricity. Lack of access to electricity denies the rural areas the potential for a broad-based economic growth and thus job creation as this is constrained by inadequate investment in rural infrastructure services that offer opportunities for employment.

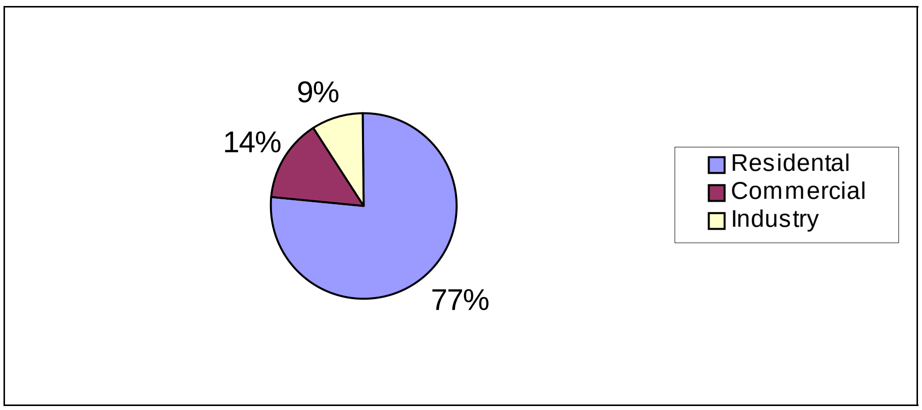
From *Figure 6.1*, biomass which comprises fuelwood (firewood and charcoal) and agricultural residues constitutes the major source of energy. This implies that by far, there is over-dependence on biomass for energy in Uganda. The percentage of clean energy rather than fuelwood is one of the indicators for the attainment of Millenium Development Goal 7 concerning environmental sustainability. Clearly, Uganda is unlikely to achieve its target on clean energy by 2015. Of the total national biomass volume, 42% is in protected areas while the rest is available for usage. Domestic use of biomass accounts for 77%, while the commercial and industrial sectors utilise 14% and 9%, respectively (*Figure 6.2*). There is high domestic use since biomass is easily accessible and cheap to use relative to other forms of energy in most parts of the country.

Figure 6.1 Energy consumption by type, 2003



Source: MEMD 2004.

Figure 6.2 Biomass utilisation by sector 2003



Source: MEMD (2004)

Biomass

Forest and forestry resources are a major source of energy, accounting for 92% of the total energy in Uganda 2002. This suggests that there has been an over-dependence on biomass as a source of energy. According to the World Bank, Uganda's annual deficit in production of fuelwood was estimated at 3.3 million m^3 in 1986. Although no more recent, accurate data are available, it is generally agreed that forest cover is shrinking and fuelwood is becoming scarce. Three tonnes/ha are estimated to be lost annually.

Measures to reduce on the use of fuelwood include training in energy efficient technologies such as fuel-efficient cookstoves, kiln construction as well as the promotion of renewable energy resources such as wind and solar power (UN System 2004).

Exploration for hydrocarbon generation has shown promising prospects, especially in the Albertine Graben area. Other sources of energy, like biogas, solar, wind, geothermal and hydrological sources are not fully developed (UN System 2004). Hence, the prominent use of biomass as a source of energy for households is likely to be maintained in the future, given that there is lack of cheaper alternative sources of energy for the poor people, particularly those in rural areas.

Almost 95% of the rural households still use firewood for cooking and the share has almost remained constant since 1992. Collection by women and girls impacts negatively on them. There is a minor shift from firewood to charcoal in the emerging urban areas. In addition to domestic use, fuelwood is used in lime production, the brick and tile industry, fish smoking, tea and tobacco curing and sugar refining (UN System 2004).

The high and increasing demand for energy in form of firewood and charcoal is not accounted for by appropriate energy extension and advisory services, particularly among the poor (UN System 2004).

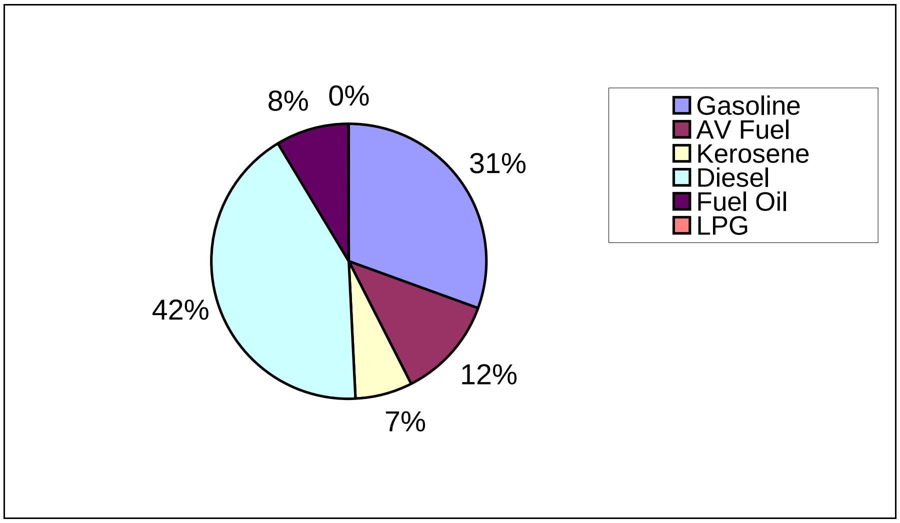
Although biomass energy consumption accounts for over 90% of the total energy consumption in Uganda, communities in rural areas are by far the largest consumers in terms of woodfuel. Levels of consumption are, however, influenced by both social and economic factors.

At present, however, more emphasis is on the efficient domestic biomass energy use both to sustain resources and reduce indoor air pollution. Training in fuel-efficient stove and kiln construction and woodfuel harvesting from farmed plantations are being encouraged as a means to reduce pressure on natural forests.

Petroleum energy resources

The main petroleum products consumed in Uganda are gasoline, aviation fuel, kerosene, diesel, fuel oil and liquid petroleum gas (LPG) or natural gas. The consumption is somewhat sector-specific. For example, kerosene and LPG are mainly consumed by the residential and commercial sectors; while gasoline, diesel and aviation fuel are largely consumed in the transport sector, and fuel oil mostly in the industrial sector. The consumption proportions of these different sectors are presented in *Figure 6.3.*

Figure 6.3 Petroleum consumption 2003



Source: MEMD (2004)

There is little information or data on the use of petroleum products in the generation of thermal electricity for domestic or commercial use. Domestically, thermal generators are scattered all over the country with no proper inventory on the extent of their use. However, commercially, the use of thermal generators has been prevalent in the up-country towns of Arua, Moyo, Moroto and Nebbi that are not served by the national grid. Recently, Aggreko Energy Ltd installed a thermal plant with the capacity of 50MW in Kampala but connected to the national grid. The Uganda Electricity Transmission Company (UETC) Limited is planning to install additional thermal plants (ERA *Pers. Comm*.).

Highest consumption of kerosene is predominantly within rural areas, especially in homes and is used mainly for lighting purposes due to lack of electricity. In major towns and the capital city, Kampala, natural gas or LPG provides an alternative source of energy for cooking.

Uganda is encouraging active oil and gas exploration, concentrated mainly in the Albertine Graben area. The area is divided into 5 basins. However, so far, no commercial quantities of hydrocarbons have been discovered and test drilling has been done in only one Basin. Oil and gas exploration, development, and production, transport and processing activities carry with them a number of major potentially adverse environmental impacts. While the Ministry of Energy and Mineral Development has produced EIA Guidelines for the Energy Sector, it is too generic and does not address environmental concerns in oil and gas adequately. Therefore, more focused and specific set of guidelines are required.

Hydropower energy resources

In 2001 through to 2003, electricity consumption accounted for only 1.1% of the total energy use in Uganda. Although the electricity grid mostly covers Kampala City and other major urban centres, rural areas where the largest percentage of the population lives has only 1 to 2% of the electricity supply. In 2002, however, 35 rural electrification schemes were completed including grid extensions. Rural electrification has increased grid connections by 12.3%.

The production of hydro electricity has generally increased from 626 MW in the year 1985 to 1 593 MW in 2001 and is expected to keep on increasing with the improvement and extension of the Owen Falls Dam (which increased generation from 260 to 300 MW in 2002).

A number of hydropower sites on both the Nile and other rivers have been studied giving a national potential of over 2 000 MW. Major sites constructed are Nalubale (Owen Falls) and Kiira (Owen Falls extension) with 180 and 80 MW capacities commissioned in 1954 and 2000, respectively. Other small operational hydro power stations include Maziba in Kabale, Kuluva in Arua; Kaganda, Mobuku 1&2 in Kasese; and Kisizi in Rukungiri. However, even with these developments, a small percentage of the national potential is being utilised.

The next biggest hydropower development is expected to be at Bujagali Falls. This project stalled for sometime due to deficiencies in design, lack of comprehensiveness of the EIA process, and a non-transparent Power Purchase Agreement (PPA). The initial cost of the project was $550 million, but has since then been revised downwards to about $300 million, representing a saving of $200 million in part as a result of the watchdog activities of environmental advocacy groups, particularly civil society organisations. Unfortunately, the advocacy work has not received much support from legislators as would have been expected! They argue that environmental advocacy groups are responsible for, among others, delays in hydropower development.

A closer look at the hydroelectricity distribution in Uganda shows that it is largely an urban issue for reasons attributed to social and economic parameters.

Alternative renewable and new energy resources

Feasible renewable energy sources in Uganda include solar, geothermal, wind energy, biodiesel and biogas, which are much cheaper than hydroelectricity and petroleum products. The Energy for Rural Transformation (ERT) Programme and the Uganda Photovoltaic Pilot Project for Rural Electrification (UPPPRE) are two attempts to develop these energy resources for rural consumption and development.

(i) Solar energy

Uganda is a tropical country with an abundant sunshine throughout the year and this provides the country with sufficient solar energy if only it could be tapped and utilised. Solar energy can either be used directly as heat, or be converted into electricity by photovoltaic panels. With photovoltaics, the efficiency is relatively low since the energy is first stored in batteries before use. They are used mainly for low power appliances that include lighting, radios, fans, television, battery charging, computers, refrigeration, photocopying and water pumping. The use of photovoltaics is not viable in high-energy consumption activities such as the operation of water heaters, cooking, drying, ironing and running of heavy machines. On the other hand, solar thermal panels are an efficient solution for water heating. The installation of solar facilities has also been relatively expensive. Nevertheless over the period 2001 to 2004 a total 312 solar systems were supplied in Rukungiri District alone (*Table 6.1*).

Table 6.1 Distribution of solar systems in Rukungiri District from 2001 to June 2004

Sub county	Quantities of the solar systems supplied
Kebisoni	32
Ruhinda	12
Buyanja	27
Nyarushanje	12
Nyakagyeme	109
Kagunga	22
Nyakishenyi	35
Bwambara	3
Bugangari	11
Town council	24
Total	**312**

Source: Rukungiri District Local Government (2004)

Uganda Photovoltaic Pilot Project for Rural Electrification

The UPPPRE (Uganda Photovoltaic Pilot Project for Rural Electrification) was a five-year pilot project started in 1998 to demonstrate and establish the financial and institutional mechanisms for providing solar photovoltaic (PV) based services on a commercial basis to households, businesses and communities in rural and peri-urban areas of the country which are: (i) not projected to have access to grid-based electricity in the foreseeable future; and (ii) have both the ability and willingness to pay the subsidised cost of the systems.

The UPPPRE project was funded by UNDP and UNDP/GEF (Global Environment Facility) to the tune of about US$ 2.3 million for technical assistance and credit financing. The project is based on making the rural population aware of the advantages of solar energy, encouraging and linking the private sector to the customers, smoothing lending from financial institutions, training of technical people in installation companies and strengthening the Uganda Renewable Energy Association.

A target to provide electricity to at least 2 000 households and 4 communities in areas not presently served by the grid by the end of the year 2001 was exceeded. The demand for solar energy has increased (indicated by the increased number of companies dealing with solar products and installations). Over 30 companies in Uganda were registered with the UPPPRE project.

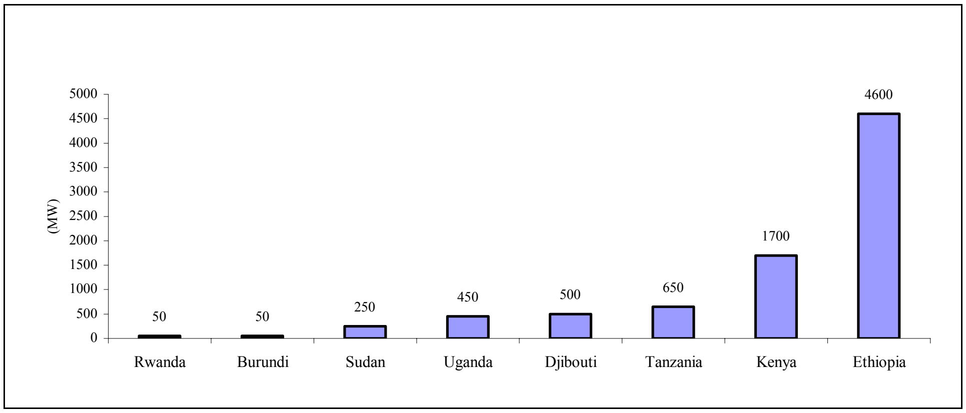
(ii) Wind energy

Wind energy in the form of electric energy is not used in Uganda. However, wind powered mills have been used mainly for pumping water. Although Uganda has not done a comprehensive wind mapping, available data from the Department of Meteorology show that the wind regime is not conducive for electric power generation (MEMD 2001). Nonetheless, the available wind regimes can be utilised for water pumping and grain milling. Windmills have been successfully used in the Karamoja region for water pumping. There are just a few isolated cases of wind generators installed in the country. This is a clean energy source except that it owes its limitations to the prevailing wind regimes.

(iii) Geothermal energy

The national geothermal energy potential is over 450 MW mainly from three most promising springs namely Kibira field near Lake Albert, Katwe field in southwestern Uganda and Buranga field near the Rwenzori Mountains whose water is normally at approximately boiling point. The Katwe field is considered the most promising due to the presence of subsurface steam at 230°C and its location, 35 km from a 132KV transmission line in Kasese, meaning its connection to the national grid would be cost-effective. However, the Katwe field is within the Queen Elizabeth National Park and hence its development is expected to have signficant environmental concerns which will call for detailed environmental impact assessments. The springs are mainly used as a tourism attraction but an assessment has been undertaken and an African Development Bank (ADB) funded feasibility study to look at renewable energies and resource mapping was to start before the end of 2002. Investigations have taken place in Kasese, Bundibugyo, Kabale, Rukungiri, Kanungu and Bushenyi districts. The Icelandic International Development Agency (ICEIDA) is reviewing the current status with a view to supporting further developments. A comparison of the geothermal energy potential of Uganda with the other eastern African countries is shown in *Figure 6.4*.

Figure 6.4 Geothermal energy potential of East African countries



Source: MEMD (2001)

Biogas energy

Biogas energy generation works by the anaerobic decomposition of excreta from sources such as cattle, pigs, chickens and humans. The gas produced is 60-65% methane and 35-40% carbon dioxide. Biogas energy technology was introduced in Uganda over 20 years ago. Since then, there has been a number of projects targeting the dissemination of this technology. The most recent one involved support obtained from China to construct 20 demonstration biogas digesters and to train a number of technicians. There is also a need to perfect the designs so that those of high integrity are popularised. An example of this is given in *Box 6.1.*

Box 6.1

Biogas usage

Paul Bukenya Mukasa a retired civil servant in Kiteezi, Wakiso District, benefited from a Chinese government grant which funded the equipment for his Biogas plant with the help of the Ministry of Energy and Mineral Development (MEMD). This is one of a number of biogas plants installed by MEMD as a pilot plant study mainly at regional schools and institutions.

With a daily input of one wheelbarrow of cow dung obtained from his 4 cows and two 20 litre jerry cans of water, a weekly output of approximately 20 jerry cans of slurry is obtained. With an initial capital outlay of 2 million Ushs, a 20 yr lifespan, the system has an $8m^3$ capacity and negligible running costs. Gas pressure of 3-9 bars is generated: 3-4 bars on rainy days and 6-9 bars on sunny days.

Source: MEMD (2001)

Although biogas provides a cheap, clean energy source for cooking and lighting and also generates slurry that can be used as agricultural fertiliser, the technology has not yet gained widespread use in Uganda. Limited spread of this technology could be due to some social and economic issues. Social issues include people resisting the use of the raw materials (excreta) as well as the high initial cost of setting up the biogas plants.

6.2 Biodiversity Resources

Biodiversity refers to a range of variations or differences in living organisms and their environments, distinguished by three levels of biological hierarchy: genes, species and ecosystems. Biodiversity conservation is concerned with the conservation of natural ecosystems and their components in the face of human activities or influence. Biodiversity gained prominence at the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992, and with the coming into force of the Convention on Biological Diversity (CBD) in the same year. Recently the main concern has been the role of biodiversity in maintaining the functioning and resilience of ecosystems and the implications of ecological disruption.

Uganda is endowed with a very rich and varied biodiversity due to its biogeographical setting, varied altitudinal range of 600-5100 m thereby creating diverse physical features (*Box 6.2*). With an estimated 90 vegetational communities, Uganda has a large number of fauna and flora species although the actual figure is relatively unknown. There are very few endemic species despite the country's unique biogeographical position. Uganda, with only 2% of the world's total area, is estimated to have altogether half a million species, with flowering plants numbering over 4 500. In addition, Uganda has respectively over 11% and 7% of the known world bird and mammal species.

The contribution of Uganda's biodiversity resources, organisms or parts thereof, populations or other biotic component of ecosystems with actual and potential value for humanity is about $1,000 million per year and probably greater when valued comprehensively (Emerton & Muramira 1999). Of this total amount, direct benefits were worth $411.5 million, while indirect benefits constituted the remainder at $588.5 million (Emerton & Muramira 1999). However, these benefits accrue at a cost. Emerton & Muramira (1999) estimated economic costs at $202 million per annum; and losses to other economic activities at $48.5 million/year.

Box 6.2

Biodiversity endowment

Ugandans have inherited a very rich flora and fauna, but the country is rapidly losing its biodiversity: a preliminary estimate suggests an overall rate of loss of about 1% per year. Planned agricultural development, urgently needed to improve peoples' lives, will further reduce the habitats of many species, whilst a wide range of human activities continues to degrade non-farmland areas, especially (but by no means only) outside protected areas.

Source: Pomeroy *et al*. (2002)

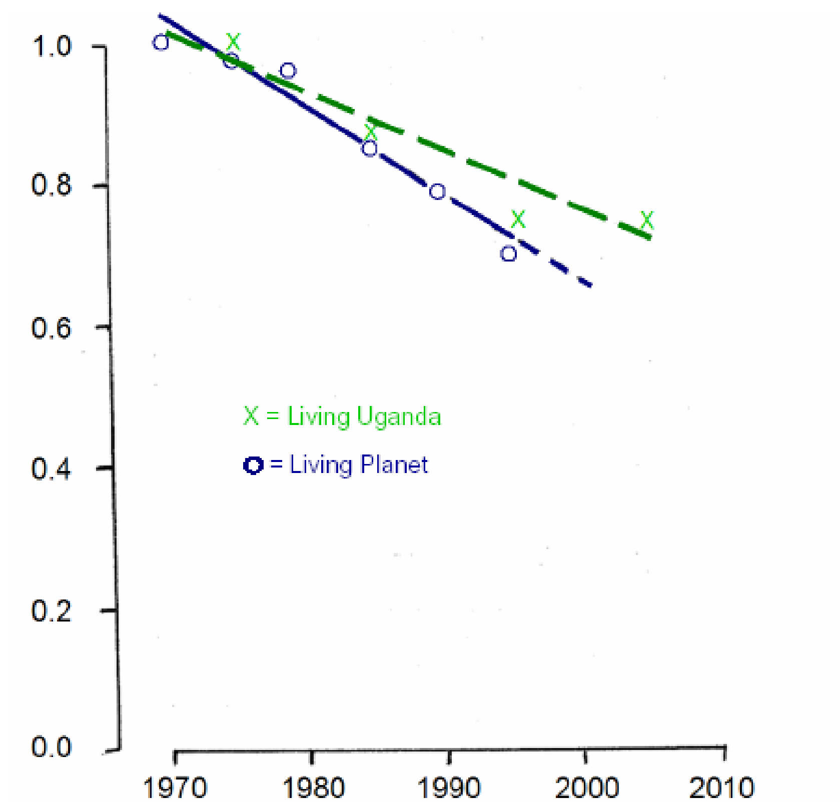
6.2.1 Biodiversity Loss

The major biodiversity issues in Uganda are: (i) loss of biodiversity estimated at 0.8-1.0% per year, resulting from habitat conversion; (ii) introduction of alien species;

(iii) pollution; (iv) over-harvesting and trade in live plants and animals and derived parts; and, (v) climate change.

According to Pomeroy & Tushabe (2004), overall rates of biodiversity loss in Uganda have declined for such important groups as large mammals and primates, including apes, as well as birds such as pelicans and fish eagles. On the other hand woody biomass in all its forms continues to decline, together with all the biodiversity that depends upon trees, and biodiversity loss seems to be an almost-inevitable consequence of agricultural intensification (Pomeroy & Tushabe 2004). Overall, however, Uganda as reflected by the Living Uganda Index (Jenkins *et al* 2004) is doing better than the planet as a whole (Living Planet Index): overall, the rates of loss are around 0.8% for Uganda, but above 1% for planet earth (Pomeroy & Tushabe 2004) as shown in *Figure 6.5.*

Figure 6.5 Biodiversity indices for both the planet and Uganda



Source: Pomeroy & Tushabe (2004), using data from WWF (2002) and Jenkins *et al* (2004)

Although forest cover has declined somewhat, the loss of biodiversity in protected areas of Uganda has overall been stopped and the trend reversed between the 1990s and the present (*Table 6.2*). Outside the protected areas, the biodiversity of Lake Victoria has declined between the 1990s and now. There is also a slight decline in wetland biodiversity which has been stopped somewhat and some reversal is taking place even outside PAs. Notwithstanding the foregoing, localised biodiversity loss is still going on (*Table 6.3*), such that the total picture is a continuing loss of biodiversity outside PAs.

Table 6.2 Biodiversity indices for Protected Areas

Parentheses ( ) = from independent trend lines; [ ] from inter/extrapolation. Categories with new data (since BD 2002) are in **bold**, and those where, although there are no new data, the indices have been recalculated, are shown in *italics*. Irrespective of actual years, all data are placed in their respective decades – so, for example, 1990 and 1999 are both treated as '1990s'

		Data type[a]	Data quality	60s	70s	80s	90s	00s
National	B1.1 Forest trees	F	A[b]	(97)	98	99	100	[101]
	B2.5 Mountain gorillas	F	A	(69)	99	89	100	108
	B2.6 Antelopes	S	B	356	[285]	218	100	[133]
	B2.7 Other large herbivores	S	A	477	[320]	165	100	107
	C3 Forest cover[d]	F	C	126	117	108	100	93
				235	180	136	100	109
Average – National								
Local	D1.1 Sango Bay and Karamoja – Plants	F	C	104	100	102	100	100
	D1.2 Sango Bay and Karamoja	F	C	168	155	118	100	[99]
	B2.4 Forest primates	F	B	-	94	106	100	134
	B3.6 Fish Eagles	W	A	-	82	[91]	100	113
	B3.7 Lions in QECA	S	B	-	109	[105]	100	85
	B3.8 Vultures in National Parks	S	C	-	144	[122]	100	98
Average – local				-	109	105	100	105
Average – all PA data					144	120	100	107

Note: *a: F = forest S = savanna W = wetland A = agroecosystems U = urban*
b: Very limited areas, but geographically dispersed
A – very good B – fairly good C – fair. See text for details
c: From Figure 5 in BD 2000.
Source: Pomeroy & Tushabe (2004)

Table 6.3 Indices for Non-Protected Areas

		Data type	Data quality	60s	70s	80s	90s	00s
National	A1 Lake Victoria fish species[a]	W	C	138	138	126	100	64
	A2 Terrestrial vertebrates species	F,S	B	101	101	100	100	100
	B3.1 Marabous	U	A	48	83	[92]	100	134
	B3.2 Pink-backed Pelicans	W	B	86	101	[101]	100	104
	B3.5 Tree birds	A	B	-	65	82	100	117
	C2 Wetland areas	W	A	(107)	(106)	(103)	100	(96)
Average – National non-PA				88	99	101	100	103
Local	B2.2 Weaver birds in Kampala	U	B	[123]	112	112	100	[90]
	B.2.3 Fruit bats	A,U	B	230	187	142	100	55
	B3.3 Makerere birds	U	B	123	123	109	100	83
	D2.1 SW Uganda – plants	A	C	196	161	145	100	92
	D2.2 SW Uganda – animals	S[b]	C	142	133	108	100	100
Average – local non-PA				163	143	123	100	84
Average – all non PA data				123	119	111	100	94
LIVING UGANDA INDEX				-	132	116	100	100

Notes: *a: included as national because they constitute some 77% of all Ugandan fish species.*
b: the wildlife spp concerned were mainly buffalo, leopard, bushpigs and vervet monkeys
Source: Pomeroy & Tushabe (2004)

As seen in *Table 6.4*, at the biome level in general, forest biodiversity loss has been stopped and there is a reversal of the trend. The same is true for savannah although the improvement is less than for forest biodiversity. On the other hand, wetland biodiversity continues to be lost and so is the case for agroecosystems and urban areas.

Table 6.4 Biodiversity indices by biomes

	N=national L=Local	PA= Protected areas	60s	70s	80s	90s	00s
FOREST A2 Vertebrate species	N		101	100	100	100	100
B1.1 Forest trees	N	PA	(97)	98	99	100	[101]
B2.4 Forest primates	L	PA	-	94	106	100	134
B2.5 Mountain Gorilla	N	PA	-	(99)	(99)	100	109
C3 Forest cover	N	(PA)	126	117	108	100	93
D1.1 Sango Bay and Karamoja- plants	L	PA	104	100	102	100	100
D1.2 Sango Bay and Karamoja- animals	L	PA	168	155	118	100	[90]
Average - forest			-	105	102	100	104
SAVANNA A2 Terrestrial vertebrate species	N		101	101	100	100	100
B2.6 Antelopes	N		356	[285]	218	100	[133]
B2.7 Other large mammals	N	PA	477	[320]	165	100	107
B3.7 Lions in QECA	L		[114]	109	[105]	100	85
B3.8 Vultures in National Parks	L	PA	[166]	144	[122]	100	98
D2.1 SW Uganda – plants	L	PA	196	161	145	100	92
D2.2 SW Uganda – animals	L		142	133	108	100	100
Average – savanna			122	179	138	100	102
WETLAND A1 Lake Victoria fish species	N		138	138	126	100	64
B3.2 Pelicans	N		86	[101]	[100]	100	104
B3.6 Fish eagles	L		[73]	82	[91]	100	113
C2 Wetland areas	N		(107)	(106)	(103)	100	(96)
Average wetland			101	107	105	100	94
AGROECO-SYSTEMS B2.3 Fruit bats	L		230	187	142	100	55
B3.4 Tree birds	N		(48)	65	82	100	117
D2.1 SW Uganda plants	L		196	161	145	100	92
Average – Agroecosystems			158	138	123	100	88
URBAN AREAS B2.2 Weaver birds in Kampala	L		[123]	112	112	100	[90]
B2.3 Fruit bats							
B3.1 Marabous	L		230	187	142	100	55
B3.3 Makerere birds	N		48	83	(92)	100	134
	L		160	160	121	100	83
AVERAGE – Urban areas			140	136	117	100	91

Source: Pomeroy & Tushabe (2004)

6.2.2 Habitat Conversion

A principal cause of habitat conversion is human population pressure. Despite the high incidence of diseases such as HIV/AIDS, malaria, etc., Uganda's population is growing rapidly. Annually, more land must be brought under cultivation to feed the increased number of people. In places such as Kabale and Kisoro, the increased demand for agricultural land has led to land fragmentation while in other areas, encroachment onto PAs or extension of cultivation into ecologically fragile zones has taken place.

Other factors contributing to habitat destruction are bushfires, poor agricultural practices, uncontrolled mining or drilling, inappropriate sectoral policies and legislation, and armed conflicts and civil unrest. Annual bushfires lead to alteration of ecosystems. Some species become extinct while others proliferate for instance the fire-resistant *Acacia sp*. Poor agricultural practices, such as over-stocking of rangelands and cultivation on steep slopes contribute to erosion and siltation of waterbodies, thereby altering these ecosystems as well as their species composition.

Policies, such as that of agricultural modernisation if not carefully implemented, could be detrimental to the environment. The consequences of such practices could result in loss of genetic diversity due to over-specialisation and pollution of soils and waters by agro-chemicals.

Persistent armed conflicts have contributed to the cutting down of forests and inadequate management of PAs. The insecurity that was in southwestern Uganda made it difficult for managers to be effective custodians of the wildlife-protected areas in the region. In the early 1980s, many peri-urban plantation forests were cleared for security reasons. This has in turn led to greater pressures on the surrounding natural forests for fuelwood, poles and timber. Equally, civil unrests in neighbouring countries have resulted in influxes of refugees into Uganda. These refugees need land to settle, poles to build homes and fuelwood for cooking and heating. In Moyo and Adjumani districts where the refugee population is high (as much as 50% of the total), areas of localised land degradation including deforestation around refugee camps are evident.

Inappropriate policies and inadequate inventories of Uganda's biodiversity have in the past contributed to non-selective harvesting of various species. Also, little grasp of ecology and taxonomy, low levels of enforcement including monitoring and evaluation, and unrealistically high international prices for some species or their products have historically led to over-harvesting. These and the indiscriminate harvesting of Uganda's biodiversity have in the past contributed to the loss of the country's species richness, particularly where wildlife, fish, plants and birds are concerned. This is because knowledge of species in Uganda is largely confined to the larger and more conspicuous vertebrate and higher plant species. The lower but nonetheless important forms are little known. Of the 345 known mammalian species, a large number are under various degrees of threat. These include, among others, the mountain gorilla, African wild dog (probably extinct), the chimpanzee, the eland, roan antelope, steenbok, and cheetah. The northern white and black rhinoceros are extinct as a result of un-regulated commercial harvesting to satisfy demand for rhino products in international markets.

Uganda has substantial fisheries resources due to its many freshwater lakes and rivers. This has endowed the country with over 200 freshwater fish species contributing about 3.4% of the country's total *GDP* in 2003, and over 50% of the country's total protein supply (UBOS 2004). During 1994 and 1995, however, the catch stagnated around

103 000 metric tonnes due partly to the impact of the water hyacinth. Over-fishing and high post-harvest losses, pollution of the fisheries, impact of the activities of the fisherfolk communities such as wetland fires, agriculture, etc. on fisheries resources, and inadequate institutional and administrative structures were the major setbacks in the management of fisheries resources biodiversity. Until now, no detailed study on the Ugandan part of Lake Victoria to establish the status of the surviving cichlid species has been carried out. However, preliminary studies show that some haplochromine and tilapine cichlids have survived in refugia at the edges of the lake and in nearby small satellite lakes (Chapman *et al* in press). Similar to the animals, the status of plants outside protected areas in Uganda is not known for most species. A recent joint project between MUIENR and WCMC has attempted to evaluate the status of woody plant species in Uganda. Based on this study, there are 54 woody plant species considered to be under threat. The majority of them occur in one or more PAs. Within the PA system there are restricted range species that are critically endangered such as *Chassalia ugandensis* from Kayonza Forest, *Rytgyinia sp*, which is confined to Iganga District in eastern Uganda and *Aloe tororoana* an endemic species only known to occur on Tororo rock occupying an area of only a few hectares. *Phoenix reclinata* is highly vulnerable outside PAs, as it is heavily harvested for fencing posts. Others include *Milletia lacus-alberti* and *Dialium excelsum* from Budongo Forest Reserve, *Lobelia stuhlmanii* and *Alchemilla roccati* from Rwenzori National Park.

The avifauna is largely doing well. However, of the more than 1 000 recorded species, the country has 28 threatened species at global level. Ten are designated as vulnerable e.g. Lesser Kestrel, Corncrake, Blue Swallow and Grauer's Rush Warbler; 2 are data-deficient i.e. Nahan's Francolin and the Entebbe Weaver, and 16 are near-threatened e.g. the Shoebill, Lesser Flamingo, Pallid Harrier, Red-faced Barbet, Papyrus Gonolek and Fox's Weaver. The Fox's Weaver, *Ploceus spekeoides,* is the only bird species endemic to Uganda, and recent surveys by the Nature Uganda indicate that healthy populations may exist in the Lakes Kyoga, Opeta and Bisina swamps. Unfortunately the capture of Grey Parrot nestlings in Kalangala District still persists. There are currently efforts to gather data on the Nahan's Francolin in Budongo Forest Reserve and the Shoebill in Murchison Falls National Park. Carswell *et al* (2005) have recently published an Atlas of the Birds of Uganda which will be an invaluable avifauna management reference material. The report has updated the status of avifauna biodiversity.

6.2.3 Introduction of Alien Species

Some alien species could be a threat to indigenous species through habitat alteration and/or competition for resources. For example, *Lantana camara,* originally introduced as an ornamental plant, has spread widely and dominated many habitats in Uganda, to the detriment of indigenous plant species. The water hyacinth, *Eichornia crassipes,* is believed to be having an adverse effect on aquatic communities in the littoral zones of major waterbodies. The Nile perch, *Lates niloticus* Linn has led to the disappearance of hundreds of endemic haplochromine cichlids in Lake Victoria and many other indigenous fish stock and non-indigenous species. Following its establishment in the lake, the population of this large predator rose rapidly during the late 1960s, 1970s and early

1980s leading to what is believed to be a 10 000 fold reduction in the number of native fish which form the main diet of the Nile perch. These dramatic population declines have resulted in the extinction of much of the lake's rich fauna of over 170 cichlid fish species, 98% of which were unique to the lake.

As an opportunistic feeder, the Nile perch feeds at almost all trophic levels above the producer. Thus instead of supplementing the food-web structure, it has disrupted the food chain in the ecosystem. For example, the haplochromine population dropped from about 80% of the fish biomass in Lake Victoria in the 1970s to less than 1% in the 1980s, and about 200 species are now feared extinct (MNR 1995). On the other hand, Fryer (2004) estimates 600 species are extinct.

The phytoplankton composition in the lake has, as a result, changed and is now dominated by blue-green algae whose biomass is 4 to 5 times higher than the values in the 1960s. The concentrations of the vital nutrients have also changed. Most notably the silicon concentration has decreased by a factor of 10, and phosphorus and nitrogen concentrations have both increased (MNR 1995).

6.2.4 Biotechnology and Biosafety

The consensus in Uganda is to embrace biotechnology and use it in a sustainable way to help improve the people's livelihoods, ensure food security and human health and safeguard the environment. At present, a number of institutions in Uganda are undertaking biotechnology-related research and development (R&D) activities. These activities are being guided by the Uganda Biosafety Framework that prescribes mechanisms for the judicious application of biotechnology in Uganda. The key issues, threats and constraints include, among others:

- limited awareness on the potential use, benefits, applications and risks of biotechnology;
- inadequate skilled human resource capacity for biotechnology and biosafety;
- limited institutional and infrastructural capacity to handle biotechnology research and development;
- inadequate public-private partnerships in biotechnology use and applications; and
- lack of coherent policy and regulatory frameworks that specifically addresses national biosafety regulations, intellectual property rights including the WTO's TRIPS Agreement and access to genetic resources and benefit sharing regimes.

A number of strategies have been put in place to overcome some of the constraints. They include:

- putting in place policy and legal frameworks on biotechnology and biosafety;
- strengthening human, institutional and infrastructural capacity in all aspects of biotechnology;

- strengthening regional cooperation and collaboration in biotechnology and biosafety;
- identifying sustainable funding sources for biotechnology and biosafety activities;
- promoting research in medical, agricultural, environmental and other areas of biotechnology and biosafety;
- updating information on biotechnology and biosafety;
- establishing a strong and effective monitoring system for biotechnology use and applications;
- undertaking EIA or risk assessments on biotechnology policies, programmes or projects that are likely to have significantly negative impacts on human health and the environment including biodiversity;
- promoting trade in biotechnology products;
- developing mechanisms for sharing costs and benefits of biotechnology;
- promoting integration of biotechnology values into macroeconomic frameworks;
- undertaking awareness and publicity campaigns on the benefits and risks of biotechnology and biosafety; and
- developing and disseminating biotechnology awareness materials (NEMA 2002).

6.2.5 Biodiversity Management Factors

Uganda is yet to record all available species in the country but it is estimated that there are at least 18 783 species of animals, plants and micro-organisms represented in five taxa (NEMA 2002). These species are distributed in diverse ecosystems, both natural and modified, such as forests, woodlands, soils, wetlands and aquatic systems, agro-ecological zones and the urban environment. The Biodiversity Country Report (MNR 1996), First National Report to the CBD (NEMA 1998) and the National Biodiversity Assessment Report (NEMA 1999), among others, provide details on the status and trends on biodiversity in Uganda. The National Biodiversity Data Bank of the Makerere University Institute of Environment and Natural Resources publishes Uganda's State of Biodiversity biennially. It is envisaged that these reports will regularly complement the national SOER.

Uganda's Protected Areas (PAs) are in form of Forest Reserves and National Parks, Wildlife Reserves and Animal Sanctuaries. However, these PAs are not representative of all the key ecosystems in Uganda. It would be worthwhile to establish a PA system that represents all key ecosystems including aquatic resources, wetlands and montane ecosystems. There are other forms of biodiversity protection systems which represent specific international issues of importance. They include the following.

a. World Heritage Sites (Bwindi Impenetrable National Park, Rwenzori National Park).

b. Man and Biosphere Reserve (Queen Elizabeth National Park).

c. Ramsar Site (Lake George) and Nabugabo Wetland System.

Uganda's capacity to manage biodiversity is influenced by the following factors:

1. **Management Strengths**

Management of Uganda's biodiversity is largely a responsibility of Government. It is therefore prudent to have effective governance if this responsibility is to be fully met. Uganda's management strength is demonstrated by:

(a) *Government Accountability*
This is expressed in form of relevant policies, legislation and enforcement capacity. Policy and legislative measures have been developed to support conservation and the sustainable use of biodiversity. They include national policies on environment, wildlife, fisheries and wetlands as well as national laws on land, water and decentralisation.

(b) *Government Priorities*
During budget allocation and national planning, some budgetary items reflect biodiversity conservation requirements.

(c) *Strong Institutions*
Institutions like UWA, NEMA, NARO, NFA, WID, etc. concerned with biodiversity have been established and these institutions are increasingly getting better co-ordinated. While this is an improvement from the past, additional capacity building is required.

(d) *Management Structures*
Management structures which are conducive to biodiversity conservation have been put in place. Decentralisation of power to local governments has, for example, led to the decentralisation of the management of natural resources. Other structures include the introduction of privatisation and the Investment Code.

(e) *Biodiversity Protection*
A network of protected areas in key biodiversity habitats has been put in place and this provides a basis for sound conservation and management. Conservation is also being strengthened in biodiversity-rich areas outside PAs, e.g. in some Important Bird Areas (IBAs) with the active involvement of communities.

(f) *Presence of Viable Species*
The presence of viable species populations outside protected areas.

(g) Uganda is a signatory to a number of Multilateral Environment Agreements related to biodiversity conservation (e.g. CITES, CBD, Forest Principles, CMS).

2. Management Weaknesses

Uganda's efforts in biodiversity management are undermined by the following weaknesses:

a) *Inadequate Manpower*

This has been a consequence of Structural Adjustment Programmes whereby Uganda's Public Service was and continues to be down-sized. The critical mass of human power is lacking in most of the environment-related institutions both at policy and field level. Linked to numbers as a measure of human capacity is the lack of skilled manpower that can meet the challenges of modern biodiversity management requirements and technology, rigid institutional set-ups and procedures. All these challenges hamper institutional performance.

b) *Inadequate Infrastructure for Supporting Management*

The problem of inadequate infrastructure affects both the central and lower level governments whereby even offices are not adequately equipped for smooth and efficient functioning.

(c) *Low Core Funding from Government*

Low core funding to biodiversity management institutions has often resulted in heavy dependence on donor funding and project support. This is unsustainable and jeopardises the long-term institutional planning and prioritisation of work. Budget allocation is unjustifiably lower for biodiversity conservation when compared to other sectors.

(d) *Fragmented Management*

The fragmented management of biodiversity ecosystems and natural resources into several institutions and agencies creates a problem of institutional co-ordination and conflicts between and among sector institutions over mandate, duplication of efforts, and competition for work and resources.

(e) *Policy Failures*

Uganda has numerous policies and laws that govern natural resources management. However, some of the policies are presently outdated and need to be reviewed to reflect current management challenges. There is need to strengthen the co-ordination of various sectoral policies to achieve harmony and complementarity. This is especially so in the case of Biodiversity-related policies (National Environment Policy, Uganda Wildlife Policy, Wetlands Policy, Forestry Policy, etc.). Shortcomings in co-ordination and integrated approach in policies and legislation often result in conflicting activities and mandates. Policies pursued in most key biodiversity sectors are focused along conventional sectoral lines with no cross- sectoral linkages and synergies, while other policies such as the Wetlands policy lack adequate legal backing for their enforcement.

(f) Lack of Political Support
Some of the policies in place lack political support, to the extent that in the past there have been inconsistencies in their interpretation and enforcement. These include the Decentralisation Policy, Privatisation Policy and the Investment Policy.

(g) Policy Gaps
These exist in certain aspects of biodiversity management. For example, there are no policies on Access rights, Patents rights, and Biodiversity.

3. **Other Weaknesses in Biodiversity Management**

These include the following:

(a) Over-exploitation and unsustainable use of biological resources.

(b) Encroachment on biodiversity habitats through expansion of agricultural land, drainage of wetlands and conversion for urban/industrial development.

(c) Inadequate integration of social concerns like gender, equity, population, resource tenure, indigenous knowledge and stakeholder participation in biodiversity management.

(d) Inadequate consideration of biodiversity within the national planning process and in development considerations.

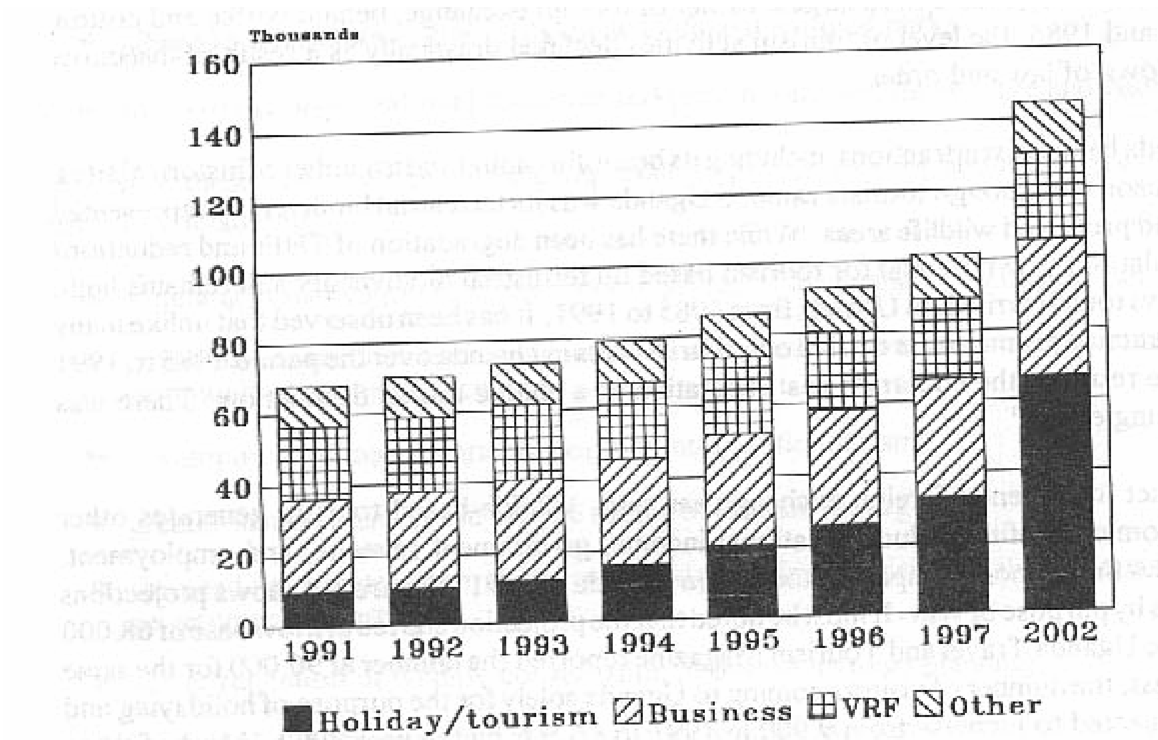
(e) Politics and associated civil unrest in some areas (NEMA 2002).

6.3 Tourism Resources

Uganda's terrestrial biodiversity represented in the protected wildlife areas and forest reserves as well as the beautiful scenary due to a wide range of habitats remains the major reason why tourists come to Uganda. However, there are other tourist attractions like cultural heritage sites as further explained in Section 7.6. By 1970, tourism was Uganda's third largest foreign exchange earner after coffee and cotton. However, between 1970 and the early 1980s the level of tourism declined drastically as a result of insecurity in many parts of the country and the general breakdown of law and order. With assistance from UNDP and the World Tourism Organisation, the Government put in place the 1993 Tourism Master Plan (UNDP/WTO 1993).

Figure 6.6 shows that with the required institutional reforms, additional investments in tourism, improvements in law and order and general macroeconomic stability, tourist levels were expected to double from about 68 000 in 1991 to slightly over 140 000 by 2002. The projected tourism levels proved to be conservative as described further below. By 2002, tourist numbers had already reached 254 000 (UBOS 2004).

Figure 6.6 Projections of visitor arrivals by purpose of visit 1991-97 and 2002



VRF – visiting relatives & friends
Source: UNDP/WTO (1993)

The economic impact of the 68 000 tourist arrivals in 1991 were estimated to generate gross foreign exchange earnings of $25.2 million; government revenue of $6.5 million and full-time employment of 6 500 people. Using an assumption of the same levels of expenditure per tourist as of 1991 (undoubtedly a conservative figure), the 2003 tourist numbers of 254 000 would have translated into the economic impacts presented in *Table 6.5*.

Table 6.5 Estimates of arrivals, and estimated revenues and employment from international tourism

	1991 [/a]	2002 [/b]
Visitor arrivals (no)	68 000	512 378
Average length of stay (nights)	14.8	N/A
Average daily expenditure (US $)	25	N/A
Gross foreign exchange earnings (US $ million)	25.2	316.6
Net foreign exchange earnings (US $ million)	15.1	189.7
National income generation (US $ million)	8.8	110.6
Government revenue (US $ million)	6.5	81.7
Employment: Full-time jobs (no)	6500	48 977

N/A – not available
/a - Source: UNDP/WTO
. import multiplier from tourist expenditure (direct and indirect effect) is estimated to be 0.4
.. income multiplier of tourist expenditure (direct and indirect levels) is estimated to be 0.35
… the direct and indirect revenue multiplier as a result of tourism expenditure is estimated to be 0.26
/b - tourist numbers and revenues from UBOS (2004); otherwise straightline extrapolation from 1991 data using gross revenue and visitor numbers as basis

The formulation of the National Tourism Policy in the past few years was to assist in efforts to promote the economy and livelihood of the people, essentially by poverty alleviation, through encouraging the development of sustainable and quality tourism. The objective of the Policy is to define new ways ahead for tourism development, which have led to an increase in the present level of tourist arrivals in Uganda from about 200 000 to about 500 000 within a 10-year period. Though the number of tourists has significantly increased by about 68.18% between 2003 and 2004, the visitor numbers to PAs is relatively lower due to inadequate security situation in some PAs, lack of implementation of a sound marketing strategy and the new tourism safety plan.

Despite the fact that Uganda's tourism is faced by a number of challenges, it plays a major role in the country's economic development. The sector has continued to be significant in the generation of government revenue, providing linkages with other sectors of the economy and leads to regional distribution of income. Wildlife-based tourism generates net incremental foreign exchange earnings and provides employment opportunities to the people.

Over the years, the tourism industry has been affected by bad publicity, which has contributed to the slow progress of the industry. For instance, the prevailing civil strife in northern Uganda that has lasted for over 19 years has affected the capacity of PAs in that area to generate significant revenues. In the southwest, during the 2000/01 financial year, Bwindi Impenetrable and Mgahinga Gorilla national parks contributed 17% of the total revenue compared to the 40% revenue collected from the same NPs in 1999/2000 (UWA 2001). This was due to the killings of tourists by the *Interehamwe,* the perpetrators of the Rwandan genocide. Despite the above, the number of tourists coming into the country has been increasing since 1994 as evidenced by the data in *Table 6.6* and *Table 6.7*.

Table 6.6 Percentage distribution of tourist arrivals 1999 – 2003

Basic Indicators	1999	2000	2001	2002	2003
Visitor arrivals by mode of transport					
Air	52	41	39	34	32
Road	48	59	61	66	68
Arrivals by purpose of visit					
Leisure, recreation and holidays	22	18	22	27	25
Business and professional	25	28	26	23	22
Visiting friends and relatives	7	11	14	13	17
Other	46	42	38	37	36
Total	100	100	100	100	100

Source: UBOS, 2004

Table 6.7 Tourists 1998-2004

Source	1998	1999	2000	2001	2002	2003	2004
Africa	116,683	116,980	132,240	144,257	192,626	233,626	406,743
Europe	45,720	43,133	36,050	36,592	33,853	39,207	48,847
America	14,550	12,898	11,947	12,919	14,785	16,409	23,438
Asia	19,166	10,493	8,368	8,163	9,302	10,937	19,979
Oceania	3,510	2,678	2,069	1,325	1,325	4,477	2,405
Total (increase)	194,790	183,348	192,755 (5.1%)	205,287 (6.5%)	254,219 (23.8%)	304,656 (19.8%)	512,378 (68.2%)
Wildlife			52,162	61,305	85,527	105,337	124,337

Source: UBOS (2004)

Although the visitor statistics indicated above show an increase since 2000 to 2004, the number of visitors from leading sources of tourists specifically Britain and United States of America is still low. This is attributed to the travel advisories issued by the two governments which discourage their citizens from visiting the country.

Tourism contributed US \$ 316.6 million in 2004 as compared to US \$ 180.8 million in 2003. It is estimated that in 2004, 70% of visitors to Uganda were residents of other African states (75% in 2002) while Europeans and Americans accounted for up to 18% and 6% of visitors, respectively (MTTI 2004). *Table 6.8* shows the trend in tourist visits to the various various national parks in the country from 1998 to 2002. Only 1 443 tourists visited Kidepo Valley in 2002 dropping from 2 470 tourists who visited the Valley in 2001. Despite the increasing revenue collections since 2003/04, the sector is still faced by a number of challenges including institutional weaknesses related to lack of relevant and up-to-date tourism legislation; and pressure on PAs for instance, local conversion of land for alternative uses. In addition to the aforementioned challenges, support for tourism levy needed to run a prosperous tourism industry is lacking. Therefore, a lot has to be done if the major objective of the Uganda Wildlife Policy that emphasises revenue generation while also contributing to rural livelihoods is to be realised.

Table 6.8 Visitors to National Parks 1998-2003

National Park	1998	1999	2000	2001	2002	2003
Murchison Falls- All visitors (Foreign visitors)	12,099 (1,893)	12,713 (1,082)	23,169 (2,361)	20,284	34,241	38,553
Queen Elizabeth	8,349	8,073	8,743	14,855	27,814	32,661
Kidepo Valley	1,840 (75)	1,501 (211)	2,285 (71)	2,470	1,443	1,049
Lake Mburo	8,182 (496)	8,552 (737)	8,443 (822)	9,616	10,800	11,692
Rwenzori Mountains	0	0	0	117	268	435
Bwindi Impenetrable	3,437 (2,990)	2,100 (1,643)	3,983 (2,693)	4,517	5,075	4,900
Mgahinga Gorilla	2,698 (2,250)	1,741 (932)	2,517 (1,388)	2,205	1,485	2,506
Semliki	113	0	0	77	802	1,179
Kibale	2,003 (1,258)	955 (420)	1,149 (412)	1,846	4,899	5,998
Mount Elgon	1,231 (306)	1,308 (295)	1,872 (338)	2,024	3,234	3,594
Total	**39,839**	**36,943**	**52,161**	**58,004**	**90,061**	**102,567**

Source: UWA 2004

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7.0 THE SOCIOECONOMIC AND CULTURAL ENVIRONMENT

7.1 Human Settlements, Housing and Urbanisation

Human Settlements

Human settlement is a phrase used to designate any place on earth where humans live. Human settlements are an integrated combination of human activities, artifacts and a set of facilities intended to facilitate human life on earth. Therefore, they are not just houses and associated infrastructure. According to the *Habitat Agenda,* the sustainable development of human beings combines economic development, social development and environmental protection with full respect for all human rights and fundamental freedoms, including the right to development, and offers a means of achieving a world of greater stability and peace, built on ethical and spiritual vision (UNCHS 1996).

By 1991, only 1% of Uganda's land was under human settlement, featuring essentially three types of settlements: dispersed rural homesteads; constellation of local administrative centres, intermediate towns and nucleated urban centres; and linear corridors of fast urbanising settlements (MLHUD 1992).

During this time also, the housing sector was severely hit by the general economic decline of the 1970s and early 1980s. There were problems related to lack of appropriate policies and programmes; inadequate financial resources; shortage of building materials; lack of human resources; collapse of the construction industry; and lack of attention to rural housing where the vast majority of the population live (MLHUD 1992). The Shelter Strategy projected total housing need of 2 125 600 units by 2006 (MLHUD 1992) as shown in *Table 7.1*. Infact the projection turned out to be conservative since Uganda's population was 24.7 million by 2002 compared to the same number projected for 2006 in the year 1992.

Table 7.1 Status of housing stock, 1991 and projections to 2006

Definition & measure	Kampala	Other Urban areas	Rural areas	All uganda (national)
Population	730,189	1,103,000	14,700,000	16,533,000
Average annual pop. Growth rate %	4.9	3.6	2.5	2.5
Average household size (individual)	4.0	4.6	5.6	5.5
No of Households	182,439	239,783	2,625,250	3,047,472
Occupancy Density	1.32	1.36	1.1	1.1
Existing Persons per sponsor housing unit	5.28	6.25	6.16	6.15
Existing No. of Dwelling units	138,068	176,310	2,386,282	2,700,660
Housing Backlog	44,228	63,473	238,600	346,301
Projected Pop. To year 2006	1,607,000	1,981,000	21,083,000	24,671,000
Total Housing need	244,400	279,500	1,601,700	2,125,600

Source: MLHUD (1992)

Over the years, human settlements have become more complex, and the environmental impacts of settlement dynamics coupled with increasing population size and pressure, have become greater. There is increased deforestation, degradation of watershed areas, pollution of waterbodies, soil erosion, and land degradation among others. Therefore settlement issues become crucial in ensuring environmental conservation and management. Since developments in both rural and urban areas are inter-dependent, the focus on human settlements aims at improving the urban ones, while extending adequate infrastructure, public services and employment opportunities to rural areas in order to enhance their attractiveness, develop an integrated network of settlements, and minimise rural to urban migration (UNCHS 1996).

Settlements and infrastructure ranging from the smallest hamlet (village) to the largest urban centre (city) reflect not only the culture, value and technology of a society, but also the natural resources endowment (MWLE 2001). In other cases, such as the situation in Uganda, they reflect the preference values of a colonizer. In 1950, the human population for Uganda was about 4.8 million. Of this, 3% lived in urban areas (MWLE 2001). It is estimated that by the year 2030, the population of Uganda will have reached 49 million of whom 30% or 14.7 million are expected to live in urban areas (UNDP 2001).

Human settlements in Uganda can be classified as rural settlements and urban settlements. As an indicator of the quality of social wellbeing, the rural human settlement arrangements in Uganda can be characterised as being wasteful of land, homesteads occupy relatively large areas while urban areas are characterised by congestion and slums. As a result, both the rural and urban poor are exposed to many environment-related diseases due to the human settlement patterns.

There are various views to describe rural settlements, one of them is that a rural human settlement is one where the population is either directly or indirectly dependant on primary production in agriculture, cattle raising, timber harvesting, fishing, small-scale mining, and others. The population may also engage in small activities like trading, food processing and construction for its livelihoods. Another view is that it is an area where there is greater preponderance of natural elements in the environment than in the urban area. There are 3 types of rural settlements: dispersed (where inhabitats are scattered and these are common in northern Uganda), nucleated (clustered) located usually near certain features such as towns, religious missions or administrative centres; and linear rural settlements, where homesteads are strung or lined along roads.

An urban area is a place where a vast proportion of people residing in it make a living in non-primary activities. The idea of an urban centre in Uganda came during colonial rule where cities were established based on colonial politics and extra-territorial economic concerns than basing on the geographical aspects or the level of development of a place. The 1991 analytical census report defined an urban centre as a locality with at least 1 000 people. This view has changed with recent data. On the other hand, urbanisation is the growth and development of urban centres. Today, the rate of urbanisation is high because some trading areas have become townships with a lot of developments. Most of the old towns such as Mityana, Kabale, Arua and Soroti have expanded at very impressive rates.

Urbanisation is the change in the proportion of the population that lives in urban areas. According to the Housing and Population Census 2002, urban centres include only gazetted cities, municipalities and towns (*Table 7.2*). And according to the Census report, there was a low level of urbanisation in the year 2002. Most of the population in Uganda lives in rural areas (over 80%). It is worth noting that urbanisation contributes to deforestation through increased demand for charcoal, firewood and construction timber. Through urbanisation, a number of forest plantations near urban centres such as Kalangala, Soroti, Mbale, and Nebbi are also threatened with degazettment for urban settlements.

Table 7.2 Urbanisation in Uganda, 1969-2002

Index	1969	1980	1991	2002
Number of towns	58	96	150	74
Urban population	634,952	938,237	1,889,622	2,921,981
Proportion Urban (%)	6.6	7.4	11.3	12.2
Urban Growth rate (%)	8.17	3.93	6.35	3.73
% In capital city	53.9	47.9	41.0	40.7
% In 20 largest towns	87.4	80.4	74.4	76.6

The figures for the 1969, 1980 and 1991 are as per the 1991 definition (ungazzetted trading centres of 1,000 persons or more). While those for 2002 are as per the 2002 definition (only gazetted cities, municipalities, and towns). Hence the lower number of town in 2002.
Source: UBOS (2002)

Housing

The National Housing and Construction Company (NHCC) is a government parastatal that was set up in 1964 charged with the responsibility of increasing the housing stock, rehabilitating houses and encouraging Ugandans to own houses. The *Habitat Agenda* of 1996 is part of the strategy of the housing sector that has addressed themes like *"adequate shelter for all"* and *"sustainable human settlement development in an urbanising world"*. The government wants to ensure that every one has adequate shelter that is healthy, secure, safe, accessible and affordable with basic facilities like water. However, there appears to be inadequate attention to, or implementation of, this goal. There are few housing development programmes such as Naalya Housing Estate. This can be attributed partly to a number of factors such as; low incomes of most of the people and the high cost of land and building materials. However, the situation has improved of late with the emergence of the private sector (such as Akright Projects Limited) providing reasonably affordable housing. This company has set up many estates, which has eased the backlog. The estates are well planned and well serviced with basic facilities.

The type of materials used in construction of roof, wall and floor of a house are good indicators of how-well off households are in terms of housing (UBOS 2003). A dwelling unit is a housing structure occupied by a single household. The 2002 Housing and Population Census reported that only 17% of the dwelling units in Uganda were made of permanent roof, floor and wall materials and about 59% of dwelling units in urban areas were permanent compared to 10% in rural areas. The implication is that even now most houses, especially rural ones, are constructed of natural resources materials and scarcities of these (poles, grass for thatch, etc.) adversely affect housing conditions.

The most common type of material used for constructing dwelling units was mud and pole for wall (50%), iron sheets (54%) or thatched (44%) for the roof and rammed earth (77%) for the floor. Iron-roofed houses increased by 6%, use of mud and poles for wall went down from 56% to 46% in 2002/03. The use of bricks increased by 11% between 1999/00 to 2002/03. The rural areas registered a bigger increase (from 72% to 77%) in the use of bricks than urban areas, as shown in *Table 7.3*. From the table it is evident that there has been a general improvement in the materials used for construction of dwelling units over the period 1991 to 2002.

Table 7.3 Materials used for construction of dwelling units in percentages.

Construction materials	1991		2002	
	Urban	Rural	Urban	Total
Permanent	NA	10.4	59.4	17.2
Mud and pole for walls	75.2	55.3	16.6	49.9
Iron sheets for roof	37.8	49.5	82.0	54.0
Thatch for roof	59.8	49.1	11.6	43.9
Rammed earth for roof	85.1	85.2	29.1	77.4

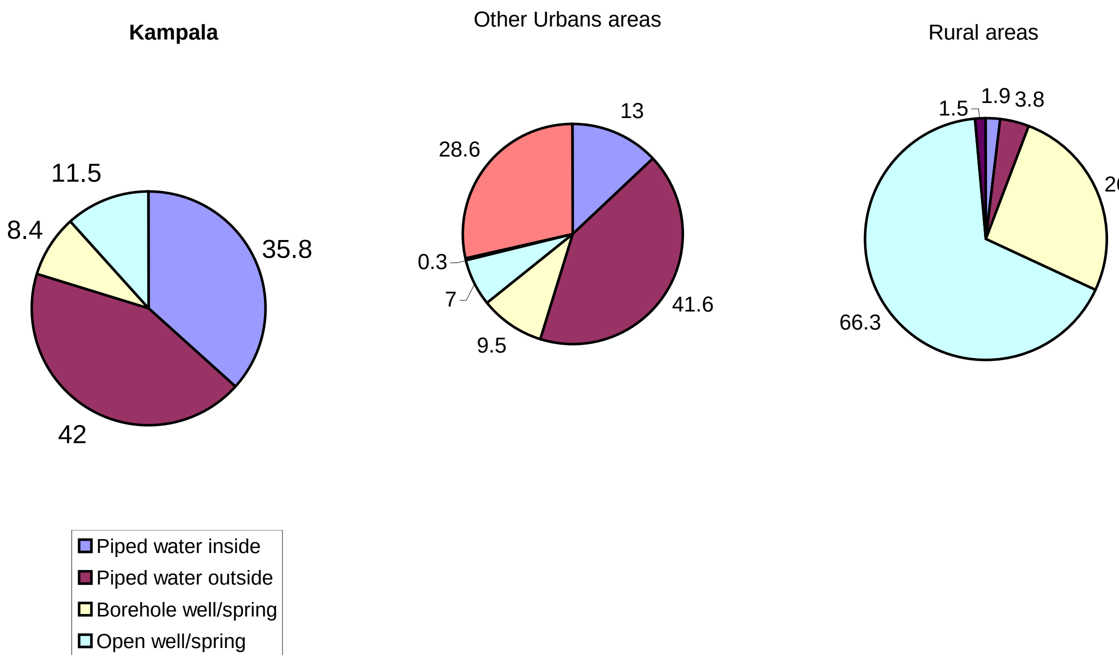
Source: UBOS 2005.

7.2 Safe Water and Sanitation

7.2.1 Urban Water Supply

The National Water and Sewerage Corporation (NWSC), the body charged with the provision of piped water in Uganda, was created as a government parastatal by Decree No. 34 in 1972. Water and sanitation facilities are important for sustaining life. Access to clean and safe water supplies is an internationally recognised fundamental right; without it people cannot remain healthy. In the early 1980s and 90s, NWSC activities were restricted to only 3 towns in Uganda, these were Kampala, Jinja and Entebbe. It was estimated that only 20% of the population had access to safe drinking water, compared to urban coverage of just less than 50% in 1991 (MPED 1991) as shown in *Figure 7.1*. However, by 1999, 11 towns in Uganda had the services of NWSC. Today, NWSC is responsible for over 19 large towns. The corporation's vision is to have more than 75 per cent continuous water production year round of installed capacity in all the systems countrywide and reduce un-counted for water to not more that 39 percent of water produced by the year 2005 (NWSC 2004).

Figure 7.1 Water coverage by the different sources, 1991



Source: MPED (1991).

Coverage and access to safe drinking water

NWSC is the principal provider of water services in the urban centres of Uganda. It supplies 1.4 million customers with 151million litres of water per day. NWSC distribution includes 16 water treatment plants and 2 490 kilometres of water mains. NWSC effectively operates in 15 towns namely Kampala (including Kajjansi and Nansana), Jinja/Njeru, Entebbe, Tororo, Mbale, Masaka, Mbarara, Gulu, Lira, Fortportal, Kasese, Kabale, Arua, Bushenyi/Isahaka and Soroti. Towards the end of the financial year 2003/2004, four new towns:Iganga, Mukono, Malaba and Lugazi were gazetted as NWSC's new areas of operation bringing the total number of towns under NWSC jurisdiction to 19 (NWSC 2004). The corporation's operating profits after depreciation have increased by 55% and the number of subscribers reached the watershed mark of 100 000 water connections. Also in the year 2003 two towns, Jinja/Njeru and Tororo received ISO certification. The certification of these towns marks the beginning of a new development in the history of NWSC towards the adoption of internationally accepted processes and quality management.

Currently the water and sanitation sector investments and activities are financed from local sources and financing from development partners, with the latter providing a larger share of the capital expenditure in the sector. In the financial year 2003/2004, around 33 000 million Ushs was disbursed in the rural sector, almost 9 million to small towns and around 16 000 million through NWSC (DWD 2004). The Water and Sanitation Sector targets adopted by Uganda are generally higher than the Millennium Development

Goal (MDG) targets, as shown in *Table 7.4*. The current status is to achieve the MDG targets for water supply, and even exceed it by having 100% coverage (DWD 2004), come 2015.

Table 7.4 Comparison of the Poverty Eradication Action Plan and MDG target for Uganda's progress in accessing safe water.

<table>
<tr><th rowspan="2">Indicator</th><th colspan="2">Status</th><th colspan="2">Sector Target</th><th colspan="2">MDG Target</th></tr>
<tr><th>Year</th><th>Coverage, %</th><th>Year</th><th>Coverage, %</th><th>Year</th><th>Coverage, %</th></tr>
<tr><td rowspan="2">Rural access of safe drinking water</td><td rowspan="2">2003/04</td><td rowspan="2">57</td><td>2005</td><td>58</td><td rowspan="2">2015</td><td rowspan="2">62</td></tr>
<tr><td>2015</td><td>77</td></tr>
<tr><td rowspan="2">Urban access to safe drinking water</td><td rowspan="2">2003/04</td><td rowspan="2">65</td><td>2005</td><td>70</td><td rowspan="2">2015</td><td rowspan="2">-</td></tr>
<tr><td>2015</td><td>100</td></tr>
</table>

Source: (DWD, 2004)

Service coverage for safe drinking water in the urban areas served increased from 63% in June 2003 to about 65% by June 2004. This increase was as a result of various mains extensions, increased connections of consumers and the creation of the public stand posts in all towns. The Corporation is mindful of the Millennium Development Goals (MDGs) objective of halving the number of persons without supply by the year 2015. In line with this objective, the NWSC has in place a medium term investment plan, which clearly indicates the resources needed to reach the MDG goals. *Table 7.5* shows water supply and sewerage coverage for 2004.

Table 7.5 Water supply and sewerage coverage as at 30th June 2004

Town	Total No.of connections	Pipe Network (Kms)	Targeted Population	Population Served	% Served (water)	% Served (sewerage)
Kampala	60,077	1,043.06	1,254,469	815,405	65%	7%
Jinja/Njeru	8,018	240.34	142,857	110,000	77%	26%
Entebbe	4,523	137.88	58,956	37,142	63%	4%
Tororo	1,873	65.75	44,172	27,828	63%	7%
Mbale	3,958	143.48	72,057	46,837	65%	28%
Masaka	2,701	111.85	62,403	46,179	74%	9%
Mbarara	4,144	104.83	72,322	57,135	79%	6%
Lira	2,000	117.15	98,948	57,390	58%	2%
Gulu	1,751	73.06	123,666	86,566	70%	5%
Fort Portal	1,986	104.65	41,336	28,522	69%	2%
Kasese	1,734	56.53	58,256	44,449	76%	0%
Kabale	1,621	102.4	47,496	25,173	53%	11%
Arua	1,539	78.817	48,728	21,927	45%	0%
Bushenyi/Ishaka	798	44.708	24,045	8,656	36%	0%
Soroti	1,752	63.59	41,511	14,114	34%	2%
Total	**100,475**	**2,488.095**	**2,191,223**	**1,427,323**	**65%**	**8%**

* Population figures are derived from the 2002 population and housing Census Provisional Results (Uganda Bureau of Statistics, 2003)

Note

(1) Population coverage is based on the following number of persons served per connection
Domestic……………………..………8 Persons/household/connection
Standpipe………………………………25 households (each 8 persons)
Institutions: Small towns…………...100 persons/Institution per connection
Medium towns………………………500 persons/Institution
Large towns…………………………1,000 persons/Institution

(2) The newly gazetted towns of Mukono, Lugazi, Malaba and Iganga are not included in this analysis.

*Source:(*NWSC, 2004)

Evidence from the analysis of survey data from the Uganda Population and Housing Census, Uganda Demographic and Health Survey, National Service Delivery Survey and Uganda National Household Surveys show steady increases in safe water coverage since 1991. The percentage of people who reported using safe water sources increased from about 26% in 1991 to 68% in 2002.

Unaccounted for water

Reduction of losses continues to form a major part of NWSC strategy in securing a balance between available resources and demand. As of June 2004, the overall un-accounted for water was 37.6% compared to 39% at the end of FY 2002/2003. This marked a 14% reduction. In Kampala, the average was about 44.7% compared to 44.5% by the end of June 2003. In the other areas, an average of about 20.8% compared to 26.7% as at end of June 2003. During the year, in other areas un-accounted for water decreased by 5.9% while in Kampala area, the average was 42% (*Table 7.6*). The improvement in the areas, including Kampala were due to the effort undertaken in the IDAMC contracts.

Table 7.6 Unaccounted for water trends.

Year	2001/2002	2002/2003	2003/2004
Total	40%	39.4%	37.6%
Kampala	44%	44.5%	44.7%
Other Area	30%	26.7%	20.8%

Source: *NWSC (2004)*

7.2.2 Rural Water Supply Coverage

Since 96 per cent of the poor people live in rural areas, the quality of rural water and sanitation services delivered is a main concern for poverty eradication. In rural areas, there are problems like inadequate community participation, poor hygiene and construction supervision at district level. Despite the above problems, there has been an increasing level of provision of safe water to rural households. The trend in rural safe water coverage shows a progressive increase over the years based on both surveys and DWD data. Evidence from surveys shows that the percentage of people who reported using safe/improved water sources increased from 20% in 1991 to approaximately 60% in 2002. Safe water coverage for Moyo District is shown in *Table 7.7* as an example. DWD data also shows the same trend, save for the drop in coverage from 58.8% to 55% in 2003. This drop was caused by downward revision based on the population census figures of 2002 - the actual population was higher than originally projected.

Table 7.7 Safe water coverage for Moyo Sub-county

S/N	Sub county	Percentage coverage (%)
1	Gimara	11.4
2	Aliba	17.9
3	Utula	59.4
4	Lefori	34.0
5	Moyo	80.1
6	Metu	110.6
7	Dufile	49.5
8	Moyo town council	68.4

Source: Moyo District Local Government (2004)

DWD's target is to supply 20 litres of safe and clean water per person per day and the water source must be situated within reasonable walking distance. It also aims at mobilising communities to promote optimal sanitation and hygiene because providing safe water without improving on sanitation and hygiene cannot yield any good results. This is being done through educational campaigns.

After construction and commissioning of an improved water facility, the next important area of interest to government and the community at large is the level at which the facility operates. The golden indicator for functionality is defined as *'the proportion of water* *points functioning at the time of spot check'.* Currently, the overall functionality rate of rural water points stands at around 80%, compared to a target rate of 80%-90%. As indicated in *Table 7.8* below, functionality in 11 out of a total of 56 districts falls below 70%, 21 districts are operating between 70% and 80%, while 16 districts operate above the national average of 80%. The status in 7 districts (excluding Kampala) is unknown.

Table 7.8 Functionality in rural area, by regions, June 2004

	Total number of districts				
Functionality rate	**Central**	**Eastern**	**Northern**	**Southern**	**Total**
Below 70 per cent	4	1	4	2	11
70 – 80 per cent	4	5	4	8	21
80 per cent and above	3	6	2	5	16
Unknown status	2	3	3	-	8
Total	13	15	13	15	56

Source: DWD (2004)

Functionality depends on technical as well as other factors. Technical factors include:

- technology option and age of the facility;
- physical – chemical properties of the source (water quality and quantity);
- quality of construction materials (pipes, pumps and cement);
- quality of construction workmanship (poor tendering processes); and
- conflict of interest (poor supervision, lack of experienced contractors).

Other factors that influence functionality levels include:

- perceptions and practices of beneficiary communities (politics, culture, settlement patterns and surrounding economic activities);
- lack of appropriate operation and maintenance (appropriate experience, supervision, management committee);
- land disputes (a facility may be fenced off if there is a land dispute); and
- natural events e.g. prolonged drought periods (DWD 2004).

A summary of the overall extent of rural water supply functionality and investment cost per beneficiary by districts is shown in *Table 7.9.*

Table 7.9 Summary of rural water supply by Districts, 2004.

District	Access to improved water		Water point functionality		Investment cost per beneficiary	
	Percent	Rank	Percent	Rank	Average (Ushs) per New Water Point	Rank
Adjumani	41.8	46	84	15	101,551	50
Apac	44.7	42	65	44	57,503	46
Arua	57.4	22	76	33	36,577	32
Bugiri	28.5	52	91	8	36,437	30
Bundibugyo	55.4	25	84	15	71,909	48
Bushenyi	75.1	4	79	22	24,818	15
Busia	60.5	16	89	10	36.502	31
Gulu	56.2	23	n/a	53	14,726	1
Hoima	67.6	6	78	27	20,057	5
Iganga	52.1	34	86	13	55,631	45
Jinja	56.2	23	100	1	33,456	27
Kabale	84.9	1	80	20	73,871	49
Kabarole	65.0	9	79	22	28,023	20
Kaberameido	53.6	29	75	37	45,327	42
Kalangala	52.3	32	95	7	41,757	37
Kamuli	49.9	37	100	1	39,442	35
Kamwenge	61.6	12	65	44	32,648	25
Kanungu	60.0	17	76	33	30,609	22
Kapchorwa	52.5	31	96	5	53,697	43
Kasese	52.2	33	72	40	39,661	36
Katakwi	36.0	48	79	22	37,375	33
Kayunga	49.2	38	87	12	34,596	28
Kibale	50.8	36	85	14	33,346	26
Kiboga	52.8	30	76	33	22,955	10
Kisoro	48.1`	39	82	17	122,669	53
Kitgum	66.2	8	n/a	53	152,206	54
Kotido	25.6	54	61	49	35,987	29
Kumi	64.6	10	61	49	21,715	9
Kyenjojo	42.2	44	61	49	31,282	24
Lira	54.2	27	82	17	27,920	19
Luwero	84.8	2	79	22	26,799	17
Masaka	53.9	28	71	41	18,372	4
Masindi	58.5	19	91	8	20,251	7
Mayuge	31.9	50	100	1	44,847	41
Mbale	55.1	26	79	22	17,531	2
Mbarara	51.1	35	77	31	42,705	39
Moroto	58.3	20	66	42	61,282	47
Moyo	64.4	11	74	38	24,497	12
Mpigi	57.5	21	81	19	27,687	18
Mubende	38.2	47	61	49	24,348	11
Mukono	61.6	13	100	1	20,338	8
Nakapipirit	48.0	13	63	46	29,296	21
Nakasongola	61.6	40	63	46	108,837	51
Nebbi	59.0	18	78	27	53,719	44
Ntungamo	69.1	5	76	33	24,586	13
Pader	23.7	55	n/a	53	n/a	55
Pallisa	42.2	44	96	5	31,051	23
Rakai	46.7	41	63	46	42,419	38
Rukungiri	78.0	3	78	27	24,646	14
Sironko	62.9	12	77	31	17,881	3
Soroti	67.3	7	74	38	25,283	16
Sembabule	27.6	53	66	42	37,842	34
Tororo	43.3	43	88	11	44,393	40
Wakiso	34.8	49	80	20	20,165	6
Yumbe	30.7	51	78	27	117,335	52
Average	53.2		79		42,599	

Note: *This is the first year in which such data has been collected and aggregated in this way. Where data was not available (n/a), the district has been moved to the end of the rankings.*
Source: DWD, 2004.

Government's response to low coverage for safe water and low coverage with appropriate sanitation facilities include the involvement of communities in the management of water points; and increased awareness through education campaigns.

- Various programmes have been put in place to improve the urban sanitation in Uganda, including the second water supply project. The project was started in 1998 mainly to improve the expansion of Kampala sewerage coverage and repair any leakages. The small towns water and sanitation project was also initiated in 1998 to rehabilitate and expand sewerage systems in town councils. Other programs to improve piped water and sanitation include; the water sector policy and strategy, the Water Act of 1995, and the 1998 Water Resources Regulations.
- Installation of sewerage treatment plants like that at Bugolobi.
- Use of waste stabilisation ponds e.g. those constructed in Masaka 1990 – 1998
- Use of alternative methods such as septic tanks and pit latrines.

Usage of Improved Water Points

Case study visits were made in August 2004 by the '*Golden Team'* to Bugiri, Iganga and Rakai towns to investigate whether people with access to improved water points actually used them. The results from this limited analysis showed that people living within 1.5 km in rural areas or 0.2 km in urban areas do use the improved water sources to some extent, but in varying degrees. A number of people reported to use the improved water sources for all domestic purposes while the rest stated that they use them only as drinking water sources, not because of the distance but also because of long queues. The Bugiri case study showed that many people of Muterere Trading Centre collected water from an unprotected spring 2.5 km away because of the long queues at the borehole that is within the trading centre. *Box 7.1* presents a summary of the case of Muterere in Bugiri District.

Box 7.1

Use of improved water points–cases of Muterere and Lumbugu

Muterere village has a population of 2 000 people and one functional borehole. People start lining up for water at the borehole as early as 5 am and the long queue remains throughout the day until 10 pm when the pump is closed. The minimum number of hours that people spend at the borehole before getting water is said to be 3 hours. Most people use the borehole for drinking water and water for other uses is collected from the unprotected springs (Iyimbi Busini) in Lyimbi A village, which is 2.5 km away. People said they would rather walk long distances to collect water from unprotected spring than spend 3 hours waiting at the borehole.

The case of Lumbugu town 4 km from Rakai town also questions whether people within a given distance of a water point actually use that source for most of their water needs. Most people in Lumbugu town use piped water for drinking water only and the rest is collected from the nearby swamp because they cannot afford the cost of the water (Ushs.50 for a 20 litre Jerrycan).

Source: DWD 2004.

In summary, there could be a significant proportion of people within 1.5 km (rural) and 0.2 km (urban) of an improved water source, but who do not use them. Usage is affected by many factors including waiting time due to long queues (rural) and the cost of water (urban). The most reliable indicator of the use of safe water might not therefore be the distance to the nearest improved water point. Further work is needed in this area, with more focus on the time needed to collect water (for rural areas) and the cost of water (for urban areas).

7.2.3 Sanitation Coverage and Access

Improved sanitation has a direct bearing on the health and wellbeing of a community. NWSC's distribution network includes 13 sewerage treatment plants and 303 kilometres of sewer main. The low level of sewerage services coverage remains of major concern of the Corporation. However, in the year 2004, the Corporation continued with the programmes to initiate the expansion of sewerage service from the current low level of 8%. Among them was the completion of the Kampala Sanitation Master Plan whose objective was to provide an appropriate framework for the implementation of downstream sanitation needs. The study established that the low sewerage coverage was partly due to low levels of willingness and ability to pay, physical limitations of slum areas, and lack of enforcement of existing planning and sanitation regulations. However, the study also noted that a bout 94% of the population in Kampala had access to alternative forms of sanitation facilities.

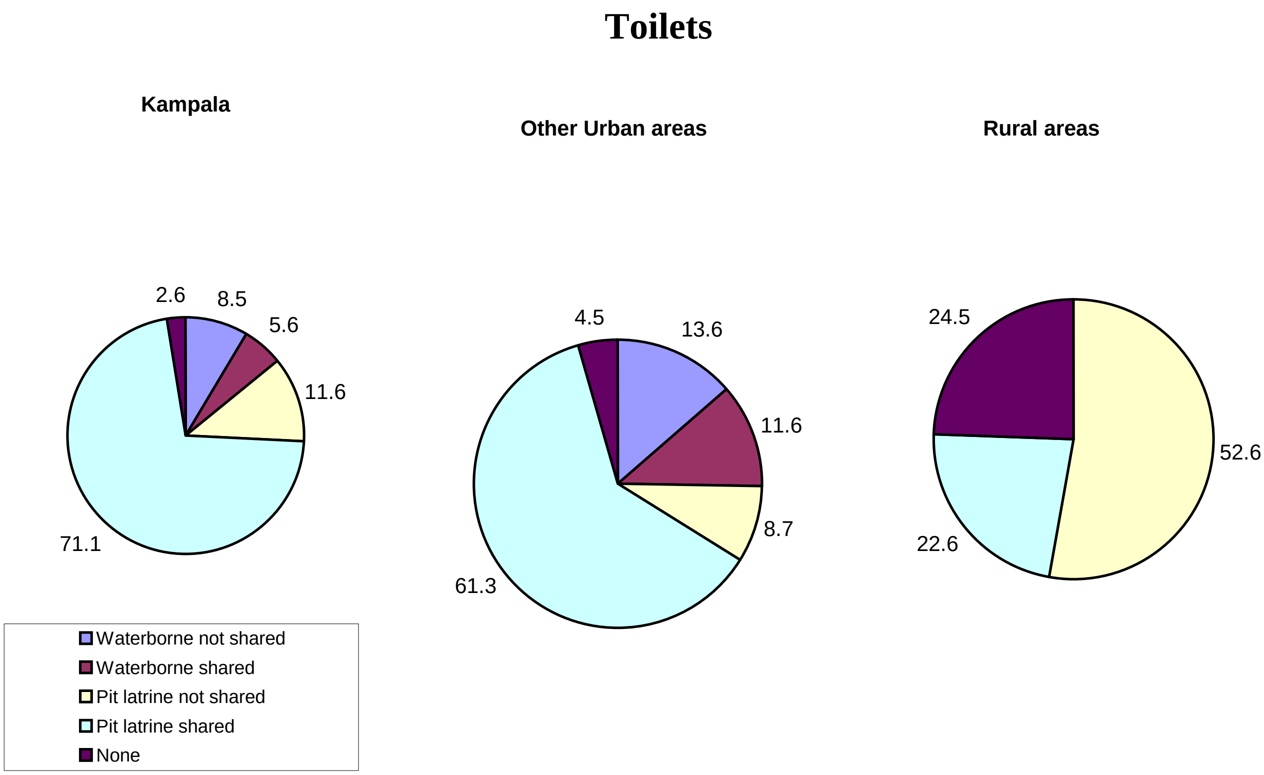
Despite the limitations in regard to sewerage coverage, 20 kilometres of sewer mains were laid and 153 new sewer connections made in the financial year 2003/2004 including an increase of 40% from the previous financial year of the volume of cesspool tanks emptying in Bugolobi Sewerage Treatment Works.

Inadequate sanitation remains a major cause of poor health and poverty in Uganda. It has been reported that sanitation-related diseases like malaria, diarrhoea, worm infections, eye infections and skin diseases account for roughly half of all the outpatient visits in the country and are the major causes of mortality and morbidity. About 440 children in Uganda die of diarrhoea weekly (MoH 2000).

Sanitation is a process where people demand, develop and sustain a hygienic and healthy environment for themselves by erecting barriers to prevent the transmission of diseases (UNICEF 1997). Broadly, sanitation is more than just building a latrine or disposing of human excreta. It includes good personal, domestic and food hygiene and safely managing solid and liquid wastes, the water chain and vector control. However, this report focuses on performance of sanitation as measured by latrine availability and usage.

Figure 7.2 shows the distribution of households by latrine/toilet facilities in 1990. At that time, the pit latrine was the most commonly used facility. In addition the siting of these latrines themselves were often given less concern leading to contamination of nearby streams and springs.

Figure 7.2 Percentage distribution of households by facilities as of 1990



Source: *MPED (1991).*

However latrine coverage, the broad indicator of (as a measure of environmental health), sanitation status has improved in the past few years from 41.7% in 1999 to 56% in 2002 and 60% in 2004. Though coverage has increased, this itself alone has not impacted significantly on sanitation diseases because the human hygiene aspects have remained poor. *Table 7.10* shows the performance of sanitation coverage by districts as of 2004. Sanitation-related diseases such as cholera, dysentery and worms have continued to be on the increase. Software activities including participatory approaches therefore need to be intensified at the grassroots with the Kampala Declaration on Sanitation as a valid and a viable strategy. Leaders in this country need to take the lead at all levels (MoH 2004).

School sanitation has always presented a great challenge that has been compounded by the introduction of the Universal Primary Education (UPE) in 1997. The UPE has resulted in a phenomenal increase in enrolment from 3 680 625 pupils in 1996, to 5 303 564 pupils in 1997 and 7 633 314 pupils in 2003 (MoES 2003). These high numbers of enrollments have required construction of more school classrooms and accompanying water and sanitation facilities. According to the MoES Management Information System, the average number of students per latrine stance has declined from 325 in 1997 to 64 in 2002. However, this improvement was still below the standard stipulated in the school building rules of 40:1 number of students: to stance ratio. On the other hand, the average masks significant variations from 26: 1 in Kalangala to 118: 1 in Yumbe (DWD 2004).

Table 7.10 Sanitation coverage by districts, 2004

District	Pit latrine coverage	
	Percent	Rank
Adjumani	41.1	36
Apac	55.4	19
Arua	49.5	26
Bugiri	n/a	44
Bundibugyo	52.0	24
Bushenyi	73.2	6
Busia	50.9	25
Gulu	n/a	44
Hoima	61.4	14
Iganga	48	27
Jinja	64	9
Kabale	87.4	2
Kabarole	63.0	11
Kaberameido	46.0	30
Kalangala	48	27
Kamuli	46.0	30
Kamwenge	55.7	18
Kanungu	92.0	1
Kapchorwa	47.0	29
Kasese	7.5	41
Katakwi	21.0	39
Kayunga	74.0	4
Kibale	60.4	16
Kiboga	53.0	23
Kisoro	60.5	15
Kitgum	n/a	44
Kotido	1.3	42
Kumi	40.0	37
Kyenjojo	55.3	21
Lira	46	30
Luwero	53.7	22
Masaka	63	11
Masindi	39.0	38
Mayuge	46	30
Mbale	57	17
Mbarara	71.8	7
Moroto	10.0	40
Moyo	n/a	44
Mpigi	n/a	44
Mubende	n/a	44
Mukono	75.6	4
Nakapipirit	0.8	43
Nakasongola	55.4	19
Nebbi	n/a	44
Ntungamo	62.0	13
Pader	n/a	44
Pallisa	64.0	9
Rakai	n/a	44
Rukungiri	86.0	3
Sironko	n/a	44
Soroti	43.5	34
Sembabule	42	35
Tororo	68	8
Wakiso	n/a	44
Yumbe	n/a	44
Average	52.0	

Note: *This was the first year in which such data had been collected and aggregated in this way. Where data was not available (n/a), the district was moved to the end of the rankings.*

Source: DWD, 2004.

7.3 Pollution

Pollution is the discharge of chemicals, materials, emissions or noise into terrestrial and aquatic ecosystems and the atmosphere in larger quantities than are sustainable.

7.3.1 Air Pollution

Emissions of a number of greenhouse gases (GHGs) have been increasing in the past due to anthropogenic (human) activities and to some extent due to natural phenomenon such as volcanoes. As discussed in the chapter on atmospheric resources earlier, these greenhouse gases have a low concentration in Uganda but can globally they change the earth's atmospheric radiation balance. In densely populated areas and cities, there is a lot of air pollution.

The most common pollutants are those that occur in the greatest quantities and whose effects on human health and the natural environment were acknowledged the earliest (OECD 1991). These include sulphur dioxide, nitrogen oxides, carbon monoxide, ozone and lead. These gases are emitted directly into the air. As fossil fuels are burned, carbon is oxidised to form carbon dioxide. Another source of CO_2 is as a result of land use change. Again, when forests are converted into farmland, organic matter is oxidised and emitted as CO_2 into the air.

In Kampala although the air quality in the city is believed to be relatively fair, industrialisation is creating some air pollution especially from such industries as abattoirs, oil and soap industries, meat and fish processing factories and the tannery. As for Jinja, it was observed that some industries emit offensive smells. Such industries include; leather tanning and fish processing. In Masese 1 and Loco Village where fish is washed, a lot of offals are left to rot and cause bad smell. In Kabale though there are no reports of air pollution, this does not mean that the air is without problems. The air is usually laden with dust during the dry season and it tends to reduce visibility (Kabale District Local Government 2004).

7.3.2 Noise Pollution

Noise is any unwanted and annoying sound that is intrinsically objectionable to human beings or which can have or is likely to have an adverse effect on human health or the environment. Even the sweetest music when played loudly becomes noise. Hence, noise is a nuisance to the affected populations both humans and non-humans. The main sources of noise in Uganda are located in or near residential areas and have no isolation. These places include; bars, discos, over night prayer meetings, generators, open video show rooms and quarrying activities.

It is important to note that the Constitution of the Republic of Uganda 1995, guaranteed every citizen a right to a clean and healthy environment devoid of among others, noise pollution. Noise standards for Uganda have been set for the general environment, for road vehicle and for public announcement systems as shown in *Table 7.11*, *Table 7.12* and *Table 7.13*.

Table 7.11 Noise standards for general environment

Facility	Noise limits dB(A) (Leq)	
	Day	Night
A. Any building used as Hospital, Convalescence Home, Home for the aged, Sanatorium, Institutes of Higher Learning, Conference rooms, Public Library, Environmental or Recreational Sites.	45	35
B. Residential Buildings	50	35
C. Mixed residential (with Some commercial and entertainment).	55	45
D. Residential + Industry or small-scale production + commerce.	60	50
E. Industrial	70	60

Source: Nema (2002)

Table 7.12 Accelerating road vehicle maximum, permissible levels of noise

	Vehicle category	Maximum sound level in db(a)
1	Vehicles intended for carriage of passengers and equipped with not more than nine seats, including the driver's seat.	78
2	Vehicles intended for carriage of passengers, and equipped with not more than nine seats including the drivers seat and having maximum permissible mass of more than 3.5 tones with an engine power of more than 150 KW With an engine power of less than 150 KW.	 80 83
3	Vehicles intended for carriage of passengers and equipped with more than nine seats including the drivers seat: vehicles intended for carriage of goods: With a maximum permissible mass not exceeding 2 tonnes. With a maximum permissible mass exceeding 2 tonnes but not exceeding 3.5 tonnes.	 79 80
4	Vehicles intended for the carriage of goods and having a maximum permissible mass exceeding 3.5 tonnes With and engine power of less than 75 KW With an engine power of not less than 75 KW but less than 150 KW With an engine power of not less than 150 KW	 81 83 84

Source: NEMA (2002)

Table 7.13 Public announcement system or device maximum, permissible levels of noise

Control Zone	Sound level dB(A) (Leq) Day	Sound level dB(A) (Leq) Night
Residential	60	40
Commercial	75	50
Industrial	85	65

Source: NEMA (2002)

7.3.3 Water Pollution

In the section on Water Resources, it was stated that the quality of the water in the country's lakes and rivers is poor and deteriorating. Water pollution is defined as any physical, biological or chemical change in the water quality that adversely affects living organisms or makes water less suitable for desired use (NEMA 2002). Sources of water pollution include industrial waste, municipal waste, and agricultural waste including gaseous emissions (NEMA 2002). Average industrial effluent discharge values were relatively high for biological oxygen demand (BOD) by 1990 (*Table 7.14*).

Table 7.14 Estimates of upper limit of biological oxygen demand (BOD) values for selected industries, 1990

Industry	BOD (mg/L)
Breweries	3 500
Sugar industries	100 000
Meat and fish processing industries	3 000
Leather processing	30 000
Oil and soap industries	30 000

Source: Droruga (1990)

To tame the high discharge values, a number of industries have since acquired wastewater treatment plants and cleaner production practices among others, supported by on-going research at various institutions (NEMA 2002). An innovative tertiary treatment of industrial wastewater using constructed wetlands has been successfully pilot-tested by the Uganda Cleaner Production Centre (NEMA 2002). Of the different plant species tested, papyrus (*Cyperus papyrus*) was found to be the most effective.

The institution directly responsible for effluent discharge issues is the Water Quality and Pollution Control Division of the Directorate of Water Development. The institution has the overall responsibility for controlling the discharge of wastewater into Uganda's waterbodies from any source. Permits for free discharge are granted by this institution if the wastewater is to the water standards established, otherwise a fee is payable for polluting the waterbodies. Wastewater containing pollutants exceeding the standards is charged using the BOD loading per tonne of oxygen per year (*Table 7.15*).

Table 7.15 Wastewater discharge fees schedule

BODs load Kg Oxygen/year	Unit charge Shs/kg Oxygen demand	Annual charge (Ushs)
100 and less	Not charged	Not charged
100 – 400	2.0	500 000
400 – 600	2.0	1 000 000
600 – 1800	2.1	2 500 000
1800 – 3000	2.1	5 000 000
3000 – 3800	2.2	7 500 000
3800 – 5200	2.2	10 000 000
5200 and above	2.5	13 000 000

Source: NEMA (2002)

7.3.4 Solid Waste Management

Solid waste refers to the refuse from households, non-hazardous solid waste from commercial and industrial establishments (not sludge or semi-solid waste), refuse from institutions, and street sweepings. The collection, recycling, storage, resource recovery, and disposal of solid wastes is what is referred to as solid waste management (SWM). *Table 7.16* shows selected parameters on costs of SWM. The data indicate that solid waste generation and the associated management is related to income levels and levels of industrialisation. As Uganda moves progressively from a low to middle income country, the *per capita* solid waste generation rate will also increase and so will the unit collection costs. Even if Uganda remains a low income country for the foreseeable future, the shear growth of the urban population will mean that absolute amounts of solid waste generated will increase.

Table 7.16 Selected parameters on costs of SWM

Parameter	Low income country	Middle income country	Industrialised country
1. SW Generation (ton/capita/yr)	0.2	0.3	0.6
2. Income ($/capita/yr)	350	1,950	17,500
3. Collection cost ($/ton)	15-30	30-70	70-120
4. Collection cost per capita ($)	3-6	9-12	42-72
5. Collection cost (% of income)	0.9-1.7	0.5-1.1	0.2-0.4
6. Cost of public cleaning ($/1 ton)	30-60	60-140	140-240
7. Disposal cost per capita ($ capital/per yr)	1-3	3-10	15-50
8. Disposal cost per capita ($ capital/per/yr)	0.2-0.6	0.9-3.3	9-30
9. Disposal cost as % of income	0.05-0.2	0.05-0.2	0.05-0.2
10. Transfer cost ($/tonne)	3-5	5-15	15-20
11. Transfer cost per capita ($/capital/yr)	0.63-1.0	1.5-4.5	9-12
12. Transfer cost as % of income	02-03	0.1-0.2	0.05-0.07

Source: Ngategize, Moyini & Others (2001) adapted from Cointreau-Levine (1994)

Based on the results of the 2002 Population and Housing Census of 24.7 million people, increasing at an average rate of 3.4% per year (UBOS 2005), by the end of 2005 Uganda's population should be somewhere around 27.3 million. Assuming 15% (or 4 095 000) of this population lives in urban areas, the amount of solid waste generated in the City, municipalities and towns would be equivalent to 819 000 metric tonnes. So, what does this mean for the environment?

Not all the solid waste generated is harmful to the environment. Close to 73% of solid waste generated in Uganda's urban centres consists of organic matter (Ngategize, Moyini & others 2001). In total approximately 88.1% of the solid waste generated is decomposable (*Table 7.17*). Metals and glass are recyclable. Hence, the biggest worry is plastics, making 1.6% of total waste generated. In the urban centres, therefore, 13 000 metric tonnes of plastic should have entered into the waste stream and ultimately the environment in 2005 alone.

Pollution from plastics waste is not only an urban issue. The Ugandan countryside is littered with plastics waste. If we assume that the *per capita* total solid waste generation for Uganda is 0.2 tonnes/capita/year, and that 1.0% of this waste is plastics (reduced from 1.6% to account for a lower level of plastics use in rural areas), then the total amount of plastics which entered into the Ugandan environment untreated was about 55 000 metric tonnes in 2005 alone. Using the same argument, the volume of plastics in 1991 would have been 33 800 tonnes, giving an average of 44 000 metric tonnes/annum over the 14-year (1991 to 2005) period. In total, therefore, over the period 1991-2005, an estimated 616 000 metric tonnes have accumulated in the Ugandan environment, blocking water sources, preventing infiltration of rainfall into the soil, while cattle and livestock die from injesting plastics as they feed on forage, among others.

Table 7.17 Estimated composition of solid waste generated in the urban areas of Uganda by category, 2002

Category	Percent
Organic matter	73.0%
Paper	5.4%
Sawdust	1.7%
Plastics	1.6%
Metals	3.1%
Glass	0.9%
Tree cuttings	8.0%
Street debris	5.5%
Other	0.8%
Total	**100.0%**

Source: **Ngategize, Moyini & Others (2001)**

Solid waste management in Kampala City Council is presented in *Box 7.2.* The data show only 25% of the solid waste generated is properly disposed of. The remaining 75% is disposed of mainly by open dumping which poses severe environmental hazards.

Box 7.2

Kampala City Solid Waste Management

The Engineering Department of Kampala City Council is entrusted with the responsibility of solid waste management in Kampala. Solid waste management is one of the biggest problems in the district. Mushrooming and unplanned residential areas in the district have outgrown the City Council's capacity for waste management and efficient disposal.

Kampala City Council is able to collect and transport only about 5 000 metric tonnes (25%) of the 25 000 metric tonnes of solid waste produced every month. *Table 5.18* shows quantities of waste generated and collected in Kampala. It is estimated that almost 80% of the households in the City are not served by Kampala City Council. The most densely populated areas such as Mulago II, Katwe and Kisenyi are hardly accessed by KCC's waste collection facility due to a combination of bad roads and absence of vehicle passway. The solid waste management in these areas is pathetic with garbage thrown all over the place. Households make their own arrangement to dispose of their waste. It is buried, burnt, thrown on unauthorised sites or disposed in mini permanent dumpsites established in the backyards or nearby locations by households. These sites are often a source of pollution (e.g offensive odour and breeding ground for vectors).

Domestic waste such as banana peelings, leaves and polythene bags are difficult to handle in an incinerator due to the fact that peelings have high moisture content while the plastic bags when burnt emit noxious and carcinogenic substances.

The industrial waste produced by such industries as coffee processors, wood workshops, hotels, tobacco manufacturing facilities, breweries, abbattoirs, etc in Kampala District are bio-degradable and can be further processed into useful by-products like fertilisers.

However, most of the 3 000 metric tonnes of solid waste (mainly animal material) generated by the abattoirs is put to some use. The City Council uses it to fertilise the parks while the hides and horns are used in the craft industry by private organisations and individuals.

Kampala hospitals do not have proper methods of disposal of their waste. Hospital waste has a high potential of spreading contagious and dangerous diseases. Mulago Hospital has a small incinerator but it cannot handle expired drugs. Hospitals like households dispose of their wastes in inappropriate ways. In Kampala District some hospitals have been accused of dumping waste bottles, expired drugs and syringes by the roadsides and in waterbodies especially Lake Victoria and sometimes the Kabaka's Lake.

Table 7.18 Number of population, amount of wastes generated and the disposal methods in Kampala

Year	Population	Average monthly refuse generated (tons)	No. of refuse trucks available	No. of refuse containers	Average quantity of waste collected (ton/month)	% Coverage	Disposal methods used
1969	330,700.00	8,929.00	12.00	Unknown	7000	78	Unknown
1980	458,503.00	13,755.00	10.00	Unknown	Unknown		Open dumping
1991	774,241.00	26,000.00	9.00	320	3500	13	Open dumping
2000	1,208,544.00	36,256.00	20.00	500	14000	39	Sanitary landfill

Source: KCC 1999 revised 2002

Open dumping, which is a commonly used method, by its nature, poses the most severe environmental hazard. As a result of private sector participation, collection and waste management has improved somewhat, but not adequate enough.

There has been a shift in recent years towards private sector participation in solid waste management at various levels in order to increase efficiency and effectiveness of the service. These include: BIN IT, NOREMA, Nabugabo Up-Deal Joint Venture and Hilltop. These firms collect garbage from different areas of the city at a fee. The Uganda Manufacturers' Association raised concerns requesting the Government to lift the ban and allow local producers and industries to start recycling polythene bags, and encourage garbage sorting at household level.

Source: Kampala District Local Government (2004)

The Public Private Partnership for Urban Environment (PPPUE) Project was put in place with the sole objective of increasing access by the urban poor to basic services and therewith, contribute to the creation of a healthy environment and the improvement of the living condition in urban and peri- urban areas in Uganda through the promotion of "Public–Private–Partnership" (PPP) in urban service delivery. The PPP approach to addressing urban environment problems has demonstrated the in-built value of satisfying multiple developmental objectives, namely:

- ensuring sustainable environmental management;
- improving the livelihood of the urban poor through participation in service delivery, and marketing of urban waste; and
- urban employment generation.

Positive impacts have been registered both from governance and environment perspectives. From the former perspective, the project has demonstrated that the poor can participate in urban service delivery provided there is commitment to give them an enabling policy environment, and to build their capacity. From an environment perspective, the project has turned environment 'bads' into business 'goods' commanding a market price (PPPUE 2004).

The relative cleanliness now enjoyed in the pilot municipalities is a fulfillment of one of the basic human rights under the Uganda Constitution, namely: a right to a clean and healthy environment. By testing out the application of user-charges for waste management, the project has operationalised the polluter-pays-principle within the framework of the National Environment Act and Agenda 21. Hence, the project has a lot of good lessons to share globally through the PPPUE Global Management Unit in South Africa.

The positive and negative impacts of the project from both governance and environment points are summarised in *Table 7.19* below.

Table 7.19 Positive and negative impacts of the project from both governance and environment point of view.

Positive impact	Negative impact
A: GOVERNANCE PERSPECTIVE	
1. The project has mobilised, organised and supported marginal groups (CBOs) for urban service delivery, thereby marketing them as potential key players in the decentralised service delivery.	
2. The project has exposed weaknesses within the rules, procedures, practices and policies for service delivery in general and specifically for the poor, and has made them start to receive attention for revision.	
3. The project has stimulated the desire to create an enabling environment for continued participation of the poor in the service delivery through the drafting of the bye-laws and create an opportunity to effectively empower people to participate and own the process.	The project has not been able to identify and mainstream lessons learnt to the national line ministry level and to other sector ministries to inform policy decision makers.
4. By allowing the local poor people to participate in the service delivery alongside the rich firms, the project has not only ensured equity, but it also broadened the livelihood opportunities of the poor.	
5. The project has marshaled and leveraged resources from several stakeholders (household, CBOs, Municipalities and Global community) and thereby made it feasible to address the urban problems which the Municipalities were unable to handle using their own resources.	
B: ENVIRONMENT PERSPECTIVE	
1. The project has successfully demonstrated that environment ‘bads’ can become business ‘goods’ worthy of commanding a price and thereby becoming sources of livelihood for urban poor.	1. The project has exposed some groups to environmental health hazards by failing to insist on basic environmental compliance standards and/or recommending use of environmentally appropriate technologies. Contract compliance is crucial to enforce the use of appropriate safety equipment by service providers
2. The relative cleanliness now enjoyed by the pilot districts is one of the basic human rights under the Uganda Constitution namely: a right to a clean and healthy environment.	
3. The project has demonstrated and created synergies among four of the eight MDGs, which the Government uses to monitor its overall development progress. The MDGs are: MDG I: Fighting extreme poverty and hunger. MDG 4: Promoting gender equity and empower women. MDG 7. Ensuring sustainable environment. MDG 8: Developing a global partnership for development.	
4. By testing out the application of user-charges for waste management, the project has operationalised the polluter-pay-principle within the framework of the National Environment Statute 1995. Likewise, it has broken the resistance to contribute to environmental cleaning.	
5. Further, the acceptance of user-charge is starting to demonstrate ‘win-win’ solution, namely a win for environment, and a win for revenue generation. In that way, the global aspiration which were proclaimed at Rio in 1992 are starting to have a local ownership.	

Source: (PPPUE 2004)

7.3.5 Cleaner Production

Cleaner production is the continuous application of an integrated preventive environmental strategy applied to processes and products so as to reduce the risk to human environment (UCPC 2003). This involves solutions to enable companies to take the necessary steps to minimise environmental damage caused by their activities while maximising economic gains. Listed below are the six principles of cleaner production:

- aiming to avoid the generation of wastes at each stage of the production process.
- conserving raw materials, water and energy through improved process efficiency.
- substituting of toxic and dangerous materials.
- reducing of the level of toxicity of all emissions and effluents at the source during production.
- recovering, recycling and re-using by-products and waste as much as possible in order to turn them into profits.
- reducing of the environmental health and safety impacts of production over their entire lifecycles (UCPC 2003).

Cleaner production has got to be put in place for those already existing industries so as to reduce industry-related pollution and eco-design when planning, constructing and commissioning of a new factory.

Cleaner production is still a new concept in Uganda. Many industries still use old technologies in their production and end-of-pipeline solutions to manage wastes. Environmental standards are being set on the assumption that compliance will be achieved by using end-of-pipeline solutions. Uganda Cleaner Production Centre with over 20 national cleaner production centres is supported by the United Nations Industrial Development Organisation (UNIDO). Many enterprises, especially the small and medium-sized claim that they cannot afford to invest in cleaner production. After the establishment of NEMA, a number of regulations have been put in place. Notable among these is the National Environment (Waste Management) Regulations 1999. Article 5 of these regulations emphasizes the need for enterprises to practice cleaner production in order to prevent pollution and minimise waste generation (UCPC 2003).

Kampala City is the centre of economic activities and their associated pollution effects. Most industrial wastes and gaseous effluents which have been of concern, have in turn caused pollution of wetlands like Nakivubo and evidence of nutrient load into Lake Victoria. The air quality has also been degraded. According to the Kampala District State of Environment Report 2004, several industries have completed or are undergoing cleaner production. These include fish processing industries for which reduction in solid wastes, water consumption, effluent volumes and process efficiency have been achieved and the pollutant load in effluents significally reduced. Regular monitoring of the city air quality is encouraged but this should be accompanied by promotion of alternative energy sources such as non-leaded fuels as well as enforcement of standards (Kampala District Local Government 2004). The air quality deterioration from vehicle emissions has been acted on through the introduction of unleaded fuels by the private sector as well as enforcing higher taxes for old vehicles imported, while the national standard of air quality is also being finalised as well.

Cleaner production is a process and therefore some options, which have been implemented, may still need monitoring for further improvement. Many options identified however could not be implemented in the new plants built in 2003/4. These include those listed in *Table 7.20*. Gomba Fishing Industries Limited received support from Uganda Cleaner Production Centre throughout the eco-benefit program and has greatly benefited from the experience.

Table 7. 20 Key options, targets and benefits of Cleaner Production

Key options	Targets	Benefits
Installation of separate water metres for fish processing and tannery, metres for production refrigeration and staff quarters	For independent monitoring of water use in these areas and particularly to be able to decrease water usage in the production department to $6m^3$/tonnes raw fish	Savings to the company through utilisation of water
Reduction of water use in production department and clean water minimisation through careful monitoring	Reduce water utilisation to $6m^3$/tonnes of raw fish	Reduction on both clean and waste water and therefore in costs or increased savings
Delamping in areas were there are too many lamps. Use of energy saving lamps in the factory and to change from high pressure mercury (>250w) to low pressure sodiumvarpomlamps (60-90w) For security lights or photocellused for automatic control of security + lights. Shift load to off peaks times (10 pm – 6 am)	For independent monitoring of electricity use in these areas and particularly to be able to reduce electricity utilisation in the production department by 5 %	Saving on energy as a result of reduction on electricity use
Use of ear muffs especially in the refrigeration section	Reduction on noise levels to acceptable levels (<80db)	Reduction on health hazard of noise
Separate Gomba fishing industries vehicles and continue monitoring their running costs separately. Continue use of optimum size for transportation of fish	Reduce the cost of fuel used by 10 % by December 2003	Saving fuel costs and reduction in air pollution

Source: UCPC 2003

7.4 Poverty

Poverty has been and remains a major cause and consequence of environmental degradation and resource depletion. In spite of being a landlocked country, Uganda in the last decade has experienced impressive economic growth of over 5% per annum (MFPED 2002). Despite this, the country remains one of the world's poorest countries ranked 146th out of 177 countries in the United Nations Human Development Index (0.493). *Per capita* income was around $ 300 in 2003, according to national authorities (UN 2004). However, over the last decade the poverty trends have fallen dramatically in some parts of the country. In 1997, the government launched PEAP as a national policy framework for enabling the majority of Ugandans to have access to basic services and improve on their household incomes over the period 1997 to 2017. Poverty and environmental degradation are linked in a vicious circle in which a significant percentage of the population cannot afford to take proper care of the environment.

Poverty trends

Basing on the surveys carried out in the 1993/94 period, the poverty lines for food and total expenses for households stood, respectively, at Ug.shs 11 500 and Ug.shs 16 400 per month. The improvements in economic indicators have not occurred at the same pace as improvements in social indicators. For instance, child mortality rates have been high since the 1960s and life expectancy has declined further. Nonetheless, poverty levels have been declining, which has contributed largely to economic growth. For example, headcount poverty fell between 1992 and 2000 from 56% to 35% and then rose somewhat. Nearly 9.5 million Ugandans constituting 38% of the population lived in poverty by 2002/03 (UBOS 2004).

As stated above, income poverty fell between 1992 and 2000 from 56% to 35% and then by 2004 rose again to 38%. Poverty shows marked regional differences. In the north of the country 72% of the population was considered poor while it fell to 46% in the central region. Economic growth in the 1990s reduced the overall headcount poverty to 35% by 2000. There was slightly more decrease in the rural population than among the urban dwellers. However, the above situation changed in 2003 when the headcount poverty increased to 38% showing a faster rising of poverty in the rural areas, especially among crop farmers. Female-headed households benefited less from the fall in poverty in the 1990s, but were less affected by the reversal, which appeared to be accounted for by increased poverty amongst male-headed households. Inequality, as measured by the *Gini Coefficient* was rising even when poverty was falling in the 1990s, but has risen more sharply thereafter. *Table 7.21* shows regional poverty and the national inequality in Uganda from 1992 to 2003.

Table 7.21 Poverty and inequality in Uganda, 1992-2003

	1992	1997/98	1999/00	2002/03
Poverty headcount by geographical location (%)				
National	56	44	34	38
Rural	60	49	38	42
Urban	28	17	10	12
Central	46	28	20	22
East	59	54	35	46
West	53	43	26	31
North	72	60	64	63
Poverty headcount by gender (%)				
Female	56	n.a	39	39
Male	56	n.a	33	38
Poverty headcount by occupation group (%)				
Food Crop	64	62	45	n.a
Cash Crop	63	46	34	n.a
Crop Farmers	n.a	n.a	39	50
Non-Crop Agriculture	55	40	42	34
Manufacturing	44	34	23	28
Construction	37	35	20	23
Trade	26	21	13	17
Government Services	37	32	15	13
Not Working	59	60	43	38
Gini Coefficient (National)	0.36	0.35	0.39	0.43

n.a – not available
Source: MFPED, 2004: Poverty Eradication Action Plan (Draft), Tables 2.1 & 2.2

The fall in poverty during the 1990s was accompanied by improved wellbeing. The MDG Progress Report of 2003 assessed that Uganda would probably or potentially attain all MDG targets except for child mortality and maternal health. But the target on HIV/AIDS has already been attained. Progress in non-income poverty indicators of the social wellbeing such as improved quality of life have shown positive outcomes due to increased investments in social sectors, especially education. However, data were not available to indicate whether the increase in income poverty after 1999 undermined the positive trend of improvements in quality of life.

There have been discussions on the root causes of poverty in Uganda prompting the government to undertake two Participatory Poverty Assessments (PPAs) in 1999 and 2002, with the intention to "*bring the voice of the poor into planning for poverty reduction*". The outcome of these assessments indicated that people themselves see poverty mainly in terms of "*inability to satisfy a range of basic human needs that stems from powerlessness, social exclusion, ignorance and lack of knowledge, as well as shortage of material resources*" (MFPED 2003).

The Poverty Eradication Action Plan (PEAP) is Uganda's comprehensive development framework. It has guided the country's formulation of policies and planning frameworks since 1997. PEAP lays emphasis on public actions across the different sectors and its main objective is to combat poverty by increasing income levels, improve access to basic services and build capacity of the people to enjoy a healthy environment. Under the PEAP, Uganda is being transformed into a modern economy through poverty eradication and by involving all actors including the public sector, private sector, development partners and civil society. The plan focuses on policies that address causes as well as manifestations of poverty, a phenomenon that affects the majority of Ugandans. The government has adopted the following poverty eradication strategies:

- increased access to productive assets, especially land;
- maintaining and consolidating macro-economic stability including fiscal stability, low inflation and predictable policy environment; and
- providing information about the efficient use of resources, including the provision of adequate health and education services for the poor.

The Human Poverty Index (HPI) measures the status of human poverty. The index is a measure that reflects the extent of deprivation. The HPI indicates how worse or better off a country is in terms of human poverty. It measures the level of deprivation from access to education and literacy, to living a long and healthy and decent life. The closer the index is to 0, the better the progress, while the closer it is to 100, the more deprived the country is.

At national level, the HPI reduced from 39% in 1996 to 34% in 1998. However, between 1998 and 2000, it registered an increase from 34% to about 38% (MFPED 2003). This increase was due to a corresponding expansion in the percentage of the population not expected to survive to age 40, which is a basic variable in the computation. HIV/AIDS has also contributed to this low level of survival. *Table 7.22* shows Uganda's Human Poverty Index by regions.

Table 7.22 Uganda Human Poverty Index, 2003

Region	**Not expected To survive to age 40**	**Illiteracy**	**Population without access to safe water**	**Children moderately underweight**	**Econ. Prov Average of cols (4&5)**	**Regional HPI**	
						2001	**2003**
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Rural	44.2	41.0	42.4	23.6	33.0	40.3	39.9
Urban	35.3	13.0	13.0	12.4	12.7	25.0	25.2
Central	38.2	23.0	37.4	19.9	28.7	31.1	36.1
Eastern	39.9	41.0	32.1	22.5	27.3	37.1	36.1
Northern	47.1	54.0	29.7	25.0	27.4	46.1	41.7
Western	46.8	35.0	48.7	23.7	36.2	39.0	38.5
Uganda	42.9	32.3	37.4	22.8	30.1	37.5	36.0

Source: UBOS (2004)

While poverty in Uganda reduced from 56% in 1992 to 35% in 2000 and then rose to 38% by 2003, poverty remains largely a rural setback with 96% of the poor living in rural areas, where 85% of the population lives.

Data from the Uganda National Household Survey 1999/2000 shows that although some districts have registered some progress in the indicators of human poverty, quite a number of other indicators have instead declined.

Linking poverty to the environment

Poverty was traditionally defined as the lack of basic needs and services such as food, clothing, beddings, shelter, paraffin, basic health care, roads, education and information. From the PPAs, this definition has been broadened to include the lack of opportunities for survival and employment, and having limited or no productive assets such as farm tools (PMA 2000). The environment matters greatly to people living in poverty. The poor often depend directly on a wide range of natural resources and ecosystems services for their livelihoods and they are the most affected by impacts of environmental degradation such as water pollution, indoor air pollution and exposure to toxic chemicals. In addition, they remain vulnerable to environmental hazards such as floods, prolonged droughts, crop losses through diseases and pests, and conflicts.

In addressing poverty, the linkages between poverty and the environment must be at the core of national efforts since poor people resort to natural resource exploitation for lack of alternative income generating activities. Again the poor derive their basic needs from environmental goods and services and the environment is critically important for their survival. Addressing environmental issues that matter to the poor is critical for sustained poverty reduction, and in order to achieve the MDGs. This requires a more "pro-poor" and integrated approach, linking action at local, national and global levels. The linkages between poverty and environment focus on ways to reduce poverty and sustain growth. It also seeks to demonstrate that sound and equitable management of the environment is integral to achieving the MDGs, in particular to eradicating extreme poverty and hunger, reducing child mortality, combating major diseases, and ensuring environmental sustainability. To the poor, poverty is defined "*as more than just the lack of income; but also the lack of the means to satisfy basic social needs, as well as a feeling of powerlessness to break out of the cycle of poverty and insecurity of persons and property"*. Many of these basic necessities are derived either directly from the environment and the natural resource base or indirectly by harnessing resources from nature to generate incomes.

Different households engage in a wide range of environment-based economic activities including firewood collection and selling, brick making, charcoal production, mining, and stone quarrying, hunting and gathering of wild fauna and flora for food and herbal medicine. The latter provide useful "safety nets" for the poor, which enable them to secure their livelihoods. It should be noted that the poor are inherently vulnerable because their survival is dependent on the goods and services provided by environment and natural resources. Due to their dependence on environmental resources their livelihoods are highly vulnerable to sudden shocks and changes in physical conditions. As poor people command a very minimal asset base, they lack alternative opportunities to make a living. In turn this means that their incomes are variable and unstable. Any slight adverse change in the condition of the physical resource base on account of shock, stress or disaster worsens their wellbeing. An example of poverty-environment linkages is illustrated by the Case Study presented in *Box 7.3*.

Box 7.3

A Case Study of Omola Dyang Community, Bala Sub-county, Apac District

Omola Dyang for instance had a large forest reserve called Kulu Obia covering an area of 210 ha. The reserve had a variety of tree species although *Terminalaia species* formed a dominant vegetation.

The reserve was gazzeted by the Forest Department as a Central Forest Reserve (CFR) in the late 1950s. The 1979 civil war and the subsequent laxity from the Forest Department had a dramatic impact on the existence of the reserve. The reserve turned out to be a major source of livelihood for the surrounding community in terms of fuelwood providing for home utilisation and charcoal burning to generate income; cultivation; and livestock grazing.

Encroachment in the reserve intensified in the 1980s to the extent that it even attracted settlement where people built permanent homes in the reserve. The illegal activities came to apeak in 2000 when insecurity forced people from other areas into the reserve. Currently, one hardly sees any tree in the reserve. People have fully cultivated and settled in the reserve.

A field visit to the reserve with intention of finding the above impacts of farming and settlement on the lives of the community revealed the following.

- Women and children walk longer distances to access firewood some times in isolated risky places.
- Sale of charcoal and firewood, which used to be a major source of income to the community is no more.
- Serious conflict on land ownership inside the reserve has erupted.
- Livestock grazing is also becoming a problem since cultivation and settlement have reduced grazing space.
- Agricultural productivity has continuously reduced over the last 8 years due to soil exhaustion.
- Since there are no more trees in the area depicting it as a reserve, more Internally Displaced Persons (IDPs) have been attracted to settle there.

Analysis
Charcoal burning and sale of firewood are no more. Women and children walk longer distances in search of firewood for domestic use. Land conflicts and low agricultural productivity have ensued. Thus, it has become clear that the livelihood of these people is gone. With worsening environment degradation, the poverty situation has intensified.

Source: Apac District Local Government(2004).

7.5 Environmental Health

Health is a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity. It should be noted that there is a strong relationship between environmental quality and the health status of the human population living in an area. Poor living and working conditions expose people to physical, chemical and biological pollution and to adverse psychological and social factors that may harm their health (MoH 2004/2005). Again, people through their endevour to survive do influence the environment often negatively. Therefore, a complete state of health can only be obtained with a healthy environment. The majority of Ugandans live in rural areas and they have limited access to health care facilities due to factors like distance to health centres, geophysical features like rivers and hills, and poverty. Only 42% of the parishes in the country have health facilities (health inventory 2000) even where the health facilities exist, access to basic elements of the health care package is far from optimal. It has been noted that Uganda has a poor health indicator and a heavy burden of diseases compared to the neighbouring countries like Kenya and Tanzania (NEMA 2002). Furthermore, the distribution of health workers in Uganda favours urban centres yet the biggest percentage of the people live in rural areas.

The main diseases of concern in the country which are also closely and directly linked to environmental conditions are malaria, and waterborne and respiratory diseases. The HIV/AIDS epidemic has an indirect although important association with the environment, in part as a result of its negative impact on agricultural production.

Malaria

Malaria is one of the most serious public health and environmental problems in the less developed countries and it is endemic in 102 countries, including Uganda. Malaria is the leading cause of death in the country. It has been noted that malaria claims a child's life every 30 seconds. Up to 30% of all deaths among the 2-4 year old age group are caused by malaria. Available medical statistics of malaria cases in Uganda in 2004 were 10 688 020 out of whom 4 142 231 or 38.5% were children under five. Malaria is the number one killer in the world and 3-5 million people die of the disease annually. Over 90 per cent of annual malaria deaths (1.35-2.43 million) occur in Sub-Saharan Africa, majority being children under five. *Table 7.23* shows common diseases prevalence rates in Kampala City in 2004. The data support the assertion that malaria is the number one killer disease. It accounted for 29% of all ailments.

Table 7.23 Common diseases prevalence rates, Kampala City, 2004

Disease	% Prevalence
Malaria	29.0
Diarrhea	14.4
Respiratory tract infections	10.0
Skin diseases	3.0
Intestinal worms	3.0
Trauma	3.0
Others	37.6

Source: Kampala District Local Government (2004)

In the 1960s, some areas in Uganda like Kabale did not have malaria because of their cold weather. But today, there is a lot of deforestation, reclaiming of wetlands in high altitudes and this has contributed to increased temperatures and thus the spread of malaria in these areas where the people had no adaptation to the disease. The implications of malaria are beyond health. Malaria affects the economic development of the country in the sense that it keeps the poor societies poorer, reduces agricultural productivity since people cannot go to their farms when they are sick, hence reducing the incomes earned by each family. More so, in urban areas, people lose their jobs because they are too sick to work. Unhygienic conditions such as bush and stagnant water are fertile breeding places for mosquitoes. Which in turn are responsible for the spread of malaria. Previous control measures of direct relevance to the environment include planting of *Eucalyptus sp* in urban areas to drain swamps which are breeding grounds for mosquitoes and the clearing of bushes. While these measures were to some extent effective in reducing mosquito populations they at the same time triggered negative environmental impacts such as wetland degradation, and localised deforestation as a result of bush clearing. Before the chemical was banned globally, DDT was also used to contol mosquito populations. There is recent government interest to re-introduce DDT for indoor residual spraying as a malaria control measure. An EIA was commissioned by the Ministry of Health, however the results of the study are not yet publicly available.

However, the Ministry of Health has a Malaria Control Programme where, in districts, the programme assists with maintenance of health units, stocking of drugs, and ensuring prompt treatment. Also, the government has reduced taxes on mosquito nets and the chemicals used to treat them. This was a big step taken by the country in an attempt to fight malaria. From current statistics, there is evidence to show that the use of mosquito nets has increased. *Table 7.24* shows proportions of populations by regions and other attributes using mosquito nets.

Table 7.24 Mosquito net usage

	Households owing at least 1 mosquito net	**Percentage of children under 5 years with mothers who**	
	Percent	**Slept under a mosquito net last night**	**Usually sleep under a mosquito net**
By residence			
Urban	39.9	21.1	23.4
Rural	9.2	5.7	6.3
By region			
Central	15.3	7.3	8.2
Eastern	15.4	9.9	11.1
Northern	14.6	9.8	10.7
Western	5.5	2.2	2.4
By quality of house			
Electricity	46.1	21.5	23.3
Piped water	33.2	21.0	23.0
Finished floor	30.7	15.2	17.2
None	8.3	5.8	6.4
Total	**12.8**	**7.3**	**8.1**

Source: UBOS (2002)

Cholera

Cholera's mode of spreading is through contaminated water and food via hands as well as poorly disposed of feacal material. It spreads rapidly in heavily populated communities with poor sanitation and drainage water. Children are particularly susceptible to the disease. Cholera develops within a few hours and the person loses so much water and salts and dies within 24 hours. Cholera has been reported in a number of districts since 1997. Recently, it has been reported in Arua and Kasese districts, and the Katanga region of Kampala District.

The Ministry of Health has devised means to provide comprehensive preventive health services. It works hand in hand with the Ministry of Education and Sports to implement health promotional programmes in schools.

Dysentery

This is where a person has diarrhoea with visible blood in the stool and usually accompanied by abdominal pain. The disease is due to poor sanitation and hygiene practices in many parts of the country. Currently, 54 out of 56 districts have reported dysentery cases. The Department of National Disease Control and the Government are working hand in hand to control the disease through, among others, awareness creation.

Respiratory diseases

The main causes of respiratory diseases include poor ventilation, over-crowding in homes, smoke and other chemical substances, which cause allergies. Combustion of woodfuels in homes emits gases like sulphur dioxide, nitrogen oxides, carbon monoxide and polyaromatic hydrocarbons (PAHs) all of which have adverse effects on human health. These gaseous emissions aggravate respiratory diseases such as asthma, chronic bronchitis and emphysema. PAHs are carcinogenic. Rural areas and slums in urban areas are the most affected by respiratory diseases due to poorly built houses, which lack ventilation. The gases emitted by the burning of woodfuel affect mainly women and children who spend long hours in smoky kitchens during food preparations (NEMA 1997).

Sleeping sickness

Sleeping sickness is spread by *Cruzei rhodesiense* tsetse fly caused by a germ called *Triponasoma gambiense*. The symptoms at the early stages are persistent headaches, on and off fever, general body weakness, joint pains and stiff necks. However if the disease is not reported early, then the victims' conditions will be complicated with muscle stiffness, mental confusion, apathy and incontinence urine. The situation may also lead to the enlargement of saliva glands. Treatment of the disease is best when done in the early stages.

Despite it being less rampant in the recent decades, the disease still exists in some parts of the country especially in the Busoga region. Sleeping sickness has hit Busoga covering all the five districts in the region that is Jinja, Mayuge, Iganga, Bugiri and Kamuli. Part of the West Nile region is also affected. The situation of sleeping sickness is serious and mostly affecting children of school going ages. However, the disease is not new in the country as it first attacked Busoga way back in the 1930s and 80s. The reason for the disease's return to Busoga after such a long period cannot easily be established as a number of people blame it on the livestock restocking programme. But from some sources, the disease has been around for the last six years and it is only recently that it increased. People in the communities are warned not to take tsetse fly bites casually because any bite is potential for sleeping sickness and people should report them immediately it occurs.

The control of the disease vectors has not yet been addressed as it was in the previous years. In the 1980s, there were fly traps and a plane was used to fly over the villages spraying pesticides. Care has to be taken that the chemicals used for spraying do not persist in the environment. Drugs for treatment are in stock and treating the patients is done at Namungalwe Sleeping Sickness Treatment Centre in Iganga.

HIV/AIDS

HIV/AIDS is the second killer disease in the world, the first being malaria. In Africa HIV/AIDS was first discovered in Uganda in 1982 among the fishing community of Kasensero village, Rakai District along the shores of Lake Victoria (UBOS 2001). There are different types of the HIV virus; the one occurring in Uganda is HIV-1, which is common in most of Sub-Saharan Africa (UN 2004). Some 3.1 million people died of HIV/ AIDS in 2004 in the world; 2.3 million adults and children were from Sub-Saharan Africa.

HIV/AIDS is among the leading causes of death in Sub-Saharan Africa and the epidemic has spread with devastating speed (World Bank 2001). Over 2.4 million adults and children are estimated to have died due to HIV/AIDS in the year 2000 alone (WHO 2000). HIV/AIDS is not only a public health problem it is also a threat to the development of Sub-Saharan Africa.

More than 95% of the 36 million people in the world living with HIV/AIDS are in developing countries, and 25 million (or 69%) of them are in Sub-Saharan Africa (UNAIDS 2001; UNAIDS /WHO 2000). In Africa, HIV/AIDS is largely a rural / urban poor issue, where a matrix of socio-economic, cultural and gender-related vulnerabilities indicate that the links between AIDS, food insecurity and poverty are strong and deadly (UNEP 2000b). HIV/AIDS is a threat to sustainable agricultural and rural development through its systematic impacts (FAO 1999). This epidemic has many impacts on the people, environment and economy such as: labour shortage and declining agricultural productivity, reduced incomes, increased expenditure on medical treatment; and an increase in the dependency ratio.

The disease is an extremely serious threat to the health, security and development of Uganda (UNDP 2001). HIV/AIDS is one of the major challenges to human development at individual, community and national levels. The disease pauses a grave burden to the health of the people, reduces their incomes, threatens their livelihoods and poses a threat to the economy and security of the nation. Of all the societal groupings, the poor have borne and continued to bear the brunt of the problem. According to the UNDP report 2001, there are historical factors that contributed to the spread of HIV/AIDS among the people. These included cultural practices where a widow would be taken over by someone in the family, mother to child transmission and through infected blood. Due to the above, the rate of infection was so high till the government intervened and educated the people and they became aware of some of the ways through which the virus was spread. As a result, there has been a decline in the infection rate at antenatal clinics (*Table 7.25*).

Table 7.25 HIV infection rates in antenatal attenders

District	Centres	HIV infection prevalence rate (%) in 2000	HIV prevalence rate (%) in 2001
Kampala	Nsambya	11.8	9.5
Kampala	Rubaga	10.7	10.4
Mbarara		10.0	10.6
Jinja		8.3	7.4
Tororo		4.7	7.0
Mbale		5.5	5.6
Kasese	Kilembe	4.2	2.1
Soroti		5.0	5.0
Hoima		-	5.3
Arua		5.2	4.8
Pallisa		3.8	3.7
Moroto	Matany	1.99	1.7
Kibale	Kagadi	10.5	7.4
Kisoro	Mutolere	2.1	4.1
Moyo		2.7	2.7
Gulu	Lacor	13.1	11.3
Location			
Urban		8.8	8.7
Rural		4.2	4.2

Source: Aids Control Programme (2002).

According to recent statistics, there is a general decline in the rate of HIV/AIDS infections. For instance the rate has dropped from over 30% in 1992 to 6.5% in 2001 and it is 4.2% in rural areas to 8.8% in urban areas (UNDP 2001). Also the rate of other sexually transmitted diseases has fallen from 44.2% in 1989 to 20.5% in 2000. However, there are more infections among females than males and according to the 2002 population and housing census there are more females (12.6 million) than males (12.1 million) in the country.

Malnutrition

This is one of the most important health problems among infants and young children in Uganda. It is ranked among the top ten killers in the country. About 2% of the deaths in children under 5 years of age are due to nutritionally-related causes (MoH 2003). The most common malnutrition diseases among the under-fives in Uganda are; *Kwashiorkor*, *Marasmus*, stunted growth and under weight. Malnutrition lowers the child's immunity making it more susceptible to diseases like measles and respiratory infections. About 61% of rural children are severely stunted compared to 8% in urban areas (MoH 2002). There are regional differences in the proportion of chronically under-nourished children. The proportion of stunted children is highest in the western (43%) and northern (42%) and lowest in the central region (34%). Maternal under-nourishment can lead to anemia during pregnancy with its attendant problems, which may include abortion, still birth and low birth weight. Prevalence of anaemia in pregnant mothers in the 1985 – 1999 period was rated at an average of 30% (World Bank 2000). Malnutrition leads to poor development of the brain and to reduced individual achievement. Maternal malnutrition induces stress hormones through the endocrine pathways, which prevent mothers from producing antigens. The antigens are supposed to protect infants from diseases before they develop their own immune systems. Thus malnutrition in mothers makes their infants vulnerable to disease by denying them immunity against the diseases (Frank 2000).

According to the UDHS carried out in 1995, 43% of children below 5 years of age were found to be stunted as a result of malnutrition. This was the highest recording in Sub-Saharan Africa. Malnutrition is itself determined by other factors. These include the education and social status of the child's mother, much more than the availability of food (Smith & Haddad 2002). Malnutrition can lower a child's immunity, making it more susceptible to diseases such as measles and respiratory infections (KCC 2004). There are several factors affecting the nutritional status of Ugandans. These are:

- cultural practices;
- inadequate lack of knowledge on proper nutrition;
- large family sizes;
- low incomes;
- inadequate lack of proper food processing and storage facilities;
- a poor distribution and marketing system;
- poor agricultural practices; and
- poor transport systems.

Trends in malnutrition have been relatively stable for the last 10 years although they have been subject to seasonal variations, deteriorating prior to the peak of the harvest season and improving after harvest. The health and social consequences of nutritional problems include the following.

1. In young children, the impairment of physical and psychomotor development, impaired immune response associated with an increased susceptibility to

infectious diseases and death as well as mental retardation and poor school performance.

2. In adults, the reduction in physical capacity, decreased work output and productivity, reproductive wastage and poor reproductive outcomes as well as impaired mental performance.

Collectively these adverse effects result in stagnation in the national socioeconomic development process.

To address child health inequalities focus should be put on households by ensuring gender equality in formal education and measures that will improve household socioeconomic positions. The stunting indicator should guide development and health workers to effectively target vulnerable households. The causes and potential consequences of higher prevalence of stunting among males compared to females should be explored.

The nutrition status of the population particularly children and women is poor and has been identified as a major health problem in Uganda. In order to control diseases due to nutrition anaemia, protein energy malnutrition, iodine deficiency disorders and vitamin A deficiency, a combination of strategies including awareness building, case management, rehabilitation, and supplement on food fortification and diet diversification should be employed. The Department of Community Health aims to use a multi- sectoral approach with other sectors in the implementation of strategies to improve the nutrition status of Ugandans.

7.6 Cultural Heritage

Cultural heritage is part of humanity's relationship to the world and past achievements and discoveries (AsDB 2003). Cultural heritage, also often refered to as 'cultural property', 'cultural patrimony' or 'cultural resources', is defined as the present manifestation of the human past (AsDB 2003). It refers to sites, structures and remains of archaeological, historical, religious, cultural or aesthetic values (AsDB 2003).

The National Environment Act Cap 153 provides for the protection of the country's cultural heritage. Furthermore, as a member of the global community, Uganda is a Party to the convention on the *Conservation for the Protection of the World Cultural and Natural Heritage, 1972. Table 7.26* shows the different items which collectively constitute cultural heritage.

The Department of Antiquities and Museums (DAM) of the Ministry of Tourism, Trade and Industry is the institution responsible for the conservation of Uganda's cultural heritage. Through support from the World Bank funded Protected Areas Management and Sustainable Use (PAMSU) Project, the capacity of DAM to conserve the country's cultural heritage has been strengthened and the cultural, and historical heritage and para-archeological sites preserved to some extent. Approximately 187 cultural, historical and para-archeological sites have been identified and their specific locations recorded for easy tracing using GPS.

As mentioned earlier, cultural heritage sites combined with biodiversity rich areas and other features present the mosaic of attractions on which sustainable tourism in Uganda should be built. Cultural heritage is an important component of ecotourism, the fastest growing segment of tourism worldwide.

Clearly, the efforts of the DAM need to be augmented by district governments. Since most local governments view tourism as largely a protected-area concern, cultural heritage attributes in their respective jurisdictions offer opportunities for increased involvement and greater diversification of the economies of their areas. The role of the DAM in such cases would be to provide technical advice in the development of tourism based on cultural heritage. The DAM would also be responsible for setting standards and coming up with certification procedures to ensure adequate protection of the country's cultural resources. Furthermore, it would also be useful if the DAM could spearhead the formulation of a 'National Cultural Heritage Policy'. This policy would in turn be elaborated into a Bill for Parliament to consider; and an action plan spelling out investment priorities in the sustainable utilisation of the national cultural heritage, and equitable sharing of the benefits arising therefrom. Utilisation of the various cultural heritage sites for promoting ecotourism may call for the preparation of 'EIA Guidelines for the Sustainable Utilisation of Cultural Heritage Sites in Uganda'.

Table 7.26 Classification of types of cultural heritage

Main category	Sub-types	Comments
Sacred Sites	Burial Sites	Often discovered during construction phase of projects
	Sites of religious or spiritual significance	Important cultural sites were often inspired by religious beliefs and are still considered sacred places
Archaeological sites	Pre-historic sites	These sites are often undetected or overlooked. They frequently shed light on use or over-use of natural resources, changing survival strategies and social organisation
	Historical Sites	Many of such structures are still in use. They may also point to ecological changes and agricultural practices
	Engineering and industrial sites	The introduction of new technologies can be documented and understood by studying artifacts and earlier structures. This in turn may suggest methods for conservation and may shed light on future avenues of technological advance
	Sites within biological diverse areas or protected reserves	Management policies that protect both cultural and natural resources should be developed
Monumental sculpture	Cave sculpture	The protection of these sites depends on an understanding of the processes of deterioration
	Architectural sculpture	Exterior sculpture is often damaged by polluted air and rising water levels
Monumental painting	Cave or wall painting	Conserving wall painting in the face of tourist flows requires careful planning
Architectural and town planning	Monumental architecture	Great works of architecture and urban planning demonstrate the introduction of new design principles and construction techniques
	Indigenous or vernacular architecture	Local materials such as wood, mud, brick and stone were used to build extraordinary architectural compositions
	Historic settlements and town centres	The protection of the historic core of cities depends on a comprehensive policy to address infrastructure and social needs
Historic landscapes	Cultural landscapes	Landscapes whether designed, organically evolved or relict demonstrate mankind's responses to changing environmental conditions
	Historic parks and gardens	Returning gardens to their original appearance may require research into plant materials
	Trade routes monuments and remains	Remains of ancient trade routes document early trade relations and cultural connections. Trading patterns often long distance, are revealed in archaeological findings such as ceramics, metal work, coins or paleobotanical evidence

Source: Adapted from the Asian development Bank, *Environmental Assessment Guidelines*, 2003

Selected examples of cultural heritage sites are presented below, obtained from the records of the DAM.

1. Kampala District

Bagalaze Tombs

This was a palace of Namasole Bagalayaze mother of Kabaka Mwanga II. It was turned into her tombs after her death in 1916. Despite her son ordering for the execution of Christian martyrs and a strong resistant to the British colonial rule, she is remembered for her acts of kindness when she gave land to the Catholic and Protestant churches, the mosque for Muslims, 2 local schools, a hospital and a brick making enterprise.

Rubaga Cathedral

The Catholic Cathedral on Rubaga Hill was built in 1912-1925. The palace of Kabaka Mutesa I was originally on this site and it was from here that the explorer Stanley sent his letter to the daily telegraphs telling the Christian world of the opportunity for missionary work in Uganda.

Kabaka's Lake

It is a man-made lake of 15 hectares dug during the period 1886 to 89 on the orders of Kabaka Muwanga hoping to extend it through the swamp to one of the bays on Lake Victoria.

Fort Lugard

Surrounding Old Kampala Hill stands the Fort marking the place where the flag of Imperial British East African Company (IBEAC) first flown in 1890 by Captain F. Lugard (later Lord Lugard). On April 1893, the company's flag was replaced by the Union Jack when Sir Gerald Portal first proclaimed this country a protectorate of Uganda. A plaque commemorates the event.

Uganda Museum

Located at Kitante Valley, the museum houses about 4 000 exhibits and about 30 000 preserve collections within its storage. It was first housed in one round house at Fort Lugard in 1908 and later as collections grew, was transferred to Makerere School of Fine Art at Makerere University. Funds were then collected to build the current National Museum at Kitante.

2. Kabarole District

Amabere Ga Nyinamwiru

The site is located in Fort Portal having three areas of tourist attractions with waterfalls, 3 areas of stalactite and stalagmite formation and one part housing the *Amabere ga Nyinamwiru.* Formation of the stalactite and stalagmite are well documented at the site.

Karumbi Tombs
Also in Fort Portal, the place acts as a graveyard for the royal kings; Kasagama, Rukidi and Kaboyo, including princes and princesses of Toro kingdom. Three houses each on the grave with every tomb having displays of artifacts of the deceased kings. Several graveyards for princes and princesses are opposite the main graves of the kings.

3. Bundibugyo District

Semapaya Hot Spring
It is located in Semliki National Park. The hot spring water overflowing from the ground (female) is greater than the male. The Bamaga inhabitants of the area seasonally do sacrifice and cleanse at the site by bathing with the salty hot spring waters believed to be having healing powers. It is locally called *Sempaya* the name being derived from Kiswahili word *Schemu mbaya*. The whites faced hard time when they were constructing the road to this area due to hard rock and said it was bad place hence - Sempaya.

4. Kotido District

Magosi Stone Age Site
Magosi site is on a hill with boulders in a semicircular form with stone flake wastes and a scatter of small pieces of shreds some with decorations. The area is about 2 acres with Magosi I discovered in 1925 and Magosi II in 1962. At Magosi II are discoveries of ground stone axe, a hand axe, several broken bored stones and a large number of late stone findings.

5. Nebbi District

Homestead of Rwot of Paidha
This is a large compound home with a gate and two main round huts for the king of the Alur. It has two round huts – Abila in the middle used for the ancestors. Another group of two miniature huts fenced off by the side of the compound. They are 1.5m and 30cms high respectively and used for veneration and offertories.

6. Sembabule District

Bigo Bya Mugenyi
The site is associated with the legendary Bachwezi (13-16 centuries ago). It consists of extensive ditch system of 10 kms in all, partially excavated in 1957 and 1960 by M. Posnansky with an outer ditch running on a ridge and both arms running in the Katonga river swamp. The systems are associated with encircling rituals which have become active shrines. For example the ditch system Mugenyi whose name is also associated with the site, the other is associated with Kagoro, Kasaho village adjourned to the earthworks.

Bigo Bya Mugenyi Site
Source: Uganda Museum. 2005

7. Moyo District

The Burial Place of Emin Pasha
There are no signs of existing fort or any trenches, except for the three graveyards, one of which is Emin Pasha's grave. The other persons buried in the place are not known. Otce-Dufile Wildlife Reserve where the graves are located has elephants and other wild animals. It is a wildlife migratory corridor with an adjoining national park in the Sudan. Colonel Gordon established this Fort in 1874, as an outpost of the Egyptian Government.

The Burial Place of Emin Pasha

Source: Uganda Museum. 2005

8. Kumi District

Ngero Rock Paintings

Major painted panel in Eastern Uganda featuring red concentric circles and horizontal shapes that have been described as “people sitting in canoes”. Some of these paintings may have been used in rainmaking rituals and probably date between 1000 and 4000 years ago. One of these rocks is decorated with red concentric circles and secret ceremonies are still held at this site.

9. Kibaale District

Ssemwama Rock Shelter

The site is an extensive formation of granite rocks, with rock shelters that have been used for some generations. Currently there is a fireplace at the entrance of the Rock Shelter. The main shrine is thatched with banana leaves and grass on the eastern side of the Shelter. The miniature shrines are covered with bark cloth and spear grass on the western side of the Shelter. Although Ssemwama was not one of the Bachwezi dynasties, this site is also associated with the Bachwzei cult and it is an active shrine. The most important attribute to this shrine is the observance of the numerical supplication objects.

Ssemwama Rock shelter

Source: Uganda Museum. 2005

10. Kamuli District

Kagulu Hill Cultural Site

Origin of the Balangira “Batimbo”, the royal clan of Busoga is attributed to this site. A number of shrines are at Kagulu residence’s home near the rock and the shrine trees in different places. Visitors may request whatever they want to achieve in life and once their target is achieved, they must come and fulfill their promises to the spirits. No shoes must be worn when visiting these sites.

Kagulu Hill Cultural Site

Source: Uganda Museum. 2005.

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PART III

MANAGEMENT SYSTEMS AND TOOLS, AND CONCLUSIONS AND RECOMMENDATIONS

8.0 ENVIRONMENTAL MANAGEMENT SYSTEMS AND TOOLS

Uganda has made significant progress in the area of developing the necessary instruments, tools and processes for environmental management and planning. Beginning with virtually no form of systematic environmental planning, the NEAP was instituted in 1991. Since then, the NEAP process has yielded other downstream environmental tools and planning processes such as environmental assessment and mainstreaming the environment in development plans. Management of the environment was previously along sectoral lines. Through the NEAP process, an appropriate structure for environmental management was put in place. Hence, beginning from a near-zero position in 1994, institutional instruments and structures for environmental management were put in place by 2004. The broad guiding principles for environmental management were elaborated in the National Environment Management Policy (MNR 1994). These principles are the following.

- To ensure all people living in the country the fundamental right to an environment adequate for their health and wellbeing.
- To encourage maximum participation by the people of Uganda in the development of policies, plans and processes for the management of the environment.
- To use and conserve the environment and natural resources of Uganda equitably and for the benefit of both present and future generations, taking into account the rate of population growth and the productivity of the available resources.
- To conserve the cultural heritage and use the environment and natural resources of Uganda for the benefit of both present and future generations.
- To maintain stable functioning relations between the living and non-living parts of the environment through preserving biological diversity and respecting the principle of optimum sustainable yield in the use of natural resources.
- To reclaim lost ecosystems where possible and reverse the degradation of natural resources.
- To establish adequate environmental protection standards and to monitor changes in environmental quality.
- To publish relevant data on environmental quality and resource use.
- To require prior environmental assessments of proposed projects which may significantly affect the environment or use of natural resources.
- To ensure that environmental awareness is treated as an integral part of education at all levels.
- To ensure that the true and total costs of environmental pollution are borne by the polluter.
- To promote international cooperation between Uganda and other states in the field of the environment.

8.1 Institutions, Policies, and Laws

Institutions

The NEAP process advocated for a new institutional structure for environmental management observing that the Department of Environment Protection which existed by then could not handle the functions and roles envisaged. Hence the National Environment Management Authority (NEMA) was created through an Act of Parliament in 1995. NEMA is the principal institution in Uganda responsible for environmental matters in the country with the mandate to co-ordinate, monitor and supervise all activities in the field of the environment.

An Inter-Ministerial Policy Committee (IPC), composed of 11 Cabinet Ministers, is the supreme organ of NEMA. The Prime Minister of the country chairs it. The IPC provides policy guidance and co-ordinates environmental issues in various sectors and liaises with Cabinet on issues affecting the environment generally. Another important organ of NEMA is its Board of Trustees, which oversees the implementation and successful operation of policy and functions of NEMA.

NEMA relates horizontally with the different sectoral agencies and departments. These institutions were previously called Environment Liaison Units (ELUs) but are now known as Lead Agencies (LAs).

An important feature of reforms of environmental management has been through the decentralisation process. Districts and lower local governments are responsible for the management of environment in their respective jurisdictions. NEMA links vertically with local governments and assists them through technical backstopping, capacity building and where funds are available, the funding of demonstration projects. Recently, the Public Service Commission carried out a major re-structuring of how local governments should manage the environment and natural resources. The new format calls for the creation of a department or directorate of natural resources at the district level depending on the physical size and economy of the district in question. For large districts, the structure consists of a Director of Natural Resources. Below the Director are district technical personnel in charge of lands, forests, environment and wetlands. In some of the districts, the environment officer also doubles as the wetlands officer. This structure is a significant improvement from the situation where environment was either alone, with planning, production, or health departments and directorates. It lends greater weight to the office of the District Environment Officer. However, the structure still needs further improvement. For example, it does not give adequate recognition to the cross-sectoral nature of environment. Second, the opportunity of bringing all biodiversity institutions under one umbrella as recommended in the National Environment Management Policy of 1994 has just been partially achieved. One would have expected that the district fisheries and wildlife offices would also be under the Directorate or Department of Natural Resources instead of having them under Production. Under the new structure, the

Department or Directorate for natural resources represents significant opportunities for districts to raise non-tax resource based revenues.

Finally, in some districts such as Mbarara, Council recognised and appreciated the enormity of the amount of work of the District Environment Officer and approved a bigger budgetary allocation for additional personnel. The District Council decided to have a Principal Environment Officer at the District level and Environment Officers in each Sub-County. So by 2004, Mbarara District had a Principal Environment Officer and six environment officers at the county level.

NEMA deals with two categories of districts: focal and non-focal. The selection of which districts qualify as focal ones is based on well laid out objective criteria (*Box 8.1*).

Box 8.1

Criteria for Selection of Focal Districts

(i) the distribution of the impact of environmental degradation in terms of geographical area and population affected;

(ii) the degree of threat of environmental problems to human health and life support systems;

(iii) the possibility of the present environmental problems worsening and/or developing into other environmental problems;

(iv) the potential for irreversible damage;

(v) the eventual economic and social cost of not taking action now;

(vi) the preparedness of the district to handle the environment management programme;

(vii) the presence and criticality of cross-district environmental issues;

(viii) absence/presence of any donor support for the district; and

(ix) the need to enhance or sustain environmental and natural resources opportunities in the district.

Source: NEMA Database

NEMA also links vertically with the private sector and civil society. Initially, the private sector perceived environmental management as being negative to development. Through continued awareness creation, this perception is slowly changing. For example, the Financial Sector in Uganda is in the process of formulating a code of conduct for voluntary compliance with environmental management through a UNEP/NEMA initiative. Clearly, the continuing occurrence of violations of environmental regulations by the private sector means that much more work remains to be done in getting the private sector to appreciate that sound environmental management is a win-win-win option and not a hinderance to economic development.

Civil Society Organisations (CSOs), especially those with focus on conservation have been the ‘traditional friends’ of the environment and ‘voice’ of the rural communities. NEMA also links vertically with these CSOs who are often national and international

NGOs, community-based organisations (CBOs) and community-based associations (CBAs). The National Environment Management Policy recognised the important role CSOs would play in promoting better management of the environment. There are literally hundreds of CSOs involved in different aspects of environmental management. What is common among the local NGOs, CBOs and CBAs is first, the lack of capacity - both skills and finances. The Conservation Trust of Uganda (ECOTRUST) pioneered managing small grants made available to CBOs and CBAs through financial support from USAID. While the small grants scheme was successfully implemented (Ocici & Moyini 2004) the project was at the last stages of expiry. NEMA also has a project for small grants management with funding from the EMCBP II Project of the World Bank. A second challenge facing the local NGOs, CBOs and CBAs is Government's shift away from project financing to budget support. The move has denied the CSOs their traditional source of funding. Other things remaining equal, it is likely there will be a rationalisation of the CSO 'industry' with a number closing due to lack of funds for implementing conservation projects, or re-orienting activities away from their traditional focus of operations. On the other hand, there are opportunities for national NGOs to partner with foreign NGOs who may have the financial resources to carry out conservation work.

Policies

Since 1994, the policy infrastructure for environmental management has improved significantly. While the National Environment Management Policy remains the principal instrument as far as environmental management is concerned, it is now 10 years old and probably in need of revision. This is especially so in light of new and emerging problems. Equally, the National Environment Action Plan of 2005 also needs to be revised.

The National Environment Management Policy encouraged the formulation of sectoral policies to address unique and specific issues of the various sectors. A list of the pertinent policies for environmental management is included in *Box 8.2.* Uganda holds the record of being the second in the world to formulate and adopt a policy on wetlands conservation and management. The policy was adopted by Cabinet in 1995.

Box 8.2

Key Ugandan policies for environmental management

1. The National Environment Management Policy, 1994
2. The National Fisheries Policy, 2004
3. The Tourism Policy, 2003
4. The National Forestry Policy, 2001
5. The Land Policy (draft).
6. The Land Use Policy (draft)
7. The National Trade Policy (draft)
8. The Water Policy 1995
9. The Wildlife Policy 1996
10. The National Soils Policy (draft)
11. District Environment Management Policies for Arua, Mbale, Busia, Mbarara, Kasese, Kabale.
12. National Policy of the Conservation and Management of Wetland Resources 1995

Source: Various Publications

Furthermore, like the National Environment Management Policy, all the newer policies were formulated in a participatory manner, involving consultations with key stakeholders. Some districts like Arua, Mbale, Tororo, Busia, Mbarara, Kasese and Kabale have also formulated and adopted their own jurisdictional environment management policies, ensuring that these did not contradict the national environment management policy.

Therefore, an extensive policy infrastructure exists to facilitate sound environmental management, and most of the policies have in turn been translated into action plans and accompanying laws. The main constraint experienced has been the implementation of the action plans and enforcement of the laws. Constraints to the implementation of the plans have largely been the result of inadequate funding. As discussed in the latter section of this report, difficulties of enforcement are largely financial, but are also a result of inadequacy of human capacity and sometimes lack of political will especially at the lower levels of local government.

Of particular significance is the inadequacy of the capacity to analyse the impacts of various sectoral polices with respect to the environment in the wider context – biophysical, socioeconomic and cultural. As early as 1998, NEMA published *Guidelines for the integration of environmental considerations into sectoral planning, project and policy formulation in Uganda* (NEMA 1998). Unfortunately, different sectors have shown some degree of reluctance to using the guidelines. The question is why? Some of the answers may be found in the fact that the sectors concerned do not have the capacity to do so. This subject is further addressed under planning in *Section 5.2*.

Laws and Regulations

Before 1995, there was no specific law for the holistic management of the environment. The National Environment Act came into being in 1995, the same year the Constitution of the Republic of Uganda was promulgated; and also the same year the Water Act was enacted.

The Constitution was a landmark document in that for the first time, it made the provision of a healthy environment a right of all citizens of Uganda. Also, under the *National Objectives and Directive Principles of State Policy*, the Constitution provides for the protection of natural resources and the environment. The National Environment Act came into being ‘to provide for sustainable management of the environment; to establish an authority as a coordinating, monitoring and supervisory body for that purpose’, including other related matters. NEMA has compiled a list of key environmental laws and regulations titled, *Environmental Legislation of Uganda*. These laws and regulations are listed in *Box 8.3*.

Box 8.3

Key environmental laws and regulations

1. *The Constitution of Uganda 1995*
   The State shall protect important natural resources, including land, water, wetlands, minerals, oil, fauna and flora on behalf of the people of Uganda.

2. *The Mining Act, 2003*
   An Act to repeal and replace the Mining Act, Cap 148, with a new legislation on mining and mineral development which conforms, and otherwise gives effect, to the relevant provisions of the Constitution; to vest the ownership and control of all minerals in Uganda in the Government; to provide for the acquisition of mineral rights; and to provide for other related matters.

3. *The National Forestry and Tree Planting Act, 2003*
   An Act to provide for the conservation, and the sustainable management and development of forests for the benefit of the people of Uganda.

4. *The National Environment Act*
   An Act to provide for the sustainable management of the environment.

5. *The Environmental Impact Assessment Regulations, 1998*
6. *The National Environment (Waste Management)Regulations, 1999*
7. *The National Environment (Minimum Standards for Management of Soil Quality) Regulations, 2001.*
8. *The National Environment (Wetlands, River Banks and Lake Shores Management) Regulations, 2000.*
9. *The National Environment (Hilly and Mountainous Area Management) Regulations 2000.*
10. *The National Environment (Management of Ozone Depleting Substances and Products) Regulations, 2001.*
11. *The National Environment (Noise Standards and Control) Regulations, 2003.*
12. *The National Environment (Conduct and Certification of Environmental Practitioners) Regulations, 2003.*
13. *The Water Act, 1995*
   An Act to provide for the use, protection and management of water resources and supply; to provide for the constitution of water and sewerage authorities; and to facilitate the devolution of water supply and sewerage undertakings.

14. *The Water Resources Regulations 1998*
15. *The Water (Waste Discharge) Regulations, 1998.*
16. *The Wildlife Act 1996*
   An Act to provide for sustainable management of wildlife; to consolidate the laws relating to wildlife management; and to establish a coordinating, monitoring and supervisory body for that purpose and others.
17. *The Plant Protection Act, 1937*
   An Act to make provision for the prevention of the introduction and spread of diseases destructive to plants.
18. *The Animal Breeding Act, 2001*
   An Act to establish the National Animal Genetic Resources Centre and Data Bank, to provide for the promotion, regulation and control, marketing, import and export, and quality assurance of animal and fish genetic materials and generally to provide for the implementation of the national breeding policy in Uganda, and to repeal and replace the Branding of Stock Act; and to provide for other materials connected with the foregoing.
19. *The Control of Agricultural Chemicals Act, 1989*
   An Act to control and regulate the manufacture, storage, distribution and trade in, and use, importation and exportation of, agricultural chemicals and for other purposes connected therewith.

20. *The Agricultural Seeds and Plant Act, 1994*
   An Act to provide for the promotion, regulation and control of plant breeding and variety release, multiplication, conditioning, marketing, importing and quality assurance of seeds and other planting materials and for other matters connected therewith.

Source: NEMA n.d.

8.2 Environmental Standards, Assessments and Audits

Environmental Standards

Before 1995, Uganda had no means of deciding if and by how much certain environmental violations had taken place. The National Environment Act provides for the establishment of environmental standards. Standards for air quality, water quality, discharge of effluents into water, control of noxious smells, control of noise and vibration pollution and soil quality are now in place. However, standards for sub-sonic vibrations, minimisation of radiation and others have yet to be completed.

Environmental Impact Assessments and Audits

Environmental impact assessments

According to the National Environment Act, Environmental Impact Assessment (EIA) can be defined as " a systematic examination conducted to determine whether or not a project will have any adverse impacts on the environment." Alternatively, EIA is a process of studying effects of a proposed action on the environment. Environmental Impact Assessment identifies effects, compares alternatives, predicts environmental changes and weighs economic costs and benefits. Thus, EIA is a decision making tool. Why do an EIA? Mainly for the following reasons.

- Most development activities often have some negative impacts on the environment. EIA assists in recommending ways and means of removing or reducing these negative impacts. In this way EIA contributes towards protecting and conserving the environment.
- If carried out at the right time, EIA is a useful planning tool. It can highlight certain issues that need to be taken into consideration so that the environment is not harmed.
- EIA can help save money in cases where the proposed development was to take place in a location not permitted by law or because of environmental reasons. For example a developer intending to buy land can avoid financial loss if he/she does an EIA first because it may deter buying the land in a wetland where certain forms of development are not allowed by law.
- EIA can help avoid costs that would otherwise be incurred to correct environmental problems resulting from failure to predict them early enough.

The main objective of EIA is to ensure that potential problems are foreseen, and addressed at the right time. An EIA should be done when the proposed development is still being formulated. It can also be done before implementation of the proposed development has started. The developer is responsible for carrying out the EIA for a proposed activity.

One of the core values of an EIA is sustainability, where the EIA process should result in safeguarding the environment. The main role of EIA is to modify and improve design, enhance social aspects, identify management measures, inform decision-making and justify a proposal.

Section 20 SubSection (5) of the National Environment Act recognises the following levels of EIA.

1. Environment Impact Review (EIR) is required for small-scale projects that may have significant impact on the environment, and whose potential adverse impacts are easily identifiable such as renovation works, service stations for petroleum products, etc.
2. Environmental Impact (EI) Study is a more detailed analysis and is conducted for projects that are likely to have significant impacts on the environment. The purpose of an EI Study is to determine if more in-depth EIA is needed to assess various alternatives so that the decision-maker can select one, which does not have significant environmental impacts. However where the lead agency, in consultation with NEMA is satisfied, after considering the EIR that the project will lead to significant impact on the environment it shall require that an environment impact study be conducted.
3. EI Study is a major detailed assessment, conducted for any project which clearly will have significant impact, and whose mitigation measures cannot readily be prescribed unless in depth analysis of the project and its possible alternative is conducted.

Environmental audits

An environmental audit can be defined as a systematic, documented, periodic and objective evaluation of how well environmental organisations, management and equipment are performing in conserving the environment and its resources. Environmental audits are usually undertaken to check compliance with environmental policies. An environmental audit assesses the impacts of the existing development. There are several advantages of environmental audits as a management tool, including the following.

- Environmental audits identify areas of weaknesses.
- More so, environmental audits ensure that problems are solved early so that cost effective solutions are found.
- They ensure compliance to environmental laws.
- Environmental audits enhance competitive advantage, minimise waste and improve efficiency.
- They determine compliance status with proposed standards.
- Environmental audits address environmental problems in the most cost-effective manner by documenting cases of success and distributing them to other branches, thus helping to minimise mistakes while reducing costs.

- Environmental audits are also important in expansion planning where there is need to obtain both an environmental permit which involves time consuming negotiations with the regulatory agency like NEMA and the need to carry out time consuming environmental monitoring. An environmental audit will have all this information at hand.
- They aid decision-making when considering investments by assessing the risk associated with the investment.
- They improve the credibility and image of the company as regards environmental responsibility and minimise the cost of insurance by providing sufficient information on environmental risks.
- Audits serve as a valuable training exercise and the audit report can be used as material for employee training purposes.

It should be noted that environmental audits should be undertaken within a period of not less than 12 months and not more than 36 months after completion of a project or the commencement of its operations whichever is earlier. Thereafter, environmental audits are carried out periodically as circumstances require.

8.3 Environmental Planning

The National Environment Act, Section 18, provides for NEMA to prepare a National Environment Action Plan to be reviewed after every five years or such other lesser period as may be considered necessary by the Authority. The Plan is to cover all matters affecting the environment of Uganda and should contain guidelines for the management and protection of the environment and natural resources as well as the strategies for preventing, controlling or mitigating any deleterious effects (GoU 1995). Clearly, the only comprehensive national environmental planning process was the one which was carried out between 1991 and 1994. As such, the existing NEAP is almost 10 years old and in dire need of a review and revision.

The same Act, Section 19, also provides for every District Environment Committee in consultation with NEMA, to prepare a District Environment Action Plan (DEAP) to be revised every three years or such other lesser period as may be considered necessary by the Authority. The Act mandates the district plan to be in conformity with the National Environment Action Plan and binding on all the district agencies, local committees and persons within the districts (GoU 1995). Not all districts have prepared DEAPs and certainly none has reviewed its DEAP, not even the first 6 pilot districts whose DEAPs are now almost 10 years old. The preparation of the DEAPs to date have been donor-driven, and the absence of donor funds to some extent is responsible for some districts having had no DEAPs and those which are unable to review them. This is in stark contrast to the preparation of District Development Plans (DDPs), which are also 3-year planning frameworks revised annually. All districts in Uganda prepare DDPs and revise them every year because their budget allocations from the Central Government has made it a conditionality. Why not for the environment? Why the delays in revising the DEAPs, especially when they are to be integrated into DDPs? This situation calls for the need to have integrated reporting of DDPs and DEAPs and their subsequent regular revision thereafter. Presented below are the specifics of environmental planning at district level.

District environment action plans

The preparation of the DEAPs has gone through some transformation. The original DEAP process began with the collection of data and preparation of Village Environment Action Plans (VEAPs). Then the VEAPs were collated and synthesized into Parish Environment Action Plans; then onto Sub-County Environment Action Plans (SEAPs); and finally the District Environment Action Plan (DEAP). The process also called for the formulation of District Environment Management Policies (DEMPs). However, since different development partners were supporting different districts with the preparation of DEAPs, sometimes using different formats, it became necessary to harmonise the various DEAP processes and make them cost-effective at the same time.

Hence the preparation of the VEAPs were omitted altogether. Second, the DEMP became a chapter in the DEAP. Essentially, the harmonised process of preparing a DEAP involves six main steps as shown in *Box 8.4.*

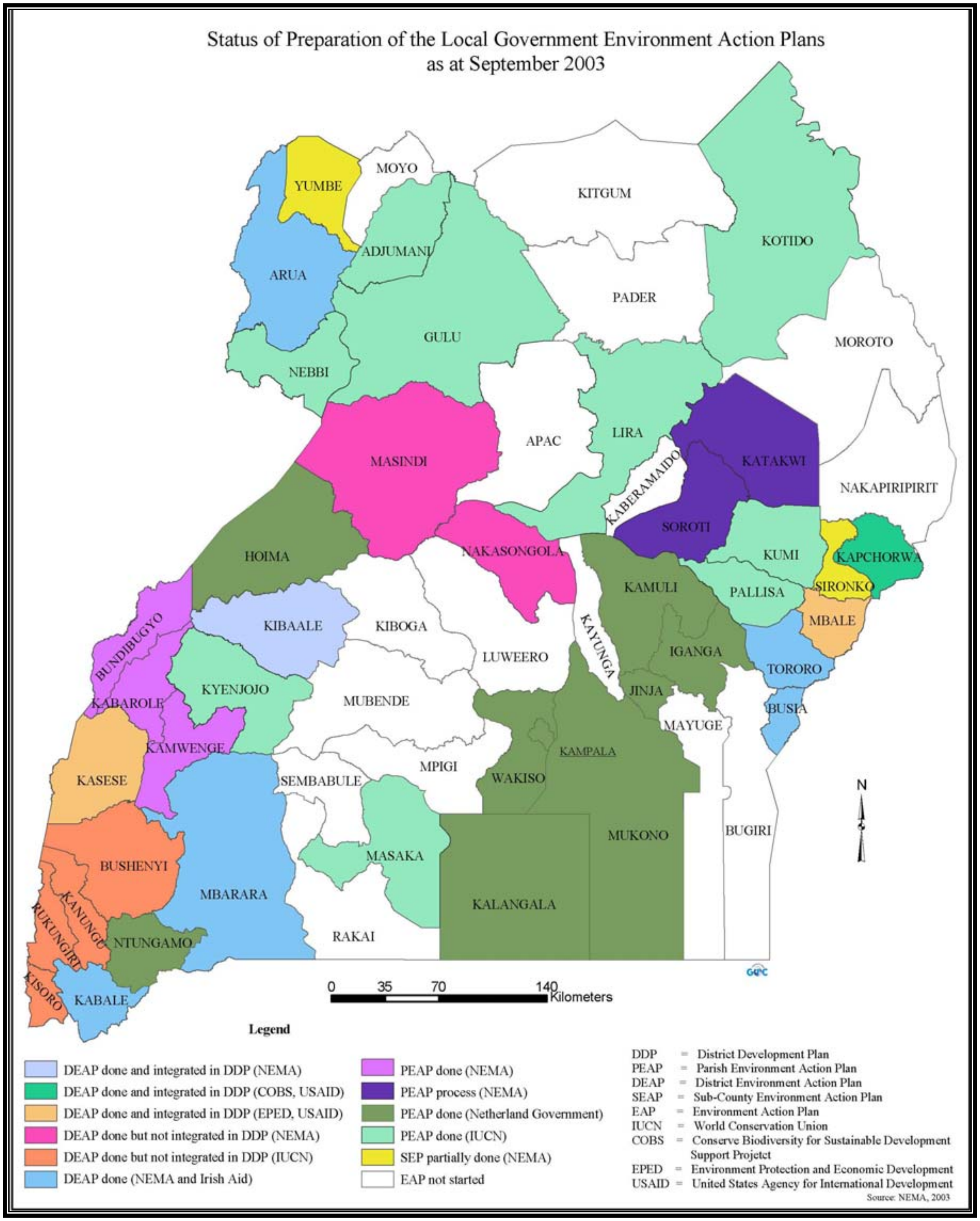
Box 8.4

Main steps in the preparation of a DEAP

1. Identifying environmental problems
2. Formulate policy goal, objectives and strategies.
3. Collect relevant data.
4. Carry out action planning to formulate DEAP.
5. Develop micro projects profile.
6. Integrate DEAP with DDP.

Figure 8.1 shows the progress made in the preparation of DEAPs for the various districts in Uganda.

Figure 8.1 Map showing DEAP preparation progress at district level.



Source: NEMA Databank

Mainstreaming of the environment

Uganda's overarching comprehensive development framework, the PEAP, calls for the mainstreaming of cross-cutting issues into sectoral development plans. These cross-cutting issues include: poverty, HIV/AIDS, gender, occupational hazards, people living with disabilities, and the environment. Environmental mainstreaming is a continuous process of:

- identifying environment and natural resources issues/opportunities that contribute to the achievement of the development goals of each sector;
- identifying potential adverse impacts and mitigation measures and positive impacts and enhancing measures for development interventions;
- budgeting for environmental interventions and mitigation measures; and
- monitoring the implementation of environmental management interventions including mitigation activities to reduce potential negative impacts or enhance positive ones of development programmes.

Several studies have been carried out on mainstreaming environment into development plans, particularly at local government level. Moyini *et al* (2001) looked at mainstreaming environment into the development plans of districts receiving support from the Royal Netherlands Embassy in Kampala. They concluded that some mainstreaming was taking place but that the location of the District Environment Office either in the production or health directorates constrained the mainstreaming process and, therefore, recommended placing the DEO together with the district planning office, as was the case in Arua District where significant success had been achieved.

Ogeda, Moyini & Others (2004) looked at mainstreaming environment into district planning and budgeting processes. The main focus of the study was the World Bank funded Local Government Development Programme (LGDP). Their assessment revealed that some checklists were being used to facilitate mainstreaming of the environment, but additional capacity building and penalties and reward systems were required to make the mainstreaming effective. Other studies included the development of environmental checklists for use in the PMA-supported non-conditional sectoral grants. Mainstreaming of the environment into local development plans is important because:

- livelihoods and poverty eradication in developing economies and agrarian societies such as Uganda very much depend on environmental sustainability;
- in such societies, sustainable development can only be achieved by promoting the wise use of natural resources and environmental stability;
- development poses negative impacts on the environment and people, which need to be addressed; and
- holistic and sustainable development requires balancing between economic, social and ecological aspects.

When successfully developed, the overall goal is to have each sector mainstream environment into its development plans as a matter of routine. This means sectoral officers, especially those at lower government levels need training in the art of environmental mainstreaming. As such, it also calls for assistance to NEMA for developing appropriate mainstreaming tools, methodologies and procedures.

Sector Wide Approach to Planning (SWAP)

In part, for purposes of budgetary allocations, the Ministry of Finance, Planning and Economic Development advocates for a sector wide approach to planning (SWAP). Environment and several of the natural resources sectors did not belong to any specific 'budgetary' sectors. The exception was originally wetlands which developed a Wetlands Sector Strategic Plan (WSSP), allowing it a favoured status in budgetary allocations. Of late, there have also been other sector strategic plans. For example, there is the Land Sector Strategic Plan (LSSP), the Forest Plan, and the Fisheries Master Plan.

A more significant development has been the attempt to define an environment and natural resources sector for purposes of budgeting and budgetary allocation prioritisation. The Environment and Natural Resources (ENR) Sector Working Group is tasked to come up with a SWAP. The ENR Sector is administratively defined to consist of: environment, forestry, wetlands, land, fisheries and meteorology sub-sectors. The ENR Sector SWAP will then constitute the framework within which resources are allocated according to the priorities of the PEAP.

Integrated Assessment and Planning

Integrated assessment and planning (IAP) is defined as an inter-disciplinary process of combining, interpreting, and communicating knowledge from various scientific disciplines in such a way that the system-wide cause-effect chain associated with a public project, programme, or policy can be evaluated for the benefit of decisionmaking (UNEP 2001).

In Chapter 8.0 of Agenda 21 which deals with integrating environment and development in decisionmaking, it was observed that 'prevailing systems for decisionmaking in many countries tend to separate economic, social and environmental factors at the policy, planning and management levels' (UN 1993), an undesirable feature. Agenda 21 recommended the improvement or re-structuring of the decisionmaking process of a country so that consideration of socio-economic and environmental issues is fully integrated and a broader range of public participation assured (UN 1993).

One of the resolutions made at the World Summit on Sustainable Development (WSSD), specifically Paragraph 145 of the Johannesburg Plan of Implementation (JPOI) emphasised the importance of taking a holistic and inter-sectoral approach to implementing sustainable development to deliver on the 2000 Millenium Development Goals (MDGs) as reported in Muhereza (2004) and UN (2002). In particular, governments (that of Uganda included) re-affirmed at the World Summit commitment to develop National Strategies for Sustainable Development (NSSD) by 2005, and to ensure that current trends in losses of environmental resources are effectively reversed at the national level by 2015 (Muhereza 2004).

The Government of Uganda, through NEMA and the Economic Policy Research Centre (EPRC) has received assistance from UNEP to carry out a pilot capacity building project in integrated assessment and planning for sustainable development. To start off this process, an integrated assessment of PEAP was carried out (Muhereza 2004) whereby key lessons, experiences, opportunities and critical gaps were identified and a way forward given. Moyini & Masiga (in press) used the IAP process to assess the extent to which the National Fisheries Policy 2004 has addressed environmental and social concerns.

8.4 Restoration and Management of Degraded Areas: Ecosystem Approach

Fragile ecosystems

According to NEMA (2004) wetlands, riverbanks, lakeshores, mountainous and hilly areas are among the most important and yet very fragile ecosystems in the country. This is especially so since they embody the water catchments and waterbodies, which are key life support systems and resource base for development in Uganda. Due to increasing human population pressure coupled with inappropriate land use practices, these ecosystems and natural resources therein are unfortunately being seriously degraded, and their vital functions have been, or are at the risk of being impaired.

Government accords high priority to the protection and management of natural resources in the country. This is reflected in the Constitution of Uganda 1995, The National Environment Statute 1995 and the Regulation 2000 thereunder, the Water Act, the Land Act 1998 and the Local Governments Act 1997.

The Constitution of Uganda, various relevant sectoral policies and laws recognise the need for protection of the fragile ecosystems such as wetlands, riverbanks, lakeshores and mountainous and hilly areas. In particular, Article 237(2)(b) of the Uganda Constitution provides that Local Governments or Government shall ‘hold in trust’ for the people and protect natural lakes and rivers, wetlands, forest reserves and national parks and any land to be reserved for ecological purposes for the common good of all citizens.

The objective of a public trust is to promote public or society welfare and conserve the resources as a whole as opposed to private trust, which benefits a private individual. In implementation of this Article 237 of the Constitution, Sections 35 and 36 of the National Environment Act, in turn provide for protection of lakes and rivers from all forms of degradation including encroachment and alteration of their physical state, as well as introduction of degrading foreign materials.

The National Environment Management Regulation 2000 on Wetlands, Riverbanks, Lakeshores, Mountainous and Hilly areas is meant to operationalise the implementation of these policies and laws, and contains requirements and guidelines for users of the resources mentioned in the fragile ecosystems to ensure their conservation.

Implementation of these natural resources management tools is ongoing, and being undertaken by different relevant Government agencies and non-governmental organisations, as well as individual land users. To enhance implementation of the Regulations, NEMA during the current second phase of the Environmental Management Capacity Building Project (EMCBP II) provides for micro-financing of community initiated projects in a number of districts that focus on integrated approaches to environmental management, particularly focusing on the fragile ecosystems which include wetlands, riverbanks, lakeshores, mountainous and hilly areas. In this respect, community-based project proposals have been developed and will soon be ready for implementation by the very communities themselves. Furthermore, NEMA has identified sites in various focus districts for piloting on ground restoration and conservation activities using ecosystems approach.

It is hoped that these two initiatives will make a significant contribution in addressing the problem of degradation of these fragile ecosystems, and that this will greatly contribute to the overall objective of achieving sustainable development of the communities without compromising the integrity of the environment. *Table 8.1* below shows the achievements of the Fragile Ecosystem Restoration Initiative

Table 8.1 Fragile ecosystem restoration initiative achievements in the Districts

	District	Achievements
1.	Mukono	⌖ Restoration of wetlands near Seeta High School in Mukono District which was degraded through excavation by the management of the school in January 2005 ⌖ Sensitised the brick makers and enforcement ongoing in 2003/4 ⌖ Restoration of the banks of Victoria Nile
2.	Kamuli	⌖ Restoration of the Victoria Nile
3.	Kayunga	⌖ Restoration of the Victoria Nile
4.	Kapchorwa	⌖ Protection of the banks of river Atari
5.	Soroti	⌖ Eviction of pastoralists who had illegally settled in Awoja wetland (Gweri sub-county - Soroti County) in September 2004
6.	Kumi	⌖ Eviction of pastoralists who had illegally settled in Agu and Kodike in September 2004
7.	Kaberamaido	⌖ Eviction of pastoralists who illegally settled in Achwali and Atigo Forest Reserves in September 2004.
8.	Katakwi	⌖ Eviction of pastoralists who had illegally settled in Apujan wetland in September 2004
9.	Nebbi	⌖ Community complied with the 50m no encroachment zone at Panyimur fishing village in October 2004
10.	Kabarole	⌖ Enforced and caused Mukwano Commodities to restore wetland located along the Fort Portal- Kyenjojo road in 2003
11.	Kasese	⌖ Massive sensitisation of the land users at the foothills of Rwenzori Mountains in the Bwera catchment on the management and restoration of degraded fragile area.
12.	Mbarara	⌖ Sensitisation, eviction and restoration of critical wetlands and important watersheds of Ibanda Hill in Ibanda Town Council, Nyabuhikye, Kichence and Rukiri sub-counties (April- July)
13.	Bushenyi	⌖ Sensitisation, eviction of encroachers and restoration of Kyerungu

		wetland located in Kurungu and Rwengwe sub-counties leading to even prosecution of encroachers (April-July)
14.	Ntungamo	Sensitisation and wetland resource land use conflict resolution and eventual sustainable wetland resource use by the community. Eviction of encroachers and restoration Kaakikongora wetland located in Ntungamo T/C in 2004
15.	Kabale	Banyakigezi Initiative- They are currently carrying out inventory of all critical hills and wetlands for gazettment
16.	Kalangala	Relocation of the communities in fishing villages of Lutoboka, Kagonya, Kivunza and Mwena outside the 50m no encroachment zone of the lake.
17.	Kampala	Eviction of an illegal market in Kawoya wetland located between Kampala and Wakiso District in August 2004.
18.	Nakasongola	Eviction of over 3000 families that had settled on the floating sudds on Lake Kyoga in 2003
19.	Kisoro	Sensitisation and zoning of the lakes Mutanda, Murehe and Kyahafi in March 2004

ONGOING EFFORTS

	District	On going efforts
1.	Mukono	Regulating brick makers to ensure that they restore the pits where they excavate clay for brick making Restoration of the banks of river Nile at Njeru Town council and Wakisi Sub-County
2.	Kapchorwa	Protection of banks of river Ngage and the banks of other rivers in the district
3.	Nebbi	Protection of banks of Rivers Nyagak (proposed HEP source) and Namwrwhodo (proposed source of water for Nebbi Town)
4.	Arua	Restoration of the banks of River Enyau that drains into the Albert Nile
5.	Kabarole	Protection of the banks of all crater lakes and wetlands in Fort Portal Municipality
6.	Kasese	Restoration efforts in Bwera catchment
7.	Mbarara	Restoration efforts at Ndejja Parish Sub-County (hills)
8.	Ntungamo	Restoration efforts at Itojo Sub County (hills)
9.	Kabale	Management efforts on Rushebeya swamp
10.	Masaka	Restoration of Nakaiba wetland through eviction of encroachers and gazettment of the wetland
11	Kalangala	Restoration of more shores of the lake islands outside the Ecosystem Restoration Pilot site.
12.	Kampala	Gazettment of all critical wetlands Nakivubo, Kinawataka/Kawoya (where evictions took place), Kansanga, Kyeitinda, Lubigi and its tributaries, Nalukolongo and Mayanja. Demolition of illegal structures in critical wetlands Reticulation of Nakivubo channel to improve on the treatment of the wastewater from the City

PLANNED

	District	Planned
1.	Soroti	⌖ Gazettment of critical wetlands in the district
2	Kumi	⌖ Gazettment of critical wetlands in the district
3.	Katakwi	⌖ Gazettment of critical wetlands in the district
4.	Kampala	⌖ Demolition of all illegal structures in critical wetlands
5.	Bundibugyo	⌖ Demolition of all illegal structures in the 50m no encroachment zone at Ntoroko fishing village ⌖ Restoration of banks of River Semliki in collaboration with ICRAF and the District Local Government

Source: NEMA (2004)

Using ecosystem approach for managing fragile ecosystems

Ecosystem concept states that earthly processes operate in a series of interrelated systems within which all components are linked, so much so that a change in one component may bring about some corresponding changes in other components and in operation of the whole system. In reality, therefore, ecosystems are geographical units of the landscape that include all natural phenomena and their components that can be identified and surrounded by boundaries. It should be noted, however, that the ecosystem approach is not entirely new, since conservation principles have always recognised the interrelationships in nature that require allround attention for the natural system in question and its function to stay.

Principles used in the Interventions using Ecosystem Approach.

The drainage basin or water catchment has been adopted worldwide as the most ideal for ecosystem approach and, therefore, it has acted as a dominant factor in selecting pilot ecosystem approach intervention sites in Uganda, and given the central role water catchments and waterbodies occupy in the management of the fragile ecosystems.

Like in the case of the catchment approach to soil and water conservation, the ecosystem approach requires that people living in a given area work together towards a common cause. In some cases the ecosystems approach is being used to quicken the pace of natural resource conservation efforts, by putting more emphasis on two interrelated strategies:

- the integrated treatment of ecosystems within the local area and how the local area is integrated and linked with other areas across the landscape to form a larger ecosystem; and

- active involvement of the communities living there.

There are two basic principles being used, namely:

- integrated and holistic approach – In the past, restoration and conservation of ecosystems have been on sectoral basis and in a rather fragmented manner. There is now increasing evidence that an integrated and holistic approach involving all relevant sectors and stakeholders under the broad principles of ecosystem approach is the more sustainable one; and

- cross-border in characteristics. Most ecosystems in Uganda especially forests, wildlife areas and water, transcend physical, political or socio-economic borders. Choice of the pilot ecosystem sites has taken this into account, giving priority to areas with significant cross-border ecosystems in order to achieve joint and harmonised management efforts on either side of the border, instil a spirit of cooperation and shared views in a wide range of issues related to natural resource management for social and economic development (NEMA 2004).

Ecosystems approach rationale for the interventions

The interventions form the epitome of, and providing assistance to, communities in complying with the Environmental Regulation for management of the fragile ecosystems. The approach has a deliberate emphasis of addressing cross border ecosystems, among districts, subcounties and parish boundaries to foster cooperation among leaders and communities in the management of the ecosystems and natural resources therein.

To save the country's waters, therefore, the interventions require all people using the mountainous and hilly areas, lakeshores and riverbanks, to implement the protected zones guidelines in which the following should be observed:

- no carrying out prohibited activities particularly reclamation and drainage of wetlands for farming and settlements, without first obtaining a permit from the Government regulating body, the (NEMA); and

- to avoid carrying out any of the regulated (prohibited) activities in the protected zones which are as follows:

  - for large lakes such as Lake Victoria, Lake Albert, and Lake Mburo which are listed in the Seventh Schedule of the Regulations, 200m from the lowest water point;

  - for lakes smaller than these, 100m from the lowest water mark;

  - for large rivers such as the Nile, Kafu and Kagera which are listed in the Sixth Schedule of the Regulations, 100m from the highest water mark;

  - for rivers smaller than these, 30m form the highest watermark;

  - if any of the regulated (prohibited) activity must be carried out in protected zones of these water systems, then a permit must first be obtained from NEMA which ensures that the negative impacts to be caused by the activity are appropriately taken care of; and

- to avoid inappropriate land use practices on different slopes in the mountainous and hilly areas, and in particular to avoid opening up developments on steep slopes in these areas. To adhere to key guidelines in the Environment Management Regulations on Mountainous and Hilly areas (NEMA 2004).

Selected pilot areas for ecosystem approach

According to NEMA (2004), out of ten sites planned for in the Environmental Management Capacity Building Project II (EMCBPII), a total of eight pilot sites located in eight districts have been selected for the ecosystem approach, and in all these water resources ecosystem forms a vital component. *Table 8.2* shows the ecosystem pilot areas in Uganda. The processes of identifying the remaining two sites is in advanced stages.

Table 8.2 Location of ecosystems approach sites.

Site	District	Sub-county	Villages	Ecosystem
1.	Jinja	Butembe	Kaitabawala Matala Buwenda Central Kyekidde Bujagali Kyabirwa Namizi East Namizi West Buyala A Buyala C Bwase Bususa	Riverbank ecosystem
2.	Mukono	Wakisi Njeru T/C	Bujawoli Kiira Buloba Malindi Kikubamutwe Nankwagara Bujawali Nkokonjeru Naminya South Bukaya West Kiryowa Bugungu	Riverbank ecosystem
3.	Kamuli	Kisozi	Nankandulo Namalumba Nabukidi Buluba Bulangira Bumegere Nakatto Bupiina Lugada Kisege	Riverbank ecosystem
4.	Kayunga	Nazigo Kangulumira	Kasega Kirindi Nakakonge Nssima Kibati Sporta Wabirongo Kitambuza Kalagala Kasambya Kavule Bukasa Mirembe Malindi	Riverbank ecosystem
5.	Kalangala		Lutoboka fishing village Kalangala T/C Mwenza fishing village Kagonya fishing village Kivunza fishing village	Lakeshore ecosystem
6.	Mbarara	Ndeija	Ndeija	Hilly ecosystem
7.	Ntungamo	Itojo	Buhanama	Hilly ecosystem
8.	Kasese	Bwera	Bwera Catchment Bwera Township	Mountain ecosystem

Source: NEMA (2004).

8.5 Environmental enforcement

The poor state of the environment by the time of the baseline period of 1991 to 1994 was partly contributed by the previous breakdown of law and order in the 1970s and early 1980s. Another contributing factor was the fact that enforcement was *ad hoc* and sectoral. Penalties for violations were, and in some cases still are not enough to deter offenders. The judiciary was also largely uninformed of the importance of sound environmental management. By 2004, the situation had improved somewhat, although more needs to be done. Some of the actions aimed at improving enforcement have included the following.

- NEMA has put in place a number of regulations and standards to operationalise the National Environment Act Cap 153.
- NEMA has also promoted strategic partnerships with lead agencies, and is generating required information and improving upon environmental monitoring systems.
- By 2004, at least 11 focal districts had been trained in enforcement.
- There is increased awareness as evidenced by the higher level of reportings of violations.
- The CID/Police have emerged as a strong partner in environmental compliance. For example, they have actively worked with NEMA and WID to enforce evictions from wetlands.
- A total of 146 persons (21 NEMA staff, 96 lead agencies staff and 47 district officials) have been gazetted and equipped as Environmental Inspectors. As indicated in *Box 8.5*, the power and functions of Environmental Inspectors is provided for in the National Environment Act.

Box 8.5

Powers and duties of environmental inspectors

An Environmental Inspector may, in the performance of his duties under the National Environment Act Cap 153 or any regulations made thereunder, at all reasonable times and without warrant:

(a) enter on any land, premises or vehicle to determine whether the provisions of this Act are being complied with;
(b) require the production of, inspect, examine and copy licences, register, records and other documents relating to this Act or any other Act relating to the environment and the management of natural resources;
(c) make examinations and enquiries to discover whether this Act is complied with;
(d) take samples of any article or substance to which this Act relates and, as may be prescribed, submit the samples for test and analysis;
(e) carry out periodic inspections of all establishments within the local limits of his jurisdiction which manufacture, produce as by-products, import, export, store, sell, distribute, or use any substances that are likely to have a significant impact on the environment, to ensure that the provisions of this Act are complied with;
(f) carry out such other inspections as may be necessary to ensure that the provisions of this Act are compiled with;
(g) seize any plant, equipment, substance or any other thing which he believes has been used in the commission of an offence against this Act or the regulations made thereunder;
(h) close any manufacturing plant or other activity which pollutes or is likely to pollute the environment contrary to this Act for a period of not more than three weeks;
(i) issue an improvement notice requiring the operator of any manufacturing plant or other activity to cease any activities deleterious to the environment which are contrary to this Act;
(j) cause a police officer to arrest any person whom he believes has committed an offence under this Act.

Source: National Environment Act Cap 153, Section 81.

Despite the impressive achievements, enforcement of environmental regulations and laws is still problematic. At NEMA itself, there is limited human resources in the Enforcement Unit. The capacity of the lead agencies and local governments for enforcement is also low. To overcome some of the capacity constraints in the long-term at least, NEMA, with the support from UNEP is also promoting voluntary compliance. This initiative has already started with the Financial Sector in Uganda.

8.6 Environmental Education and Public Awareness

Section 88 of the National Environment Act provides for NEMA in collaboration with the Minister responsible for education, to take all measures necessary for the integration of education on the environment in the schools curriculum. Furthermore, Section 87 Subsection (4) provides for NEMA to publish such other publications as it considers necessary for public education on the environment and other environmental issues (GoU 1995).

NEMA has put in place two environmental education strategies, one for formal and the other for informal education sectors. The strategy for the formal education sector is now part of the school curriculum.

The non-formal education on the other hand is focusing at the district level and has an ultimate aim of delivering training in basic practical skills and knowledge on environmental management. It is also adopting a three-tier approach whereby a district coordination and training team of about 10 people is trained, which in turn trains three from every sub-county in the district, including secretaries for production and environment, and a government extension officer. This process is called training of trainers. These further go to the sub- county headquarters and train three trainers from every village who will then be expected to work with communities and families. This kind of approach was tried out in Jinja and Iganga districts and it was successful.

Education for sustainable development

The United Nations declared 2005-2014 as the Decade of Education for Sustainable Development. The United Nations passed a resolution in December 2002 to adopt the Decade of Education for Sustainable Development as endorsed by the Johannesburg World Summit on Sustainable Development. The Decade of Education for Sustainable Development (2005-2014) was adopted as Resolution 57/254 at the UN General Assembly 57th Session in 2002:

> *'Education is a primary agent of transformation towards sustainable development, increasing people's capacity to transform their visions for society into reality. Education not only provides scientific and technical skills, it also provides the motivation, justification and social support for pursuing and applying' (UNESCO 2003).*

Environmentalists try to respond to a broad range of sustainability concerns. Their educational programmes are designed not to empower people to manage the environment but also create more harmonious relations between society and nature. They also aim at re-orienting society modes and relations of production. However, while they may recognise the role of key stakeholders (politicians, private sector, local communities, etc), they often fail to engage them in practical and realistic participation to attain sustainability.

Therefore, for ESD to play its transformative role of re-orienting society, it is necessary to have a clear understanding of development objectives and critique modernism and its basic assumptions. This will empower all stakeholders to pursue options that are sensitive to the socio-economic and environmental impacts of the development processes (NEMA 2005).

ESD is not new but has to be focused on building a human, equitable and caring global society. This is a society having knowledge and is fully aware of the need for human dignity for all (old, young, women, men, disabled, sick, displaced, prisoners, etc) in various aspects: economic, social and ecological in their broad perspectives and totality. Activities like advocacy, policy analysis, communication, re-planning, visionary thinking and strategising among others, have to be employed to promote action competence.

Education for sustainable development starts at home and promotes environmental protection, and economic and social development. Many decisions, assumptions about the future and examination of local cultures have to be made about the three aspects. *Table 8.3* gives some examples.

Table 8.3 Some examples of environmental protection, economic and social development

ESD	Environment	Economy	Society
Knowledge	• Interdependence • Finite resources • Management	• Income generation • Components of economic growth	• Development of creativity • Locally viable applications
Issues	• Global effects • Degradation • Pollution • Loss of biodiversity • Shared natural resources • Encroachment on fragile and finite resources	• Poverty eradication • Accessibility to basic needs • Growth/ sustainable development	• Equity • Empowerment • Collaboration so as to cause positive impact and change. • Better livelihoods
Learning skills	• Proactive research • Sustainable use and management	• Planning for the future • Investing • Ploughing back • Accountability • Transparency • Communication	• Self reliance • Critical thinking competence • Action oriented • Visionalising • Proactive responses • New technology and applications • Discovery
Perspectives	• Interrelationship • Environment has no boundaries	• Local, national, regional and global benefits	• Role and contribution to the community, nation and human race.
Values	• Benefits of well managed environments for generations to come	• Regarding other benefits beyond monetary	• Guard jealously all those values that contribute to a progressive society: culturally, politically, healthy, and economically peaceful

Source: NEMA (2005)

Uganda's approach to ecosystem development is through regulations and guidelines on fragile ecosystems. Educative and public awareness videos on various issues for example Ngage River in Kapchorwa District, which is highly degraded due to severe environmentally-unfriendly activities, like massive erosion. In contrast, in the same district Atari River, which unlike Ngage river is properly managed, its water is clean.

8.7 Environmental Research

Right from colonial times, Uganda's research capability was well recognised. Up to the time of the breakup of the East African Community in 1977, Uganda shared research facilities and research programmes with other countries like Kenya and Tanzania. Some of the research institutions were based in Uganda like the East African Freshwater Fisheries Research Organisation in Jinja and the East African Virus Research Institute in Entebbe. However, during the 1970s and the 80s, most of the staff left because there was no funding and international support.

Today, the situation is different because a number of research organisations exist and they carry out research related to the environment, and most are government-run. Furthermore, international bodies sponsor or conduct research in fields related to natural resources management and environmental protection. There is also a noticeable increase in the number of private initiatives in the area of environmental research.

However, there are some constraints to environmental research in Uganda, including insufficient manpower and lack of appropriate equipment and other facilities. The National Council for Science and Technology maintains a database of research activities carried out in the country. However, the list is uncomplete since some of the research work goes on un-registered.

8.8 Environmental Information and Monitoring Reporting Systems

8.8.1 Environmental Information

While by 1994 when there was very little comprehensive environmental information management system in place, now there are at least four main ones developed and a regional effort in the process of being established, as described below.

The Environmental Information Network (EIN)

The EIN is an on-going programme within NEMA which has been in place for the last ten years. It was an initiative put in place after it was realised during the NEAP process that environmental information was deficient and scattered across many sectors.

The main objective of the EIN is to enhance the capacity of key data producers to exchange data and information in compatible formats and within minimal timeframe and cost (GIC 2004). EIN through NEMA, has been discharging the following functions:

- creating awareness of information management needs and issues;
- capacity building (provision of training and equipment);

- promotion of data standards; and
- development of data access policies by data-producers (GIC 2004).

In other words, the functions of the EIN have been several. Four of the key functions are as follows:

- operating as a network of members with open lines of communication between all of them;
- co-ordinating the data and information functions of the members;
- recruiting members, with initial emphasis on ensuring the involvement of large data users and producers; and
- providing a forum for communication on a range of technical, institutional and policy issues relating to the availability, dissemination and use of environmental information (GIC 2004).

Initially, the EIN started with six lead agencies; and these have expanded over the years to include additional institutions giving a total of 27 altogether (GIC 2004). *Box 8.6* shows 22 of these institutions.

Box 8.6

EIN Membership List (Partial)

The Expanded membership of Lead Agencies

1. Dept. of Physical Planning, MWLE
2. Forestry Department, MWLE/Forest Sector
3. Water Resource Management. Dept. MWLE
4. Dept. of Surveys and Mapping – MWLE
5. MAAIF – Planning Unit
6. Plan for the Modernisation of Agriculture (PMA) Secretariat
7. National Agricultural Advisory Services (NAADS) Secretariat
8. National Agricultural Research Organisation (NARO)
9. Ministry of Finance, Planning & Economic Development
10. Occupational Health Safety
11. Ministry of Education and Sports
12. Ministry of Local Government
13. Directorate of Public Prosecutions
14. CID Headquarters, Uganda Police
15. Uganda Investment Authority (UIA)
16. Uganda Manufacturers Association
17. Directorate of 1st Parliamentary Council
18. Dept. of Energy Resources - MEMD
19. Dept. of Petroleum Supplies – MEMD
20. Dept. of Geological Surveys and Mines – MEMD
21. Dept. of Community Health, MOH
22. Makerere University Institute of Environment and Natural Resources (MUIENR) – the National Biodiversity Data Bank

Source: GIC (2004)

The National Integrated Monitoring and Evaluation Strategy (NIMES).

According to GIC (2004), NIMES was launched by the Office of the Prime Minister in March 2004, intended to bring rationality and harmony in the implementation of government service delivery. The co-ordination framework is composed of a four-tier structure, namely:

- a Cabinet Sub-Committee on Policy Co-ordination comprising Ministers of those co-ordinating ministries chaired by the Prime Minister;
- an Implementation Co-ordination Committee composed of all the Permanent Secretaries chaired by the Head of the Public Service/Secretary to the Cabinet;
- a Technical Implementation Coordination Committee, a multi-sectoral technical committee chaired by the Permanent Secretary, Office of the Prime Minister; and
- several Sector Working Groups, which brings together all sectoral stakeholders to discuss their efforts in the implementation of sector activities. This mechanism is meant to facilitate inter-sectoral co-ordination for the realisation of sector targets and goals (GIC 2004).

Finally, according to GIC (2004), the four main objectives of establishing NIMES were:

- to ensure key stakeholders articulate data and information needs;
- to bring greater co-ordination to monitoring and evaluation initiatives in Uganda;
- to ensure that there is a sound base available to inform decisionmaking on the national policy frameworks such as the PEAP; and
- to enhance monitoring and evaluation capacity in Uganda.

Land Information Systems

The Ministry of Water, Lands and Environment is implementing the Land Sector Strategic Plan (LSSP) which covers the years 2001-2010. One of the strategic objectives of the LSSP is to increase availability, accessibility, affordability and use of land information for planning and implementing development programmes (MWLE 2000). To achieve this strategic objective, Government has embarked on the establishment of the Land Information System as a unified and relevant means to access land information (GIC 2004). It is expected that the LSSP will also be important in the implementation of the key national policies including: the PEAP, PMA, Decentralisation Policy, the Medium Term Competitiveness Strategy (MTCS) for the Private Sector, and the National Environment Management Policy (GIC 2004). Also the Land Information System should, in the long-run, contribute to the international commitments of Uganda to the Multilateral Environmental Agreements (MEAs).

The National Biodiversity Data Bank

The National Biodiversity Data Bank (NBDB) at Makerere University Institute of Environment and Natural Resources (MUIENR) was established in 1990. NBDB has comprehensive information on Uganda’s biodiversity. It has over the years been recognised by many Ugandans as a central biodiversity data repository (though not formally). A lot of information has been generated from the data held. For example, MUIENR publishes biennial 'State of Uganda's Biodiversity'. Some of the information from the publication of 2004 has been used in this State of Environment Report for Uganda.

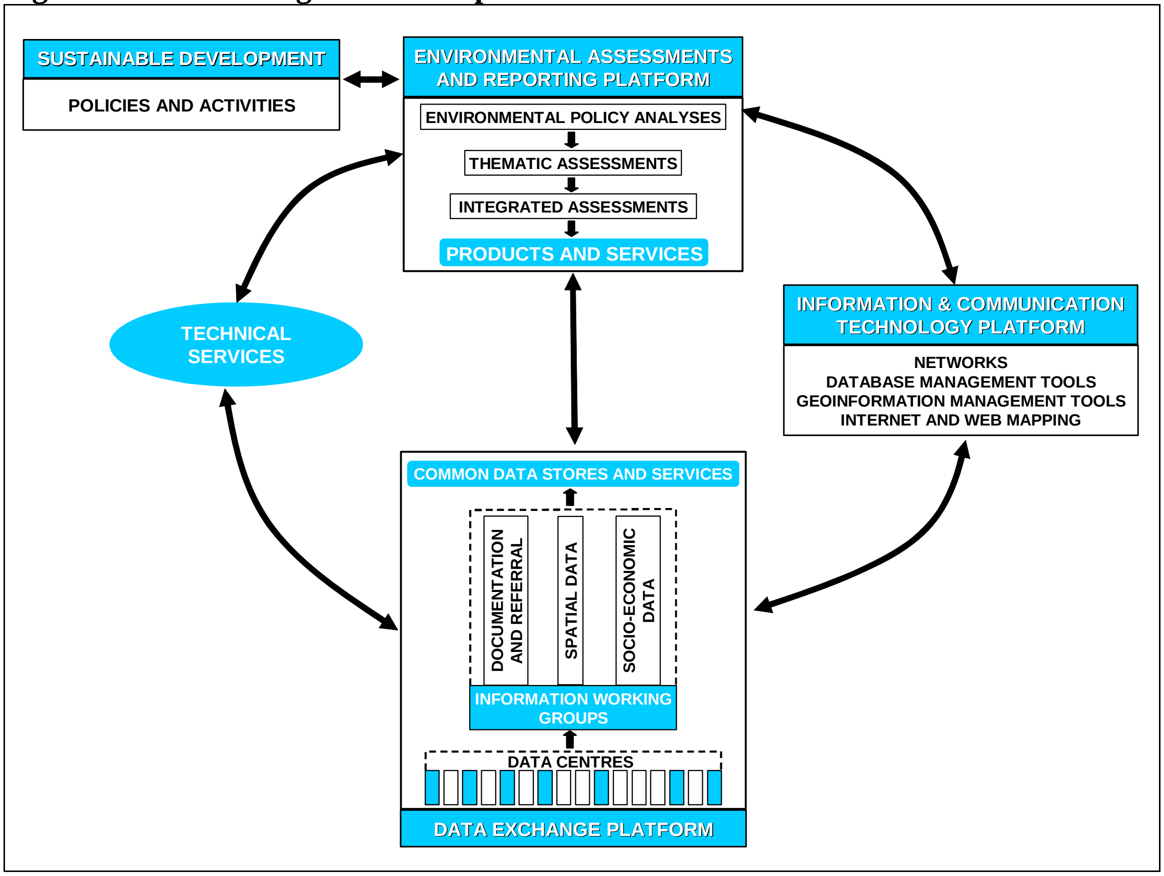
The African Environment Information Network

Uganda is also an active member of the evolving African Environment Information Network (AEIN). The AEIN is a multistakeholder capacity building process that aims to harness and enhance access to information and knowledge to support the management of Africa's environmental resources as assets for sustainable development. The goal is to strengthen the capacity of African countries to use good quality information on environmental assets to make informed investment choices at sub-national and national levels, and manage these assets on a sustainable basis. In the context of the information-driven economy of today, the enhanced capacities in resource information management and communication technologies will also help to better leverage the value of Africa's environmental assets (GIC 2004). This would be particularly relevant in the context of international negotiations with respects to the MEAs, as well as trade (GIC 2004).

According to GIC (2004), several African countries, Uganda included, have acceded to many of the global MEAs each of which imposes its own reporting obligations on countries, and requires information which tend to be wide ranging. For instance Chapter 40 of Agenda 21 deals entirely with information, and so are UNFCCC (Article 5: Research and Systematic Observations, and Article 123: Communication of Information related to Implementation); CBD (Article 7: Identification and Monitoring, Article 17: Exchange of Information, and Article 18: Technical and Scientific Cooperation); and UNCCD (Article 16: Information Collection, Analysis and Exchange, and Article 19: Capacity Building, Education and Public Awareness).

A schematic of the AEIN components is shown in *Figure 8.2*.

Figure 8.2 AEIN Programme components



Source: GIC (2004)

8.8.2 Environmental Monitoring

Section 24 Sub-Section 1 of the National Environment Act mandates NEMA in consultation with the relevant lead agencies to monitor:

- all environmental phenomena with a view to making an assessment of any possible changes in environment and their possible impacts; and
- the operation of any industry, project or activity, with a view to determining its immediate and long-term effects on the environment.

Sub-Section 2 further provides for environment inspectors appointed under Section 80 to enter upon any land or premises for the purpose of monitoring the effects upon the environment of any activities carried on that land or premises.

Within NEMA, monitoring is a function of the Directorate of Environmental Monitoring and Compliance (EMC). In order to enhance inter-departmental co-ordination, a team approach has been adopted within the organisation. The team responsible for monitoring is the Environment Regulations and Enforcement Team (ERET) which meets bimonthly. The ERET is responsible for ensuring well co-ordinated and integrated development and implementation of environmental regulations, licensing/permits, inspections, and EIA and audit monitoring in the country. The main challenges facing monitoring of the environment include: inadequate human resource capacity for monitoring and limited capacity to carry out surveillance to ensure compliance.

8.8.3 Environmental Reporting

Sources of information on the environment in Uganda is now more diversified than was the case as of 1994. The various sources include:

- *the State of Environment Report for Uganda.* Section 7, Sub-Section 1(k) of the National Environment Act mandates NEMA to prepare and disseminate a national state of the environment report once every two years. NEMA has performed this duty according to the law and has now produced the sixth of such report;

- *the District State of Environment Report.* Section 15, Sub-Section 2 (h) of the National Environment Act mandates each district to prepare a district state of environment report annually. Unfortunately, the districts have not been able to do so as prescribed by law, citing problems of lack of capacity and financial constraints. NEMA provided the districts with a 'how to' manual in 1996 and every district prepared a DSOER then. The manual was subsequently revised in 2003 and in 2004 the districts prepared their reports using the new format.

- *the DEAP process.* Many districts have district environment action plans which details environmental problems and corrective actions, in some cases, right up to the village level. In some of the districts, the DEAPs have been incorporated into the district development plans while in others this has not been done citing lack of knowledge on how to do it;

- before the preparation of the first DSOERs, each district prepared an *environment profile* highlighting key environmental stresses;

- the *Uganda Participatory Poverty Assessment Project (UPPAP)* has been conducting studies in selected districts. These studies contain sections on the environment and natural resources;

- some development partners prepare periodic *Country Environment Profiles* to guide them in identifying priority areas for support;

- *the PEAP*, revised every three years also has sections which deal with the environment, particularly the link between environment and poverty;

- *a number of sectors have their own annual reporting* requirements. Some of these reports have sections of relevance to the environment;

- the United Nations Development Programme publishes *country MDG progress reports* every 2-3 years. The first one for Uganda was produced in 2003.

- the United Nations Development Programme in 2004 produced a publication specific to Millenium Development (MDG) Goal Seven for Uganda on 'Ensuring Environmental Sustainability'. The publication was *Guidelines for Annual Reporting on Millenium Development Goal Seven for Uganda'* (UNDP 2004);

- many civil *society organisations also put out various reports*, some dealing with the environmental situation in Uganda;

- *the Envirnment Impact Statements* submitted by the private sector are also invaluable sources of information on the environment;

- some of *the research carried out at research or academic institutions* have aspects dedicated to, or are entirely on, environmental issues; and

- the United Nations Development Programme also publishes *National Human Development Report*. Each report has a different theme. There are several themes. Environment is one of them. The Uganda National Human Development Report 2005 focused on the environment (UNDP 2005).

- the National Biodiversity Data Bank produces the State of Uganda's Biodiversity Report every two years. The first was produced in 1999. These are meant to complement the SOER produced by NEMA.

The main place to access these various reports is the NEMA library. Reports may also be accessed from the libraries of research and academic institutions. NEMA, within the Ugandan EIN acts as a metadatabase, meaning that even if the information is not available in its library, the organisation should be able to guide enquirers as to where they can access such information. There is, therefore, need to ensure that NEMA's metadatabase capacity is strong and can effectively deliver the required service. This could be the service of the Clearing House Mechanism, if it was in place.

8.9 Innovating Towards Financial Sustainability

The lack of adequate financing was by 1994 and still is cited as one of the major constraints to the effective management of the environment in Uganda. According to the National Environment Action Plan (NEAP) for Uganda, the country's investment needs - especially in the areas of environment – have generally not been prioritised which has often led to investments in less urgent or even inappropriate programmes and projects (MNR 1995). Reasons advanced then included having no enabling environmental policy, lack of awareness among Government planners combined with weak monitoring and evaluation systems for existing investments (MNR 1995). Unfortunately, finances still remain inadequate. A key question is how much financial resources actually flow into environmental management in Uganda? No one seems to know for sure, except there is the feeling that the amount is inadequate for it to be effective. *Box 8.7* shows the objectives and strategies which were spelt out to ensure financial and economic sustainability. The main focus was to attract private resources to achieve environmental conservation and management objectives (MNR 1995). Unfortunately, the NEAP was overly optimistic in this regard since private capital has not been realised in significant quantities over this period.

Box 8.7

Financial and economic sustainability

Objective

To mobilise increased private 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) mobilise 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.

Source: MNR (1995)

Sections 89 and 90 of the National Environment Act provide for the establishment of a National Environment Fund. Section 89 Sub-Section (2) lists five sources of money for the fund. They are:

- disbursements from Government;
- all fees charged under the National Environment Act;
- any fees prescribed for any service offered by NEMA;
- any fines collected as a result of the breach of the provision of the National Environment Act or any statutory instrument made under it ; and
- gifts, donations and other voluntary contributions to the Fund made from any source (GoU 1995).

Section 90, Sub-Section 1 of the National Environment Act makes the NEMA Board responsible for the administration of the Fund. Sub-Section 2 further provides for the Board, on the advice of the Executive Director of NEMA, to provide funding for any Government department involved in the field of environmental conservation and natural resources management. Sub-Section 3 provides that subject to any limitations that may be imposed by the Policy Committee, the Fund may borrow money for the implementation of the objects of the Act (GoU 1995). It is worth noting that the National Environment Fund was indeed created and consists of all the various Accounts at different banking institutions and the Bank of Uganda held by NEMA at the moment. However, operationalisation of the Fund for enhanced realisation of funds has yet to happen.

An alternative way of looking at financing environmental management is to view it from the perspective of conservation financing. As shown in *Box 8.8* there are essentially three categories of sources of funds, namely: government funding; fundraising; and revenue generating financial arrangements (Smith & Martin 2000). The emphasis of this section is on the latter for the following reasons.

- government revenues are limited and environment has great difficulty in competing with other sectors such as health, defence and education. The situation gets worse at the district level where the District Environment Office gets about 10% of the annual budget requested. This partly explains why districts which do not have externally-funded project funds do not have DEAPs; and

- the main source of financing for environment and natural resources has been the multi-lateral and bilateral development partners followed by philanthropic contributions by members of the international NGOs. While the support is welcome, its sustainability is questionable.

Box 8.8

Sources of funding environmental management

1. Government funding	***2. Fundraising***	***3. Revenue generating financial arrangements***
• direct central government subventions to line ministries and parastatals such as NEMA • central government transfers through budget support • central government counterpart funds for specific projects including those dealing with the environment.	• multilateral donors • bilateral donors • individual contributions • corporate contributions • philanthropic contributions (NGOs) • others (such as lotteries, debt-for-nature swaps)	• business enterprises - ecotourism - ecological services (carbon, watershed, bioprospecting, etc) - solid waste management • financial instruments (endowments, sinking funds, revolving funds) • property-based transactions (easements, concessions, real estate transactions).

Source: Adapted from Smith and Martin (2000)

Ecotourism

Ecotourism is a major source of revenue. Currently, ecotourism is the third largest source of foreign exchange earnings. These earnings have to be shared among a number of stakeholders – conservation agencies (UWA, NFA, DFR), Government (in form of taxes), tourism facilities operators, tour operators, and local governments and communities around protected areas (through revenue and benefit sharing arrangements). The amounts realised by NFA and DFR for ecotourism services are much smaller in comparison to those earned by UWA from the same source. However even in UWA's case the revenues translate into about 24% of the institution's annual budget.

Revenues from professional services

NEMA has also realised some revenue in form of fees, mainly for reviewing and approving environmental impact statements and audits. The main source of the fees is the private sector. As Uganda's economy grows, private investments are expected to do the same. An indication of the level of large-sized private sector investments in form of direct foreign and domestic investments is shown in *Table 8.4*. Of the planned investments, some funds are likely to be spent on environmental considerations - practitioners' EIA consultancy fees and NEMA approval fees. At 1% of planned investment, the fees would have amounted to about $ 67 million over the period 1990 to 2004 for indicated projects. However, not all planned investments have actually been realised. Furthermore, not all planned investments require EIA or other environmental interventions. Hence the amount of funds earned by consultants and to some extent NEMA would be much less than indicated.

Table 8.4 Uganda Investment Authority: Annual summary of totals for licensed projects.

Year	*No. of Projects*	*Planned Inv(USD)*
1991	9	16,029,500
1992	166	387,918,113
1993	268	583,568,981
1994	347	416,915,191
1995	388	659,470,929
1996	315	749,153,629
1997	282	573,868,291
1998	130	369,367,866
1999	96	645,373,257
2000	110	319,165,364
2001	135	274,118,130
2002	157	894,622,496
2003	163	355,165,199
2004	193	435,224,400

Total Planned Investment from 2 783 Listed Projects (US $): 6,679,961,346

Source: UIA Database, 2005

Payment for environmental services

Payment for environmental services (PES) is a relatively new source of financing for environmental management, in Uganda at least. Worldwide, there is growing interest in market-based approaches to conservation. Public regulation and protected area systems, while critical, are insufficient to stop widespread resource degradation. For natural resources to be conserved they must be more valuable than the alternative uses of land and in order for them to be well-managed, good stewardship must be rewarded over a bad one. Markets and payments for ecosystem services, such as carbon sequestration, watershed protection and biodiversity conservation are emerging as viable alternatives to protect and restore ecosystems, while rewarding resource stewards and landowners for good land management practices.

Payment for Environmental Services (PES) is emerging as an innovative instrument with both theoretical and practical potential opportunities for bringing positive change to environmental management, preservation and conservation as well as contributing to sustainable development and eradication of poverty at all levels.

During the past decade, there has been a widespread emergence of markets and other compensation or payment schemes for ecosystem services around the world, particularly related to forests – such as watershed protection, biodiversity conservation and carbon sequestration. PES implementation focuses on the fact that the key to reverting ecosystem service degradation lies in changing the world's land use and industrial production practices.

According to the Millennium Ecosystem Assessment, ecosystem services are the benefits people obtain from ecosystems. These include provision of services, such as food and water; regulating services, such as water regulation and disease control; supporting services, such as soil formation and nutrient cycling; and cultural services, such as recreational, spiritual, religious and other non-material benefits (Ruhweza & Masiga 2005). The concept of environmental services does not have an agreed upon definition. Commonly, it refers to regulating and supporting cultural ecosystem services as outlined in the Millennium Assessment's definition.

The notion of paying or compensating for environmental services arises from different perspectives or interests. Thus, compensation mechanisms are variously seen as financial instruments for conservation; an option to ensure climate change mitigation at the lowest cost; an option to ensure environmental services of local or regional interest, such as regulation or filtration of water flows; and a possibility to strengthen rural livelihoods and re-valuing rural landscapes, and their diversity of practices and ecosystems.

As reported in Pomeroy *et al* (2002), Clausen (2001) used various data sources to estimate the relative amounts of fixed carbon for ten districts, six of which are in the southwest. The 'Final Carbon Values' reported by Clausen (2001) ranged from 18 tonnes of carbon/ha in Mbarara to 117 for Bushenyi and Luweero (*Table 8.5*). Carbon trade is still in its early stages of growth in Uganda. A few companies/organisations have negotiated carbon deals to conclusion. The majority of companies/organisations are still in the preliminary stages of developing project idea notes (PINs) and project design documents (PDDs) and making contact with potential carbon buyers. In addition, there are a number of capacity building initiatives that are taking place in the country, aimed at preparing the private sector to tap into this potentially lucrative and emerging global market. As a result, there is a lot of interest among potential participants who have gone ahead to start some activity implementation even before they have identified potential carbon buyers (*Table 8.6*).

Table 8.5 Final carbon values for selected Districts in Uganda, 2001

District	Final carbon Values tonnes/ha
Bushenyi	117
Gulu	88
Kabale	58
Kasese	113
Kisoro	84
Kotido	42
Kumi	36
Luwero	117
Mbarara	18
Rukungiri	100

Source: Clausen (2001); Pomeroy *et al* (2002)

Table 8.6 Some organisations/companies that have or are in the process of accessing carbon finance.

Organization	Project Location	Description of activity
ECOTRUST Uganda - Trees for global Benefits program.	Bushenyi District	Promotion of tree planting among small landholders.
UWA – FACE Foundation	Mt. Elgon and Kibale national parks	Reforestation of formerly encroached areas
Busoga Forestry Company LTD	Bukaleba Forest Reserve	Establishment of tree plantation.
IUCN – The World conservation Union	Mt. Elgon area	Still at the design stage of developing a tree planting activity within the national park and with communities outside the park.
Rift Valley Tourism Promotion Limited	Masindi District	Reforestation and habituation of chimpanzees. At stage of developing concept.
Liberty Trust Mityana Fruit Trees Initiative	Mityana	Growing of fruit trees for provision of fruits for sale while accessing carbon funds to supplement on funds.

Source: B.Byamukama of ECOTRUST (Pers.Comm.).

Watershed management is critically important due to increased degradation of watersheds, which has resulted in deterioration of water quality and decreased water flow. It is important that water users contribute to the management of watersheds if they have to be assured of the necessary water quality and quantity into the future. Payment for watershed management is not developed at all in Uganda at the moment.

The main objective of developing PES initiatives is to contribute to the conservation and sustainable use of natural resources as a strategy to fight poverty. Indeed it has been argued that some PES mechanisms may encourage poverty (Greg-Gans &Bishop 2004). However, in Uganda, opportunities for using PES mechanisms and sustainable natural resource management have already been tried. A novel example is the Market Access for Organic Products Programme, under the Exports of Organic Products for Africa initiative funded by the Swedish International Development Agency (SIDA) implemented by two European organisations Grolink AB and Agro-Eco Ltd. This programme provides exporters with the opportunity of selling organically certified products in the European markets. However, the project is also based on the exporters being able to build a network of poor organic farmers or sustainable fishers as their suppliers. The poor producers earn a premium of 25 to 50% above the conventional market prices (Ruhweza and Masiga 2005). List of payments for ecosystem services projects in Uganda is shown in *Table 8.7.*

Table 8.7 Payments for ecosystem services projects in Uganda,
(Carbon, biodiversity and other ecosystem service projects)

Carbon projects	Biodiversity projects	Other projects
ECOTRUST – Trees for Global benefits program	Mgahinga Bwindi Impenetrable Forest Conservation Trust (MBIFCT)	Water Project for Uganda Breweries Limited/ National Wetlands Programme
West Nile Power Project	Integrated Co-management of Lakes through Beach Management Units	Bufumira Islands Alternative Energy Demonstration Project
UWA/FACE Forest Certification Initiative	Kibale and Mt. Elgon National parks Co-management scheme	Chimpanzee Sanctuary and Wildlife Conservation Project
	Budongo Forest Eco-tourism Development Project (BFEP)	Promotion of Bamboo Sector- Prime/West Project
		Market Access for Organic Products
		International Gorilla Conservation Programme (IGCP) Water Gravity Scheme
		Collaborative forestry management in Kibale and Mt Elgon National Parks
		Echuya Forest Conservation Project- Nature Uganda
		The Mabira Forest Reserve Eco-tourism Project

Source: Ruhweza and Masiga (2005)

Payments for biodiversity conservation may be used to preserve endangered species, rare animal species or in protecting biodiversity of the country or a region from violators. Uganda has achieved considerable progress in implementing payments for biodiversity conservation services in the forest and wildlife sub-sectors. The major examples include private and public-private collaborative investments in nature conservation through ecotourism firms as the Budongo Forest Eco-tourism Development Project (BFEP); profit sharing agreements and bio-prospecting contracts existing with the Uganda Wildlife Authority (UWA) for most National Parks including Bwindi and Mgahinga national parks; certification and eco-labelling of biodiversity products and services such as the pilot forest certification initiatives between UWA and FACE Foundation for Mount Elgon National Park.

It has often been remarked that environmental legislation in Africa has progressed faster than management and enforcement. PES is a case in point of such a situation. Nearly all policies and legislations have a component for the use of market based/economic instruments and yet there has not been a rapid effort to research, develop and domesticate economic instruments in the management of the environment and natural resources in Uganda. While the forestry and wildlife sub-sector managers have a head start, the responsibility especially for the MWLE and NEMA is to identify sectors where PES can be adopted more easily. By characteristics, PES will be adopted more easily where the cost of the damage and monopoly to an ecosystem is high for other resource users, and where the violators and polluters recognise the damage their activities cause. Having identified the target areas for PES the appropriate instruments for recouping payments can then be designed. The design of instruments should use participatory tools in principle as a learning process for the different institutions and the polluters, beneficiaries and resource managers of the ecosystems. This process would then be replicated over other areas where the potential for PES exists.

Financial investments

As discussed earlier, the largest share of funds ear-marked for environmental and natural resources management comes from fundraising (multilateral and bilateral development partners and philanthropic contributions). This suggests that financing for the environment and natural resources management in Uganda is not sustainable. As stated in the NEAP, financial sustainability is critical and a desired objective (MNR 1995). One option is to promote the creation of financial investments (Smith and Martin 2000). There are three main types of financial investments: endowments, sinking funds and revolving funds, and hybrids thereof.

According to Smith and Martin (2000), endowments and sinking funds are very similar in the way they generate income, but quite different in the way they spend both: income generated and the principal of the fund. Endowments and sinking funds typically invest their capital in stocks and bonds, usually offshore (Moyini & Asiyo 2004; Smith & Martin 2000) as a risk reduction measure. The overall purpose of these investments is to generate stable flows of income from earned dividends to support environmental and natural resources management activities. Endowments have strict rules preventing invasion of the principal and limiting the use of funds to the dividends generated. EMA Consult (2001), estimated that NEMA would require an endowment fund of about $50 million to support environmental management countrywide. Currently, the only endowment fund established and fully operating for environment and natural resources management is the Mgahinga Bwindi Impenetrable Forest Conservation Trust (MBIFCT) aimed at protecting the Mountain Gorilla ecosystem and improving the rural livelihoods of the surrounding communities. The Trust was capitalised initially with $4 million GEF funding. Some operational funds were obtained from USAID and the Royal Netherlands Embassy. The Conservation Trust of Uganda (ECOTRUST) was also established in 1991 but does not have an endowment. The Environment, Forest, Wildlife and Fisheries all have provisions for funds structures, but no endowments as yet.

The exisiting funds for environment, forest, fisheries and wildlife currently operate as sinking funds. By their very nature, these funds use the principal they receive in an established period by spending any accrued dividends plus a portion of the principal.

ECOTRUST and a few NGOs operate different types of revolving funds, used to transfer funds to rural communities, but on condition of repayment. In ECOTRUST's case, since the funds are heavily subsidised, they in effect behave like sinking funds. For some NGOs, the revolving funds are availed at market rates, hence in effect becoming like commercial loans.

Property-based transactions

Experiences worldwide seem to indicate that property-based financial arrangements for environment and natural resources management tend to be difficult investment mechanisms to put in place (Smith & Martin 2000). Notwithstanding the above, there are two types of property-based transactions that potentially could be sources of finance for environment and natural resources management activities in Uganda. They are: easements and concessions; and real estate deals.

Concessions represent the right to use land or to access its resources for profit or as a means to obtain an income (Smith & Martin 2000). The Uganda Wildlife Authority has granted several concessions to the private sector for developing tourist facilities in the wildlife protected areas. Typically, the concessions include payment of ground rent and a percentage of sales as concession fees. The earlier concessions negotiated by Uganda National Parks and inherited by UWA were for 30-year leases and included exclusive zones of as much as 25 km radius! They were, therefore inequitable and too restrictive. The old concessions are currently being re-negotiated. The NFA is another conservation agency that grants concessions for the development of tourism facilities.

An easement is a privilege or a right without profit that one person or institution has over the lands of others (Smith & Martin 2000). Section 73 of the National Environment Act provides that a court may, on an application, grant an environmental easement subject to provisions of the Act. *Box 8.8* lists the conditions under which an environmental easement may be imposed. However, easements have not yet been used to generate income for environmental management in Uganda.

Box 8.9

Conditions of issuance of environmental easements

Without prejudice to the general effect of subsection (1), an environmental easement may be imposed on burdened land so as to-

(a) preserve flora and fauna;
(b) preserve the quality and flow of water in a dam, lake, river or acquifer;
(c) preserve any outstanding geological, physiographical, ecological, archaeological, or historical features of the burdened land;
(d) preserve a view;
(e) preserve open space;
(f) permit persons to walk in a defined path across the burdened land;
(g) preserve the natural contours and features of the burdened land;
(h) prevent, or restrict the scope of any activity on the burdened land which has as its object the mining and working of minerals or aggregates;
(i) prevent or restrict the scope of any agricultural activity on the burdened land; and
(j) create and maintain works on burdened land so as to limit or prevent harm to the environment.

Source: GoU (1995)

On the other hand, real estate transactions have potential to raise revenue for some of the environment and natural resources management agencies. For example by having its own premises (building donated by Government), NEMA is now free of obligations to pay rent for office space. The donated property has additional area where an office tower could be constructed for purposes of earning rental income. The NFA also has a sizeable piece of land in Kampala. The land could be developed for rental income. Such real estate undertakings could help defray the institutions' operating costs and even perhaps generate surpluses for use in field activities or as contributions to endowment funds to enhance financial sustainability, or both.

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9.0 CONCLUSIONS AND RECOMMENDATIONS

9.1 Conclusions

The State of Environment for Uganda 2004/2005 has demonstrated with supporting data that the investments the country, its development partners and civil society have made over the period 1994 to 2004 have registered significant progress in the way the environment is managed compared to the baseline situation of 1994. However, many challenges still remain and some are emerging.

In terms of progress, the Constitution recognises a healthy environment as a fundamental right of all Ugandans. The country has also put in place a comprehensive set of cross-sectoral and sectoral policies, laws, regulations, guidelines and standards. The problem the country faces is in the area of enforcement of the existing environmental instruments. It is further complicated by the fact that there is a deliberate plan to decentralise environment and natural resources management, at a time when most districts lack the necessary capacities to do so. The capacities of the districts are being enhanced, but this is expected to require more time and financial resources.

Despite the improvements in the institutional, policy and legal framework, Uganda still faces daunting environmental challenges. In a nutshell, Ugandans are enjoying environmental goods and services today at the expense of those not yet born, contravening the principle of sustainable development which the country subscribes to. Evidence of the abovementioned statement can be found in the following:

- neglect of provisions of environmental laws;
- horrendous hidden annual costs of soil erosion;
- increased land scarcity evidenced by reduced access by the poor, and in some parts fragmentation;
- fish and other natural resources off-take rates approaching and in some cases even surpassing long-run sustainable yield levels;
- apart from Kampala City Council, virtually no meaningful efforts are being made at managing solid waste in other urban areas, especially the non-decomposable components (plastics). Even in Kampala, the effort is minimal;
- low level of private sector involvement in environment and natural resources management;
- low royalty rates instead of economic rents for natural resources, hence government’s inability to expand the non-tax revenue base;
- officially sanctioned, at both central and local government levels, encroachment onto protected areas in the name of economic development;
- poor administration of land-related matters – ownership, dispute settlements, inappropriate uses, etc. to some extent as a result of the absence of land use plans;
- inadequate levels of domestication of the multilateral environmental agreements Uganda is signatory to so as to inform local governments and local environment communities.

However, despite the challenges that persist and some emerging ones, successes have been achieved in certain areas. These include the following:

- mass poverty has been effectively tackled, having reduced from 56%in 1992 to 38% by 2004;
- there have been noticeable improvements in dealing with a number of environment-related diseases - HIV/AIDS, malaria, sleeping sickness, etc.;
- higher safe water and proper sanitation coverages countrywide than was the case in 1994;
- biodiversity loss in wildlife protected areas and forest reserves have stabilised somewhat and in some PAs the trend has even reversed as evidenced by increasing wildlife populations;
- an increase in the percentage of permanent houses (a proxy for better living conditions) than was the case in 1994;
- higher enrolment of pupils under the Universal Primary Education with an opportunity to raise the consciousness of the youth about environmental concerns as part of their formal curriculum and through promotion of education for sustainable development;
- an enabling policy framework is in place for environment and natural resources management;
- opening up of export markets for environmental goods and services such as carbon, gum arabic, *aloe vera*, etc.; and
- more effective communication and data sharing opportunities among different sectors and African countries.

9.2 Recommendations

The recommendations listed below are in effect key policy responses required or necessary to further improve environmental management. The key responses are the following.

1. *Enforcement*

Governments at both the centre and local levels need to increase efforts at the enforcement of existing environmental laws and regulations. This may, among others, necessitate strengthening the capacity of enforcement personnel and institutions, and creating greater awareness for environmental issues among the judiciary. Voluntary compliance guidelines should be promoted for various industries in the private sector. Furthermore, compliance to international environmental conventions and agreements of which Uganda is a signatory should be improved.

2. Solid waste management

The problems of solid waste management are becoming ever bigger as aresult of increased urbanisation in part. There is an urgent need to develop a national solid waste management policy and an accompanying law to strengthen the provisions in the NEMA guidelines and regulations.

3. *Awareness creation*

Policymakers need to be made aware that environmental management can complement national economic development. This calls for the application of the tools of integrated assessment and planning. Government should request for assistance in establishing the integrated assessment and planning framework in Uganda.

4. The development framework at local government levels

The provision of the National Environment Management Policy calling for the integration of environment into development plans needs to be emphasised at the local government levels. A Manual needs to be prepared to guide the local governments in integrating DEAPs or SEAPs into DDPs and SCDPs.

5. *Incentives and disincentives*

Local communities need to be encouraged through appropriate incentives and disincentives to conserve the environment and natural resources. Likewise, the private sector should be persuaded through appropriate disincentives to refrain from damaging the environment. The private sector should also be encouraged through a set of incentives to view environmental goods and services as a source of wealth.

6. *Soil erosion*

The Plan for Modernisation of Agriculture, NAADS and district agricultural and land offices should be encouraged to recognise soil erosion as the topmost problem in farming, and devote greater resources for addressing it. At the national level, the draft National Soils Policy needs to be revised, updated and adopted. Thereafter, a National Soils Sector Strategic Plan ought to be elaborated based on the policy.

7. *Land policy and the land use policy*

Both the Draft Land Policy and Draft Land Use Policy need to be adopted by Cabinet to facilitate revisions to the Land Act and to allow for the preparation of land use plans need to promote the optimal utilisation of the country's land resources. The vegatation maps prepared by Longdale-Brown at a scale of 1:500 000 need to be digitized for purposes of establishing baseline conditions pertaining at Uganda's independence. Institutions such as MUIENR and NFA could be contracted to do the work.

8. Natural resource inventories and stock assessments; availing environmental information

It is quite a long time ago that many of the inventories of natural resources (forests, wildlife, fisheries, etc.) were carried out. Inventories are expensive undertakings, hence Uganda should seek international assistance in compiling more current inventory data to allow for better and informed decisionmaking in environmental and natural resources management. Greater support should be given to environment information initiatives so that timely information can be availed for decisionmaking.

9. Sectoral annual reports

The different sectors should be encouraged to prepare annual reports. Some sections of the reports would be useful tools for monitoring environmental changes and thus permit timely action. These reports would also constitute useful data for the preparation of the national and district state of environment reports, and other environment and sustainable development reports including the fulfillment of national obligations of the various MEAs.

10. National environment policy and action plan

Both the National Environment Management Policy and the National Environment Action Plan are now old and outdated. There is need to revise the two instruments in order to accommodate emerging issues such as greater levels of investment in aquaculture, solid waste management and payments for environmental services.

11. Sustainable financing

In the absence of development partner assistance many of the environmental management activities in the country would have not been possible. Ensuring future sustainability for environmental financing requires a combination of both new and old financing arrangements. The old ones may involve the imposition of an environmental tax or levy, principally the work of the Ministry of Finance Planning and Economic Development. New mechanisms for raising financing include promoting payment for environmental services. Government ministries and agencies, and civil society organisations and the private sector should be encouraged to promote the markets for Uganda's biodiversity products and ecological services. Local governments could also increase their non-tax revenue base through the promotion of tourism based on cultural heritage resources. Therefore, there is need to establish standards, operations procedures, and certification of the major cultural heritage resources of the country by the Ministry of Tourism, Trade and Industry as the principal institution responsible.